Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District Project – Phase 2, Yukon, Canada

Report Prepared for

Alexco Resource Corp.

Report Prepared by

SRK Consulting (Canada) Inc.

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Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District Project – Phase 2, Yukon, Canada

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Cover: View of mill complex looking west-southwest.

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CAUTIONARY STATEMENT

This preliminary economic assessment is preliminary in nature. The "potentially mineable tonnes" disclosed in the mine plans are partly derived from Inferred mineral resources by the application of a cut-off NSR, and dilution and mining recovery factors. Inferred mineral resources are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that this preliminary economic assessment will be realized.

SRK estimates that Inferred mineral resources form the basis of 6 percent of the "potentially mineable tonnes" included in the plant feed schedule of this PEA.

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List of Abbreviations

Unit or Term	Abbreviation	Unit or Term	Abbreviation
cubic feet per minute	cfm	load-haul-dump	**LHD**
cubic metres per second	cms	metal leaching/acid rock drainage	**ML/ARD**
degree	°	metre	**m**
degrees Celsius	**°C**	micron	**µm**
dollars (Canadian)	**$ or C$**	milligram	**mg**
dollars (US)	**US$**	millimetre	**mm**
dry stack tailings facility	**DSTF**	National Instrument 43-101	**NI 43-101**
Eastern Keno Hill Silver District Project – Phase 2	**EKHSD project**	net present value	**NPV**
Elsa Reclamation & Development Company Ltd.	**ERDC**	net smelter return	**NSR**
Enhanced Production Scheduler	**EPS**	non-acid or metal leaching	**N-AML**
First Nation of Na-cho Nyak Dun	**FNNND**	operating expense	**Opex**
general and administrative	**G&A**	ounce/troy ounce	**oz**
gram	**g**	parts per million	**ppm**
grams per litre	**g/L**	percent	**%**
grams per tonne	**gpt**	potentially acid or metal leaching	**P-AML**
inch	**"**	pound	**lb**
internal rate of return	**IRR**	preliminary economic assessment	**PEA**
kilogram	**kg**	Qualified Person	**QP**
kilograms per cubic metre	**kg/m^3**	SRK Consulting (Canada) Inc.	**SRK**
kilometres	**km**	square metre	**m^2**
kilotonne	**kt**	three-dimensional	**3D**
kilowatt	**kW**	ton (2000 lbs)	**ton**
kilowatt hour	**kWh**	tonne (1000 kg)	**t**
life-of-mine	**LoM**	tonnes per day	**tpd**
litre	**L**	United Keno Hill Mines Ltd.	**UKHM**
litres per second	**L/s**		

1 Summary

1.1 Introduction

Alexco Resource Corp. (Alexco) owns 100 percent (%) of the historic Keno Hill silver district, located in Yukon, Canada. It is comprised of polymetallic silver-lead-zinc deposits occurring in the historic Keno Hill silver district located in the vicinity of the village of Keno City, Yukon. There are approximately 30 known deposits in the area, many of which have been subject to small scale mining operations over the last century, and numerous prospects.

Alexco's objective is to unlock value in the silver-rich Keno Hill silver district, and is focused on growth by advancing its promising district properties to development decisions.

The Bellekeno mine is one of several mineral properties held by Alexco within the Keno Hill silver district. The Bellekeno mine, which commenced commercial production at the beginning of calendar year 2011, operated as Canada's only primary silver mine until operations were temporarily suspended by Alexco at the end of August 2013 (refer to Alexco's July 17, 2013 news release).

The current status of Alexco's more advanced properties within the Keno Hill silver district are listed below:

- Bellekeno mine: In production since 2011 until temporary suspension of operations at the end of August 2013. This preliminary economic assessment (PEA) assumes that production stoping will re-start January 1, 2015;
- Lucky Queen mine: Reconditioning and development work was undertaken from early 2012 into Q2 2013, with operations temporarily suspended in March 2013. The PEA assumes that pre-production development work will re-start in Q2 2016;
- Onek mine: Development work was undertaken from late 2012 into Q2 2013, with operations temporarily suspended at the end of May 2013. Onek is not included in the production plan presented in this PEA report;
- Flame & Moth deposit: Scoping level mine planning work has been completed by SRK Consulting (Canada) Inc. (SRK), and an internal company report has been provided to Alexco. Alexco is working toward the initiation of the permitting process. The PEA assumes that pre-production development work will begin April 1, 2014;
- Bermingham deposit: A historical, small scale silver producer, where additional exploration drilling has been done by Alexco and an updated resource block model has been completed. No mine planning has been completed on the new mineral resources. This deposit is not considered in this PEA report.

This PEA is based on Alexco's plan to resume underground development activities in the eastern part of the Keno Hill silver district, specifically at the Bellekeno and Lucky Queen mines and the Flame & Moth deposit beginning April 1, 2014, followed by the commencement of production stoping and processing on January 1, 2015. The project describing the development and production plans for these three properties that support the long range feed schedule for Alexco's mill facility is referred to as the Eastern Keno Hill Silver District Project – Phase 2, which in this report is abbreviated as the EKHSD project.
These deposits have mineral resource block models that were constructed using a geostatistical block modelling approach with the mineralization constrained by wireframes. Mineral resources are

classified as Indicated or Inferred following the CIM *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2010).

An updated mineral resource model for the Bellekeno deposit was constructed by Alexco during the third quarter of 2012 under the supervision of David Farrow, BSc (Hons), GDE, PrSciNat, PGeo (BC), a third party consulting geologist.

A mineral resource estimate for the Lucky Queen deposit was previously prepared by SRK and published in an independent technical report on September 8, 2011entitled “Technical Report on the Lucky Queen Deposit, Lucky Queen Property, Keno Hill District, Yukon” (SRK, 2011a).

In 2013, a mineral resource block model for the Flame & Moth deposit was constructed by Alexco under the supervision of Mr. Farrow. The mineral resource estimate is documented in a March 15, 2013 technical report entitled “Updated Technical Report on the Flame & Moth Property, Keno Hill District, Yukon” (Farrow and McOnie, 2013).

This technical report documents the context and assumptions required to develop the economic analysis to support the PEA based on these three mineral resource estimates. The report was prepared following the guidelines of the Canadian Securities Administrators National Instrument 43-101 and Form 43-101F1, and it is in conformity with the generally accepted *Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines* (CIM, 2003).

1.2 Property Description and Ownership

The Bellekeno, Lucky Queen, and Flame & Moth deposits are near the village of Keno City, approximately 350 kilometres (km) north of Whitehorse, Yukon, within the EKHSD. Alexco’s administration and camp facilities are located at the historic company town of Elsa, which is accessible from Whitehorse via a 460 km all-weather road and by air via the Mayo airport, which is some 40 km to the southwest. A gravel road known as the Silver Trail connects Mayo to the project area and the village of Keno City.

Alexco currently maintains a sizable land position in the Keno Hill silver district, including the Bellekeno, Lucky Queen, and Flame & Moth deposits. Mineral exploration at Keno Hill silver district is permitted under the terms and conditions set out by the Yukon Government in the Class IV Quartz Mining Land Use Permit – LQ00240, issued on June 17, 2008 and valid until June 16, 2018.

Central Yukon is characterized by a subarctic continental climate with cold winters and warm summers. Average temperatures in the winter are between -15 and -20 degrees Celsius (°C) while summer temperatures average around 15°C. Exploration and mining work can be carried out year-round. The landscape around the Keno Hill silver district is characterized by rolling hills and mountains with a relief of up to 1,600 metres (m).

1.3 History

The Keno Hill mining camp area has a rich history of exploration and mining with 21 deposits having documented silver production in excess of 3,110 kilograms (100,000 ounces). Silver was first found in 1901 but small-scale mining only began in 1913. High silver prices at the end of World War I led to renewed and ultimately successful exploration activity in the area. Since then, at least 65 deposits and prospects have been identified within the area. Many small silver deposits were mined independently of each other throughout the area between 1913 and 1925.

The Treadwell Yukon Company Limited (TYC) consolidated a number of small mines and properties in the area in the 1920s. TYC continued to be the dominant company in the mining camp until it ceased operations in 1942 upon the untimely death of its founder Livingston Wernecke.

Keno Hill Mining Company Limited (KHM) acquired the interests formerly controlled by TYC in 1945. KHM was reorganized in November 1947 as United Keno Hill Mines Limited (UKHM) and by 1958 UKHM had acquired several properties, interests in properties, and other companies, including the assets of Galkeno Mines Limited and Canadian Northwest Mines and Oil.

Ventures Limited (later Falconbridge Nickel Mines Limited and Falconbridge Limited) acquired a controlling interest in UKHM in 1960 and assumed management control.

UKHM ceased all production in the area in 1989 and placed the active mines on care and maintenance, but continued to conduct limited underground exploration and development at the Bellekeno and Silver King mines. On February 18, 2000, UKHM was granted bankruptcy protection with PricewaterhouseCoopers Inc. (PwC) being appointed by the court as the interim receiver and receiver-manager of UKHM in 2001.

In June 2005, Alexco was selected as the preferred purchaser of the assets of UKHM by PwC. In February 2006, Alexco's purchase of UKHM's assets through a wholly-owned subsidiary, Elsa Reclamation & Development Company Ltd. (ERDC), was approved. Under the Keno Hill Subsidiary Agreement, ERDC is indemnified against all historical liability, has property access for exploration and future development, and is not required to post security against pre-existing liabilities. ERDC received a water licence from the Yukon government in November 2007, giving Alexco free and clear title to surface and subsurface claims, leases, free-hold land, buildings, and equipment at the Keno Hill silver district.

Alexco embarked on an aggressive surface exploration program in 2006 with continued yearly exploration programs through 2013. The Bellekeno mine reached commercial production in January 2011 with at a nominal rate of 250 tonnes per day (tpd).

1.4 Regional and Local Geological Setting

The Keno Hill mining camp is located in the northwestern part of the Selwyn Basin in an area where the northwest-trending Robert Service Thrust Sheet and the Tombstone Thrust Sheet overlap. The area is underlain by Upper Proterozoic to Mississippian rocks that were deposited in a shelf environment during the formation of the northern Cordilleran continental margin. The area underwent regional compressive tectonic stresses during the Jurassic and the Cretaceous, producing thrusts, folds, and penetrative fabrics of various scales.

The Robert Service Thrust Sheet lying to the south of the Keno Hill silver district is composed of Late Proterozoic to Cambrian coarse grained quartz rich turbidite succession with interbedded shales and locally limestone of the Hyland Group, Yusezyu Formation.

The Tombstone Thrust Sheet that lies to the north and underlies the Keno Hill silver district consists of Devonian phyllite, felsic meta-tuffs, and metaclastic rocks of the Earn Group that is conformably overlain by the Mississippian Keno Hill Quartzite. This latter unit is locally thickened due to folding and/or thrusting and is the predominant host of the silver-lead-zinc mineralization of the Keno Hill district. Four intrusive suites intrude the sedimentary sequence:

- Late Triassic gabbro to diorite sills;

- Early Cretaceous Tombstone granite to granodiorite;
- Mid Cretaceous diabase dykes and sills;
- Upper Cretaceous McQuesten peraluminous porphyritic granite.

The Mississippian Keno Hill Quartzite is composed of a thick Basal Quartzite Member that is overlain by the Sourdough Hill Member. The sequence was metamorphosed to greenschist facies during the Cretaceous. The Basal Quartzite Member is up to 1100 m thick and comprises quartzite interbedded with minor graphitic phyllite and is intruded by Triassic greenstone sills. The Basal Quartzite Member is the dominant host to the silver mineralization in the Keno Hill silver district. The overlying Sourdough Hill Member comprises graphitic and sericitic phyllite, chloritic quartz augen phyllite, and thin limestone units. To the south, the Robert Service Thrust Fault separates the Keno Hill Quartzite from the overthrust Upper Proterozoic Hyland Group, which is comprised of predominantly meta-sedimentary chlorite and quartz-rich schist. The Keno Hill Quartzite is intruded by quartz-feldspar aplite sills or dykes that are correlated with the Early Cretaceous intrusive suite found elsewhere in the district.

Three phases of folding are identified in the Keno Hill silver district. The two earliest phases consist of isoclinal folding with subhorizontal, east- or west-trending fold axes. The later phase consists of a subvertical axial plane and moderate southeast-trending and plunging fold axis. In the Keno Hill silver district, the first phases of folding formed three structurally dismembered isoclinal folds of which the Basal Quartzite Member outlines synforms at Monument Hill where the Lucky Queen mine is located and at Caribou Hill, while the Bellekeno mine and the Flame & Moth prospect are located on the limb of a third dismembered syncline between Galena Hill and Sourdough Hill.

Within the Keno Hill silver district, up to four periods of faulting are recognized. The oldest fault set consists of south-dipping foliation-parallel structures that developed contemporaneously with the first phase folding. The Robert Service Thrust Fault truncates the top of the Keno Hill Quartzite and sets the Precambrian schist of the Yusezyu Formation of the Hyland Group above the Mississippian Sourdough Hill Member of the Keno Hill Quartzite. The mineralization in the Keno Hill silver district is hosted by a series of northeast-trending pre- and syn- mineral vein faults that display apparent left lateral normal displacement. These are commonly offset by post-mineralization high angle cross faults, low angle faults, and bedding faults. Most commonly, these comprise northwest-striking cross faults that show apparent right-lateral displacement.

1.5 Deposit Types and Mineralization

The Keno Hill silver district is a polymetallic silver-lead-zinc vein district with characteristics analogous to Kokanee Range (Slocan), British Columbia; Coeur d'Alene, Idaho; Freiberg and the Harz Mountains, Germany; and Príbram, Czech Republic. Common characteristics include the proximity to crustal-scale faults, affecting thick clastic metasedimentary rocks, and intrusion of felsic rocks that may have acted as a heat source driving the hydrothermal system. In the Keno Hill silver district, the largest accumulation of silver, lead, and zinc minerals occurs in faults in structurally prepared competent rocks.

In general, gangue minerals include manganiferous siderite, minor calcite, and quartz. Silver occurs in argentiferous galena and argentiferous tetrahedrite. In supergene assemblages, silver can be native or in polybasite, stephanite, and pyrargyrite. Lead occurs in galena, and zinc in iron-rich sphalerite. Other sulphides include minor pyrite, arsenopyrite, and chalcopyrite.

At the district scale, the hydrothermal system exhibits sharp lateral mineralogical changes equivocally associated with temperature gradients around magmatic rocks. The hydrothermal veins also exhibit sharp vertical mineralogical zoning, historically interpreted to be lead-rich at the top to more zinc-rich at depth.

1.6 Exploration Status

Most past exploration work in the Keno Hill silver district was conducted as support to the mining activities until the mines closed in 1989. This historic work involved surface and underground drilling designed to explore areas surrounding the main underground working areas.

The current exploration program conducted by Alexco is the first comprehensive exploration effort in the Keno Hill silver district since 1997. Alexco has conducted surface diamond drilling programs in the district every year since 2006.

No additional surface drilling has been completed on the Lucky Queen deposit since the independent technical report was published as the intent was to access the orebody and begin development. The updated mineral resource estimate on the Bellekeno deposit incorporated the knowledge gained in the last three years of production and the results of additional underground and surface exploration drilling. The Flame & Moth updated resource estimate incorporated all drilling completed through to the end of 2012.

1.7 Development and Operations Status

Commercial production started at the Bellekeno silver mine on January 1, 2011 and continued at a nominal rate of 250 tpd with some 158,346 tonnes (t) being milled in 2011 and 2012. The average head grades for this period have been 794 gpt silver, 9.9% lead, and 5.3% zinc. Operations at the site were temporarily suspended at the end of August 2013. The following is an excerpt from Alexco's July 17, 2013 news release.

"…Alexco has developed a contingency plan to operate through the summer while beginning preparations to undergo a temporary and orderly suspension of operations at the Bellekeno mine and mill prior to the onset of winter. This avoids selling silver at current or weaker market prices, and positions the mine and mill for a re-opening after the winter, assuming the silver market has improved from current levels and underlying fixed costs have been reduced. Alexco plans to use the winter period to significantly restructure the underlying fixed costs at Keno Hill, as well as refine plans for a production ramp-up to 400 tonnes per day in the 2014 -- 2015 time period."

Readers are referred to the complete text of the July 17, 2013 news release, available on Alexco's website www.alexcoresource.com.

This PEA is based on Alexco's plan to resume production in the eastern portion of the Keno Hill silver district on January 1, 2015 and it describes mining plans for the Bellekeno and Lucky Queen mines, and the Flame & Moth deposit.

The permit and amendments to existing permits required to bring the Lucky Queen deposit into commercial production were received in Q4 2012.

Development of the Lucky Queen deposit began in January 2012 with Alexco re-establishing the existing portal, installing services, and beginning rehabilitation of the existing drift, which was driven in the 1980's by UKHM. Reconditioning of this drift has progressed more slowly than planned with a bypass driven in one caved area, and ice occupying much of the 1,000 m length ultimately reconditioned. Despite these setbacks, the reconditioning was advanced to the planned ramp collar location prior to receiving the required permits and underground development began in early November 2012. The project was temporarily suspended in early March 2013, partly due to a need to amend the mining licence to allow storage of waste rock at the site to reduce waste haulage and storage constraints. The amendment is due to be filed prior to resuming production. The project is planned to resume during Q2 2016 and this is reflected in the PEA schedules and economic analysis.

Preliminary mine planning has been completed for the Flame & Moth deposit, and permitting for production at Flame & Moth is scheduled to begin in Q4 of 2013.

Mined tonnes produced from these three mine sites will be trucked to Alexco's nearby 400 tpd mill facility as scheduled in the PEA life-of-mine (LoM) plan.

Development of the Onek deposit began in August 2012 with the building of a new road to access the proposed portal collar location, construction of a new haul road, excavation of the portal bench, establishing the ramp face, and the installation of ground support and services. The first ramp round was taken in early November 2012 and underground development began with the goal of reaching the target vein at the 960 elevation. On May 31, 2013, Alexco announced that operations at Onek would be temporarily suspended. Onek is not included in the PEA production plan.

1.8 Mineral Resources and Mineral Reserve Estimates

This PEA technical report is based on mineral resource estimates for three deposits that are part of Alexco's EKHSD project:

- Bellekeno deposit;
- Lucky Queen deposit;
- Flame & Moth deposit.

The mineral resources have been estimated in conformity with the generally accepted CIM *Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines* (CIM, 2003) and are reported in accordance with the Canadian Securities Administrators' National Instrument 43-101. Mineral resources are not mineral reserves and have not demonstrated economic viability. There is no certainty that all or any part of the mineral resource will be converted into mineral reserve.

In the opinion of SRK, the resource evaluations reported herein are a reasonable representation of the global polymetallic mineral resources in the Bellekeno and Lucky Queen mines, and Flame & Moth deposit at the current level of sampling.

1.8.1 Bellekeno Mineral Resources

The updated Bellekeno Mineral Resource Statement (Table 1-1) presented herein represents the third mineral resource evaluation prepared for the Bellekeno deposit in accordance with the Canadian Securities Administrators' National Instrument 43-101. The mineral resource model was prepared by Alexco personnel under the supervision of a third party consulting geologist David Farrow, BSc (Hons), GDE, PrSciNat, PGeo (BC), of GeoStrat Consulting Services Inc. The model considers 405 core drill holes drilled by Alexco during the period of 2006 to 2012 as well as historical drilling and chip data collection during production both historically and by Alexco. The resource estimation work was completed by Mr. Farrow, a Qualified Person as defined in National Instrument 43-101.

Table 1-1: Updated Mineral Resource Statement for the Bellekeno Deposit, September 30, 2012

Class	Tonnes	Ag (gpt)	Pb (%)	Zn (%)
Indicated*	365,000	658	5.3	5.3
Inferred*	243,000	428	4.1	5.1

* Mineral resources are not mineral reserves and have not demonstrated economic viability. All figures have been rounded to reflect the relative accuracy of the estimates.

** Reported at a cut-off value of C$185 (US$1 = C$1)/t using consensus long term metal prices (US$) and recoveries of Ag US$22.50/oz, recovery 96%; Pb US$ 0.85/lb, recovery 97%; Zn US$ 0.95/lb, recovery 88%; Ag grades capped at 5,000 gpt.

SRK notes that since the date of the Bellekeno deposit mineral resource statement, Alexco reports actual tonnes processed from the Bellekeno mine of 124,000 t at average grades of 701 gpt silver, 8.3% lead, and 4.3% zinc (from June 1, 2012 to the temporary shutdown on September 1, 2013).

1.8.2 Lucky Queen Mineral Resources

The mineral resource estimate for the Lucky Queen deposit was previously prepared by SRK and published in an independent technical report on September 8, 2011 entitled “Technical Report on the Lucky Queen Deposit, Lucky Queen Property, Keno Hill District, Yukon,” which is available on SEDAR.

The Mineral Resource Statement from this report is restated below.

Table 1-2: Mineral Resource Statement for the Lucky Queen Deposit, July 27, 2011

Class	Tonnes	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)
Indicated*	124,000	1,227	0.17	2.57	1.72
Inferred*	150,000	571	0.16	1.37	0.92

* Mineral resources are not mineral reserves and have not demonstrated economic viability. All figures have been rounded to reflect the relative accuracy of the estimates.

** Reported at a cut-off value of $185 (US$1 = C$1)/t using long term metal prices (US$) and recoveries developed for the nearby Bellekeno deposit (Ag US$18.50/oz, recovery 96%; Pb US$ 0.90/lb, recovery 97%; Zn US$ 0.95/lb, recovery 88%; Au US$ 1,100/oz, recovery 72%). Ag grades capped at 6,300 gpt; Pb capped at 14.8%, Zn capped at 7%, Au grades capped at 2 gpt.

1.8.3 Flame & Moth Mineral Resources

The mineral resource estimate for the Flame & Moth deposit was previously prepared by Alexco under the supervision of Mr. Farrow and published in the technical report entitled “Updated Technical Report on the Flame & Moth Deposit, Flame & Moth Property, Keno Hill District, Yukon” (Farrow and McOnie, 2013) on March 15, 2013, which is available on SEDAR.

The Mineral Resource Statement from this report is restated below.

Table 1-3: Mineral Resource Statement for the Flame & Moth Deposit, January 30, 2013

Class	Tonnes	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)
Indicated*	1,378,000	516	0.42	1.72	5.70
Inferred*	107,000	313	0.27	0.86	4.21

* Mineral resources are not mineral reserves and have not demonstrated economic viability. All figures have been rounded to reflect the relative accuracy of the estimates.

** Reported at a cut-off value of $185 (US$0.96 = C$1)/t using consensus long term metal prices (US$) and recoveries developed for the nearby Bellekeno deposit (Ag US$24.00/oz, recovery 96%; Pb US$ 0.85/lb, recovery 97%; Zn US$ 0.95/lb, recovery 88%; Au US$ 1,400/oz, recovery 72%).For all veins, Ag grades capped at 3,000 gpt; Pb and Zn capped at 15% and 20%, respectively; Au grades not capped.

1.8.4 Mineral Reserves

This PEA does not support a mineral reserve estimate. The “potentially mineable tonnes” on which the economic evaluation is based include both Indicated and Inferred mineral resources from all three deposits.

1.9 Mining

1.9.1 Mine Geotechnical and Hydrogeology

- The Keno Hill silver district is known for locally challenging ground conditions that limit the choice of mining methods to fully supported methods with limited spans such as cut and fill and small scale longhole stoping with backfill;
- The Bellekeno mine was in production for close to three years. In that time, Alexco has successfully gained an understanding of the structural context of the deposit, how the ground responds to mining, and the best means of controlling the ground;
- Alexco has developed detailed and effective standards for ground support;
- In all mining areas, weak, wet ground conditions will result in elevated mining risk. Areas exhibiting these conditions will need to be exposed early and dewatered;
- The Flame & Moth deposit is in part situated below the floor of a valley and there is potential for water ingress from faulting, overburden materials, and surface water features.

1.9.2 Mining

- Planned underground mining methods include mechanized cut and fill, and drift and fill, where spans are greater than 7 m, and small scale longhole stoping;
- Net smelter return (NSR) estimates were used as a measure of resource block value;
- All three deposits exhibit good vein continuity after application of cut-off NSR values;
- Nominal production rates are: Bellekeno mine 250 tpd, Lucky Queen 100 tpd, and Flame & Moth 320 to 370 tpd;
- Potentially mineable tonnes total 807 kilotonnes (kt) with average metal grades of 745 gpt silver, 0.40 gpt gold, 2.69% lead, and 4.67% zinc, and an average NSR value of $419 per tonne (/t);
- Contained silver in potentially mineable tonnes is estimated at 19.3 million ounces;
- The average percentage of Inferred mineral resources in the LoM plan is approximately 6%;

- Estimated average external dilution by deposit is Bellekeno 19%, Lucky Queen 44%, and Flame & Moth 15%;
- The LoM production schedule from January 1, 2015 forward averages 406 tpd for 5.5 years through to mid-2020;
- Waste development requirements for 2014 gradually increase to 7.1 m/d in Q4, while the peak rates for the LoM schedule occur in the first half of 2015, averaging 11.5 m/d.

Bellekeno

- The Bellekeno deposit was being mined by underground methods including mechanized cut and fill and small scale longitudinal retreat longhole incorporating full backfilling;
- Bellekeno potentially mineable tonnes, 11% of LoM plant feed, are estimated at 86 kt with average metal grades of 660 gpt silver, 6.74% lead, and 4.15% zinc, and NSR value of $404/t;
- The mine reached commercial production at the start of 2011. Operations were temporarily suspended at the end of August 2013. A January 1, 2015 production re-start is planned.

Lucky Queen

- The Lucky Queen deposit requires the use of mechanized cut and fill methods in order to extract the mineral resource due to the average 45 degree (°) dip of the deposit. Cemented rockfill is planned to provide adequate support to the hangingwall;
- Lucky Queen potentially mineable tonnes, which account for 16% of LoM plant feed, are estimated at 129 kt with average metal grades of 1,054 gpt silver, 0.12 gpt gold, 2.35% lead, and 1.47% zinc, and NSR value of $557/t;
- Based on a Q2 2016 development re-start, the project is expected to begin providing plant feed as of Q4 2016, with commercial production (+70% of its planned production rate) achieved by Q3 2017.

Flame & Moth

- The Flame & Moth deposit can be mined by underground methods incorporating full backfilling without causing surface disturbance that could put the mill at risk;
- Flame & Moth's potentially mineable tonnes, 73% of LoM plant feed, are estimated at 593 kt with average metal grades of 690 gpt silver, 0.52 gpt gold, 2.18% lead, and 5.44% zinc, and NSR value of $391/t;
- Based on an April 1, 2014 development start and permitting timelines, the project is expected to begin providing plant feed in Q2 2015, with commercial production scheduled for Q4 2015.

1.10 Mineral Processing

Metallurgical testwork has been conducted on each of the three deposits independently. Testwork performed from 1996 through 2009 was the basis for the design and construction of Alexco's mill facility in 2010. Results of this testwork have been compared to actual performance in the mill, which has been processing Bellekeno ore since late 2010. Since 2011, samples from Lucky Queen and Flame & Moth mineralization were tested to assess flotation performance only. To date, no testwork has been conducted on a blended sample from any of the three deposits.

As all three deposits appear to follow similar relationships between concentrate grade and recovery versus head grade, this suggests similar mineralogy but at significantly different grades and metal ratios. Mineralogical investigations should be conducted to confirm this assumption.

Testwork results indicated that a primary grind size finer than that currently achieved by the mill facility could increase flotation selectivity, especially for zinc, resulting in higher recoveries and concentrate grades.

The current PEA study assumes the mill facility's production will increase to the design capacity of 400 tpd once the additional ball mill is commissioned in Q1 2015.

The LoM plan is generally based on the mill processing a variable blend of two deposits at a time, first a Bellekeno and Flame & Moth blend, and later a blend of Lucky Queen and Flame & Moth. Flame & Moth represents 73% of the total plant feed.

Relationships between silver, lead, and zinc recovery and head grade were used to estimate the concentrate recoveries for the blends expected in the PEA production plan. In addition, based on the concentrate mass recovery, the grade of minor elements was also estimated on an annual basis for the PEA production plan. These relationships are preliminary in nature and it is SRK's opinion that they need to be verified with metallurgical testwork on actual blended samples.

1.11 Environmental and Permitting

Key environmental and socio-economic considerations associated with this project include water quality, noise/traffic/dust, land/resource use and heritage resources, and community and First Nations relations. Discharges from the underground mines typically have neutral pH levels, but elevated concentrations of zinc, and sometimes cadmium. Due to the close proximity of this site to the community of Keno City, noise, dust, and traffic have been high profile issues for the project, and are the subject of ongoing discussions with the community. Several specific issues were raised during the *Yukon Environmental and Socio-economic Assessment Act* (YESAA) process, and these will need to be addressed during permitting and the ongoing consultation with the community. Access to and through the site are key issues for the local community. Alexco has signed a comprehensive Cooperation and Benefits Agreement with the First Nation of Na-cho Nyak Dun to address environmental and social issues associated with the project.

The tailings and portions of the waste rock are a potential source of metal leaching. The Bellekeno mine tailings are currently stored in the dry stack tailings facility (DSTF), where they will be covered at closure. Progressive reclamation has already begun on the DSTF and the completed areas of the DSTF have been covered with soil and revegetated. This facility can be expanded to accommodate future production from other new mines (Lucky Queen and Flame & Moth). The Bellekeno underground mine practice was to use tailings and some of the more mineralized waste rock as backfill. This same practice is planned to continue in the Bellekeno mine, and will be employed in the planned new mines.

Waste rock generated at Bellekeno (and all of the planned mines) with a minimal potential for metal leaching/acid rock drainage (ML/ARD) will be used in construction or stored in surface waste rock storage facilities. There are surface storage pads for temporary storage of mineralized waste rock prior to their transport underground for backfilling.

The development of the Flame & Moth deposit will generate relatively large amounts of waste rock in comparison to the Bellekeno mine, and will require a temporary stockpile (waste rock set aside for underground backfill) and a permanent stockpile for excess waste rock (potentially reduced by waste rock used for surface construction projects). Alexco plans to use the majority of the excess waste rock to construct a toe berm for the expansion of the DSTF. Further characterization of Flame & Moth waste rock is needed to determine the potential for ML/ARD.

Alexco recently revised its reclamation and closure plan to address the closure liabilities associated with the further development of Bellekeno and Lucky Queen (Alexco, 2012c). As part of the Quartz Mining Licence, the Government of Yukon currently holds $4.2 million in security for these operations, including the mill area and dry stack facility. This is a reasonable level of security given the current understanding of liabilities at this site. Development of the Flame & Moth deposit will require additional financial security to cover the potential costs of additional liabilities from the site – principally, the expanded DSTF and additional waste rock storage facility. Post closure water treatment is not expected to be required at Flame & Moth.

All of the regulatory approvals required for mining activities associated with the Bellekeno and Lucky Queen deposits are currently in place. The required expansion of the DSTF and the addition of the Flame & Moth development will require further review under the YESAA process, and subsequent amendments to the Quartz Mining Licence and Water Use Licence. This process is expected to take one to one and a half years from the time of submission.

1.12 Capital and Operating Costs

1.12.1 Capital Cost Estimate

Capital costs have been estimated in 2013 dollars on a quarterly basis for the period from January 1, 2014 to the end of the planned plant feed schedule in mid-2020. In 2014, only development activity is planned. In Q1 2015, production will start, sourced from the Bellekeno mine. The Flame & Moth mine will begin delivering tonnes in Q2 2015. The Lucky Queen mine will begin producing plant feed in Q4 2016, just as Bellekeno production is ending. For the two new mine start-ups, SRK considers commercial production to have begun in the quarter that 70% of the planned production rate is achieved. This defines the following pre-production periods:

- Q2 2014 through Q3 2015 for the Flame & Moth mine;
- Q2 2016 through Q2 2017 for the Lucky Queen mine.

Table 1-4 shows the LoM estimate of total capital. It is important to note that initial capital is distributed in time as defined by the pre-production periods described above. It is not all front-end loaded in the cash flow model.

Table 1-4: Capital Cost Summary

Area	Capital Costs ($M)		
	Initial	Sustaining	Total
Bellekeno Mine		$5.2	$5.2
Lucky Queen Mine	$9.9	$9.2	$19.0
Flame & Moth Mine	$29.3	$11.0	$40.2
Mill		$2.2	$2.2
Site Services		$0.9	$0.9
Health & Safety		$0.5	$0.5
Contingency	$6.1	$2.2	$8.3
Total Capital	**$45.3**	**$31.1**	**$76.4**

Capital cost estimation work was undertaken as follows:

- Mine capital by SRK, representing more than 90% of the total estimate;
- Mill, site services, and health and safety capital by Alexco with review by SRK.

SRK considers the accuracy of the capital cost estimate components to be at a scoping level.

1.12.2 Operating Cost Estimate

Site operating costs have been estimated in 2013 dollars based on SRK's review of Alexco's 2012 and 2013 operating budgets and on actual reported operating costs for 2011 and 2012. SRK's operating cost estimates reflect Alexco's ongoing and planned initiatives aimed at reducing the site unit operating cost.

These initiatives include:

- Future mine operations including development and production are planned as owner operated (instead of contractor) using Alexco's own equipment and workforce;
- Direct purchasing of new and used equipment for Lucky Queen and Flame & Moth instead of paying contractor monthly rental costs;
- Establishing long term supply contracts with suppliers and eliminating dependence on a contractor to supply basic materials such as ground support, explosives, and other materials;
- Upgrading the mill facility to ensure that it can reliably process 400 tpd.

Table 1-5 shows the LoM site operating cost estimate. It is based on a LoM plant feed of 807 kt as shown in the economic model.

Table 1-5: LoM Site Operating Cost Summary

Area	LoM Site Opex ($M)	Unit Cost ($/tonne)
Mine	$123.9	$154
Mill	$56.1	$70
G&A	$23.7	$29
LoM Total Site	**$203.8**	**$253**

SRK's operating cost estimates for the three individual mines are shown in Table 1-6. The tonnes shown in the table exclude tonnes mined during pre-production. The Flame & Moth mine operating cost includes $7.5 M for equipment lease payments, equivalent to $13.29/t.

Table 1-6: Individual Mine Operating Cost Estimates

Mine	Individual Mine Opex ($M)	Operating Period kt	Mine Unit Cost ($/tonne)
Bellekeno Mine	$12.3	85.7	$143.11
Lucky Queen	$29.1	118	$247.51
Flame & Moth	$82.6	567	$145.74
Subtotal Mines	**$123.9**	**770**	**$160.99**

1.13 Economics

Alexco and Silver Wheaton Corp. (Silver Wheaton) entered into an agreement on October 2, 2008 (the "Silver Purchase Agreement") whereby 25% of all future silver production from Keno Hill silver district properties owned or controlled by Alexco at the time of the consummation of the Silver Purchase Agreement will be delivered to Silver Wheaton in exchange for a payment of US$3.90 per ounce (/oz) as well as a payment by Silver Wheaton of US$50 M in 2009 and 2010 used for development and construction of the Bellekeno mine.

This PEA is preliminary in nature. Approximately 6% of the "potentially mineable tonnes" disclosed in the mine plans are derived from Inferred mineral resources by the application of a cut-off net smelter return (NSR) value ($/t), and dilution and mining recovery factors. Inferred mineral resources are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that this PEA will be realized.

Inputs to the economic assessment include:

- The terms of the Silver Purchase Agreement;
- LoM plant feed of 807 kt averaging 745 gpt silver, 0.40 gpt gold, 2.69% lead, and 4.67% zinc;
- The LoM production schedule from January 1, 2015 forward averages 406 tpd through to mid-2020;
- Average NSR value of plant feed of $419/t using the prices and exchange rate listed below;
- Metal prices of US$24.00/oz silver, US$1300/oz gold, US$0.95 per pound (/lb) lead, and US$0.85/lb zinc;
- Exchange rate of US$0.96/C$1.00;
- Payable silver amounting to 16.8 million ounces;
- LoM revenue of $338 million;
- A LoM average site operating cost of $253/t processed comprised of $154/t mining, $70/t milling, and $29/t G&A;
- Capital costs totalling $76 M, equivalent to $95/t processed.

The EKHSD project indicative economic results on an after tax basis are:

- Net cash contribution of $41.4 million;
- Internal rate of return (IRR) of 38.2%;
- Net present value (NPV)(5%) of $29.6 million;
- Payback period is 3.5 years from January 1, 2014.

SRK notes that the LoM impact of the Silver Purchase Agreement is an undiscounted revenue reduction of $88 million for Alexco.

SRK further notes that the PEA is based on a specifically selected mine sequencing strategy, however there are other possible scenarios for defining an overall production schedule that may warrant further study, particularly if changing metal prices or exploration results alter the mine planning context.

1.14 Risks and Opportunities

1.14.1 Risks

Mining

- Assessments of ground conditions at Lucky Queen and Flame & Moth are based solely on drill core review;
- As the overall level of extraction increases at the Bellekeno mine, it is likely that some stress induced failures will be encountered;
- Poor ground conditions, associated with a weak and wet rock masses, could increase mining costs and reduce planned extraction at Bellekeno and Lucky Queen;
- There is a possibility of significant water inflow to the planned Flame & Moth underground workings from faulting, overburden materials, and surface water features;
- Poor ground conditions, associated with a weak and wet rock mass, could increase Flame & Moth mining costs and reduce planned extraction;
- Alexco must build up a skilled underground workforce to achieve the planned development and production ramp up in 2014 and 2015. There is a risk that some contractor support could be needed, increasing operating costs.

Processing

- Estimates of plant performance include uncertainty since they are based on metallurgical testwork conducted on unblended samples of grades much higher and lower than the production plan averages;
- No assessment of ball mill grindability has been done for Lucky Queen or Flame & Moth material;
- To date, only one composite sample from Flame & Moth has been tested and the results indicate that the current mill flowsheet could result in poor zinc flotation performance.

Environmental and Permitting

- There is potential for additional post-closure costs related to water treatment at the Bellekeno workings;
- For Flame & Moth, there is limited information on the geochemical characteristics of waste rock and tailings. Further characterization is underway for the permitting process and will be useful in determining whether the management systems used at Bellekeno will be appropriate for Flame & Moth;
- The potential for high groundwater inflows to the Flame & Moth mine could create additional costs related to management and treatment of mine water;
- Development of the Flame & Moth deposit as well as the expansion of the DSTF from the currently permitted size of 322,000 t to a capacity that will accommodate Flame & Moth (estimated at a minimum of 750,000 t) will require additional permitting and possibly environmental assessment. SRK considers this a low risk, and significant delays are not anticipated.

Project Economics

- Unless underlying fixed costs are significantly reduced, project economic results will be significantly impacted by a 15% drop in metal prices below those used in this PEA;
- The EKHSD project has relatively high fixed costs related to location, climate, and the fact that operations are spread out over a large area. Overall economic results are closely linked

to plant throughput rate. The risk is in maintaining the necessary plant throughput from multiple mines that are characterized by narrow vein mining in locally poor ground conditions.

1.14.2 Opportunities

Mining

- Depending on the impact of hydrogeology on the Flame & Moth mine plan, there may be an opportunity to achieve more than the 50% planned extraction of the barrier pillars along the Mill fault, and within crown pillar areas. Refer to report Section 22.6;
- Actual mining experience at Bellekeno mine has yielded more tonnage at a similar grade than predicted by previous versions of the underground mine plan (based on the same resource block model) such that the currently planned mine life could be extended;
- At the Bellekeno mine, the East zone represents an opportunity if economic conditions were to improve, particularly silver and zinc prices higher than the study prices;
- The Flame & Moth underground mine plan should be optimized based on the results of any additional metallurgical testwork and the results of further hydrogeology and mine geotechnical assessments. There may be an opportunity to increase the potentially mineable tonnes;
- Flame & Moth mining shapes are sensitive to the cut-off criteria, and higher metal prices or reduced royalties would increase the potentially mineable tonnes;
- In each of the three deposits there are some potentially mineable tonnes that were excluded from the PEA production plan for various reasons. This excluded tonnage amounts to 163 kt with average metal grades of 566 gpt silver, 2.92% lead, 3.64% zinc, and 0.07 gpt gold, representing a potential future mining opportunity.

Processing

- Additional testing of blended samples representative of the LoM production plan blends and grades may result in better flotation results than the ones estimated in this PEA;
- Additional hardness tests on Lucky Queen and Flame & Moth samples may reveal better grindability than the current expectation. Better ball mill grindability has the potential to decrease power consumption, improve mill throughput, achieve finer flotation feed size and, therefore, higher recoveries and concentrate grades.

Project Economics

- The project is sensitive to higher metal prices. A 20% increase in prices compared to the prices used in the study (silver price of US$28.80/oz for example) would increase estimated after tax net cash flow by roughly 2.2 times;
- Within the Keno Hill silver district, Alexco has identified several high grade silver exploration/development targets that represent a pipeline of potential projects. These represent a potential opportunity to sustain a nominal plant feed rate of 400 tpd beyond 2020 (Table 16-27), thus improving the project economics.

1.15 Recommendations

Mining

- Mining sequences, monitoring, and tactical support requirements will need to be evaluated for the later stages of the Bellekeno mine plan;

- Additional hydrogeological and geotechnical evaluation needs to be undertaken at Flame & Moth to assess the impact of the hydrogeology on the proposed mining plan;
- For Flame & Moth, a system of barrier pillars will need to be designed along the Mill fault and below the overburden areas to minimize the potential for water inflow;
- The Lucky Queen underground mine plan should be optimized based on the results of additional metallurgical test results and increased understanding of the geology and geotechnical conditions resulting from planned sill drifting on vein;
- The Flame & Moth underground mine plan should be optimized based on the results of any additional metallurgical testwork and the results of further hydrogeology and mine geotechnical assessments.

Processing

- Further metallurgical testing and mineralogical analysis are recommended on additional samples representing the blends of deposits and expected grades shown in the LoM production plan;
- Additional testwork should also include ball mill grindability, flotation performance, and a range of samples to measure variability;
- Flotation conditions for Flame & Moth zinc concentrate production need to be optimized;
- Testing of additional samples for settling and geochemical characteristics is also warranted.

Environmental and Permitting

- Alexco has already initiated investigations on groundwater conditions at Flame & Moth, and geochemical characterization of waste rock from Flame & Moth. These studies will be important for developing appropriate waste and water management plans for these areas;
- Additional geochemical sampling and testing of both potentially acid or metal leaching and non-acid or metal leaching rock from all of the mines would provide a more robust data set for use in updating future closure plans.

2 Introduction

Alexco owns 100 percent (%) of the historic Keno Hill silver district, located in Yukon, Canada, approximately 350 kilometres (km) north of Whitehorse. The district surrounds the village of Keno City, Yukon (63˚55'N, 135˚29'W). The closest town is Mayo, approximately 40 km to the southwest of the project via an all-weather road.

The Keno Hill silver district is comprised of polymetallic silver-lead-zinc deposits with approximately 30 known deposits and numerous prospects in the area, many of which have been subject to small scale mining operations over the last century.

Alexco's objective is to unlock value in the silver-rich Keno Hill silver district, and is focused on growth by advancing its promising district properties to development decisions to provide long term plant feed for its mill facility, which has the capacity of 400 tonnes per day (tpd).

The Bellekeno mine is one of several mineral properties held by Alexco within the Keno Hill silver district. The Bellekeno mine, which commenced commercial production at the beginning of calendar year 2011, operated as Canada's only primary silver mine until operations were temporarily suspended by Alexco at the end of August 2013 (refer to Alexco's July 17, 2013 news release).

The following is an excerpt from the news release.

"…Alexco has developed a contingency plan to operate through the summer while beginning preparations to undergo a temporary and orderly suspension of operations at the Bellekeno mine and mill prior to the onset of winter. This avoids selling silver at current or weaker market prices, and positions the mine and mill for a re-opening after the winter, assuming the silver market has improved from current levels and underlying fixed costs have been reduced. Alexco plans to use the winter period to significantly restructure the underlying fixed costs at Keno Hill, as well as refine plans for a production ramp-up to 400 tonnes per day in the 2014 -- 2015 time period."

Readers are referred to the complete text of the July 17, 2013 news release, available on Alexco's website www.alexcoresource.com.

The current status of Alexco's more advanced properties within the Keno Hill silver district are listed below:

- Bellekeno mine: In production since 2011 until temporary suspension of operations at the end of August 2013. The preliminary economic assessment (PEA) assumes that production stoping will re-start on January 1, 2015;
- Lucky Queen mine: Development work was undertaken from late 2012 into Q2 2013, with operations temporarily suspended in March 2013. The PEA assumes that pre-production development work will re-start in Q2 2016;
- Onek mine: Development work was undertaken from late 2012 into Q2 2013, with operations temporarily suspended at the end of May 2013. Onek is not included in the production plan discussed in this PEA report;
- Flame & Moth deposit: Scoping level mine planning work has been completed by SRK, and an internal company report has been provided to Alexco. Alexco is working toward the initiation of the permitting process. The PEA assumes that pre-production development work will begin on April 1, 2014;

- Bermingham deposit: A historical small scale silver producer, where additional exploration drilling has been done by Alexco and an updated resource block model has been completed. Mine planning on the new mineral resources has not been done. This deposit is not considered in this PEA report.

This PEA is based on Alexco's plan to resume underground development activities in the eastern part of the Keno Hill silver district, specifically at the Bellekeno and Lucky Queen mines and the Flame & Moth deposit beginning April 1, 2014, followed by the commencement of production stoping and processing on January 1, 2015. The project describing the development and production plans for these three properties is referred to as the Eastern Keno Hill Silver District Project – Phase 2, which in this report is abbreviated as the EKHSD project.

For reference, the period of production at the Bellekeno mine from 2011 into 2013, along with development activities at the Onek and Lucky Queen mines, is referred to as Phase 1.

In 2006, Alexco acquired the exploration and future development rights to many of the historic mines in the Keno Hill silver district through ERDC, a wholly-owned subsidiary. This gave Alexco free and clear title to surface and subsurface claims, leases, free-hold land, buildings, and equipment located on various properties in the Keno Hill silver district.

On December 2, 2009, Alexco issued the report "Bellekeno Project - Updated Preliminary Economic Assessment Technical Report" (Wardrop, 2009) to provide an overview of the economic potential of extracting and processing mineralized material from the Bellekeno polymetallic deposits.

In June 2012, Alexco commissioned SRK to visit the property and prepare an updated PEA for the current mine operations including mine planning and production scheduling.

In February 2013, Alexco commissioned a second group of SRK consultants to visit the property and prepare mine plans and development and production schedules specifically for the Flame & Moth deposit. A report for internal company use was included in the scope of work.

In April 2013, Alexco requested a change order to the EKHSD project PEA scope of work in that SRK's recently prepared Flame & Moth mine plans be added to the overall PEA production plan. SRK was in agreement and work on the PEA was completed on the basis of including the Flame & Moth deposit.

The purpose of this technical report is to present the current status of operations at the EKHSD project, and describe the mining and processing plans for the Bellekeno, Lucky Queen and Flame & Moth deposits that support the long range feed schedule for the mill facility.

All three deposits have mineral resource block models that were constructed using a geostatistical block modelling approach with the mineralization constrained by wireframes. Mineral resources are classified as Indicated or Inferred following the CIM *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2010).

An updated mineral resource model for the Bellekeno deposit was constructed by Alexco during the third quarter of 2012 under the supervision of David Farrow, PGeo (APEGBC), an independent consulting geologist.

The mineral resource estimate for the Lucky Queen deposit was prepared by SRK and published in an independent technical report on September 8, 2011 entitled "Technical Report on the Lucky Queen Deposit, Lucky Queen Property, Keno Hill District, Yukon."

In 2013, a mineral resource block model for the Flame & Moth deposit was constructed by Alexco under the supervision of Mr. Farrow. The mineral resource model is documented in a March 15, 2013 technical report entitled "Updated Technical Report on the Flame & Moth Property, Keno Hill District, Yukon" (Farrow and McOnie, 2013).

This current technical report documents the context and assumptions required to develop the economic analysis to support a PEA based on the mineral resource estimates of the three deposits (Bellekeno, Lucky Queen, and Flame & Moth). The report was prepared following the guidelines of Canadian Securities Administrators' National Instrument 43-101 and Form 43-101F1, and in conformity with generally accepted CIM *Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines* (CIM, 2003).

2.1 Basis of Technical Report

This PEA technical report is based on the following sources of information:

- SRK's inspection of the Bellekeno mine, including surface facilities and underground mine operations;
- Inspection of the Lucky Queen mine area, including the surface infrastructure, portal, and underground access drift;
- Three mineral resource block models described above in report Section 2;
- Previous, publicly available technical reports;
- Discussions with Alexco management and technical personnel;
- Information provided by Alexco including drawings, maps, exploration data, production data, metallurgical results from the mill facility, concentrate marketing agreements, annual operating budgets, and actual operating cost details;
- Review of environmental and permitting data provided by Access Consulting Group, which is a wholly-owned subsidiary of Alexco;
- Additional information from public domain sources.

This report is based on metric units of measurement unless otherwise stated, and with the exceptions for industry standards such as troy ounces (oz) for precious metals and pounds (lb) for base metals. All currency values are in Canadian dollars unless otherwise noted.

This report uses many abbreviations and acronyms common in the mining industry, most of which are defined in the body of the text. Further explanations are listed in the List of Abbreviations following the Table of Contents.

2.2 Contributors to the Technical Report

This PEA technical report is a collaborative effort between Alexco and SRK with contributions by Access Consulting Group and an independent consultant. Areas of responsibility are outlined in general below. The PEA technical report was compiled by SRK.

2.2.1 Qualifications of SRK

The SRK Group comprises of more than 1,600 professionals, offering expertise in a wide range of resource engineering disciplines. The independence of the SRK Group is ensured by the fact that it holds no equity in any project it investigates and that its ownership rests solely with its staff. This permits SRK to provide its clients with conflict-free and objective recommendations. SRK has a proven track record in undertaking independent assessments of mineral resources and mineral reserves, project evaluations and audits, technical reports and independent feasibility evaluations to bankable standards on behalf of exploration and mining companies, and financial institutions worldwide. The SRK Group has established a reputation for providing valuable consultancy services to the global mining industry.

2.2.2 SRK Contributions to the Technical Report

Contributions to this PEA technical report by SRK independent consultants are listed below.

Mr. Stephen Taylor, BEng, MSc, PEng, Principal Mining Engineer, was responsible for mine planning, scheduling, and cost estimation for the Bellekeno and Lucky Queen deposits. Mr. Taylor also set up the technical-economic model for the project.

Mr. Ken Reipas, PEng, Principal Mining Engineer, was responsible for mine planning, scheduling, and cost estimation for the Flame & Moth deposit. Mr. Reipas had primary responsibility for compiling the technical report.

Dr. Gilles Arseneau, PGeo, Principal Consultant, was responsible for geology, resource estimation, and reporting for the Lucky Queen deposit.

Mr. Bruce Murphy, FSAIMM, Principal Consultant (Rock Mechanics), was responsible for geotechnical assessment and mine design recommendations for all three deposits included in the production plan. Mr. Murphy has been advising Alexco on geotechnical aspects at the Bellekeno mine since 2009.

Ms. Denise Nunes, Senior Consultant, Metallurgy, was responsible for metallurgical performance estimates and reporting based on review of testwork and actual performance data from Alexco's mill facility.

Dr. Adrian Dance, PEng, FAusIMM, Principal Consultant (Metallurgy), was responsible for senior review of SRK's work related to metallurgy and processing.

Ms. Kelly Sexsmith, PGeo, Senior Environmental Geochemist, was responsible for reporting on the waste management, environmental, permitting, and closure aspects of the project. Her work included reviewing and reporting on work completed by Access Consulting Group, which is a wholly-owned subsidiary of Alexco.

2.2.3 Technical Report Contributions by Others

Contributions to this PEA technical report by Alexco included:

- Mr. David Farrow, BSc (Hons), GDE, PrSciNat, PGeo, of GeoStrat Consulting Services Inc., a third party geology consultant retained by Alexco, acted as Qualified Person (QP) for

resource estimation and was responsible for both the updated Bellekeno mineral resource estimate and the Flame & Moth mineral resource estimate;
- Ms. Laura J. Battison, BSc (Hons), PGeo, former Senior Mine Geologist, Alexco, acted as QP for the Bellekeno data used in the mineral resource model conducted by Mr. Farrow;
- Mr. Alan McOnie, FAusIMM, VP Exploration, Alexco, acted as QP for the Flame & Moth geology and data used in the construction of the Flame & Moth mineral resource model;
- Mr. Richard Trimble, PEng, EBA Engineering, acted as QP for the DSTF expansion section;
- Alexco provided estimates of future capital costs related to the mill facility, the dry stack tailings facilities, surface infrastructure for Lucky Queen, and site sustaining capital;
- Alexco set up the taxes section of the economic model.

Contributions to this PEA technical report by Alexco's wholly-owned subsidiary Access Consulting Group included:

- Planning and reporting on waste management (tailings and waste rock), surface water management, permitting, and other environmental aspects of the project.

2.3 Site Visits

In accordance with National Instrument 43-101 guidelines, the following site visits were made by the contributing independent consultants acting as QPs:

- Mr. Reipas visited the site from March 7 to 13, 2013;
- Mr. Taylor visited the site from June 25 to 27, 2012;
- Dr. Arseneau visited the site from July 26 to 28, 2010 and from May 7 to 8, 2012;
- Mr. Murphy visited the site from June 25 to 27, 2012;
- Ms. Sexsmith visited the site from August 15 to 16, 2012;
- Mr. Farrow visited the site during October 2011.

2.4 Declaration

SRK's opinion contained herein and effective November 15, 2013 is based on information collected by SRK throughout the course of SRK's investigations. The information in turn reflects various technical and economic conditions at the time of writing the report. Given the nature of the mining business, these conditions can change significantly over relatively short periods of time. Consequently, actual results may be significantly more or less favourable.

This report may include technical information that requires subsequent calculations to derive subtotals, totals, and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, SRK does not consider them to be material.

SRK is not an insider, associate or an affiliate of Alexco, and neither SRK nor any affiliate has acted as advisor to Alexco, its subsidiaries or its affiliates in connection with this project. The results of the technical review by SRK are not dependent on any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings.

3 Reliance on Other Experts

SRK has not performed an independent verification of land title and tenure information as summarized in Section 4 of this report, but has relied on Macdonald & Company as expressed in a legal opinion provided to Alexco on January 28, 2013. The reliance applies solely to the legal status of the rights disclosed in Sections 4.1 and 4.2 below. SRK did not verify the legality of any underlying agreement(s) that may exist concerning the permits or other agreement(s) between third parties.

SRK was informed by Alexco that there are no known litigations potentially affecting the EKHSD project.

4 Property Description and Location

The EKHSD project is located approximately 350 km north of Whitehorse, Yukon, Canada within the Keno Hill silver district (Figure 4-1). The nearest town is Mayo, which is accessible from Whitehorse via a 460 km all-weather road and by air via the Mayo airport. An all-weather gravel road known as the Silver Trail Highway connects Mayo to the project area and the village of Keno City. Alexco has administration, maintenance, and camp facilities at the location of the historic mining town of Elsa, which is located just off of the Silver Trail Highway. The area is covered by NTS map sheets 105M/13 and 105M/14.

4.1 Mineral Tenure

Mineral exploration in the Keno Hill silver district was initially permitted under the terms and conditions set out by the Yukon Government in the Class III Quartz Mining Land Use Permit – LQ00186, issued on July 5, 2006 and valid until July 4, 2011. Alexco subsequently obtained a Class IV Quartz Mining Land Use Permit – LQ00240 on June 17, 2008. The two permits were amalgamated on December 8, 2008 under #LQ00240, which is valid until June 16, 2018.

All quartz mining leases have been legally surveyed; the quartz mining claims have not been legally surveyed.

The EKHSD project claims and leases are held by one of three wholly-owned subsidiaries of Alexco: Elsa Reclamation & Development Company Ltd. (ERDC), Alexco Keno Hill Mining Company (AKHMC), or Alexco Exploration Canada Corp. (AECC).

Within the Alexco land package, as shown in Figure 4-2, the three properties that make up the EKHSD project are shown in tan.

A more detailed claim map for the EKHSD project is shown in Figure 4-3, which also shows the location of the mineral resources, and a table of claims and leases is found in Appendix A.

The Bellekeno mine is centred at Latitude 63.90853 degrees north; Longitude 135.26201 degrees west. The mineral resources for the Bellekeno deposit reported herein are located on the following quartz mining leases: SAM 55327, TUNDRA 12838, WHIPSAW 14081, and NOD FR. 16170.

The Lucky Queen deposit is centred at Latitude 63.94786 degrees north; Longitude 135.25421 degrees west. The mineral resources for the Lucky Queen deposit are located on the following quartz mining leases: ANTHONY 12909, OK FRACTION 13094, UNCLE SAM 12923, MATHOLE 12937, and MAYO 12919.

The Flame & Moth deposit is centred at Latitude 63.90588 degrees north; Longitude 135.32931 degrees west. The mineral resources for the Flame & Moth deposit are located on the MOTH, FLAME, FRANCES 5, and FRANCES 7 quartz mining leases and the BLUE claim.

Figure 4-1: Keno Hill Silver District Location Map (Alexco, 2013)

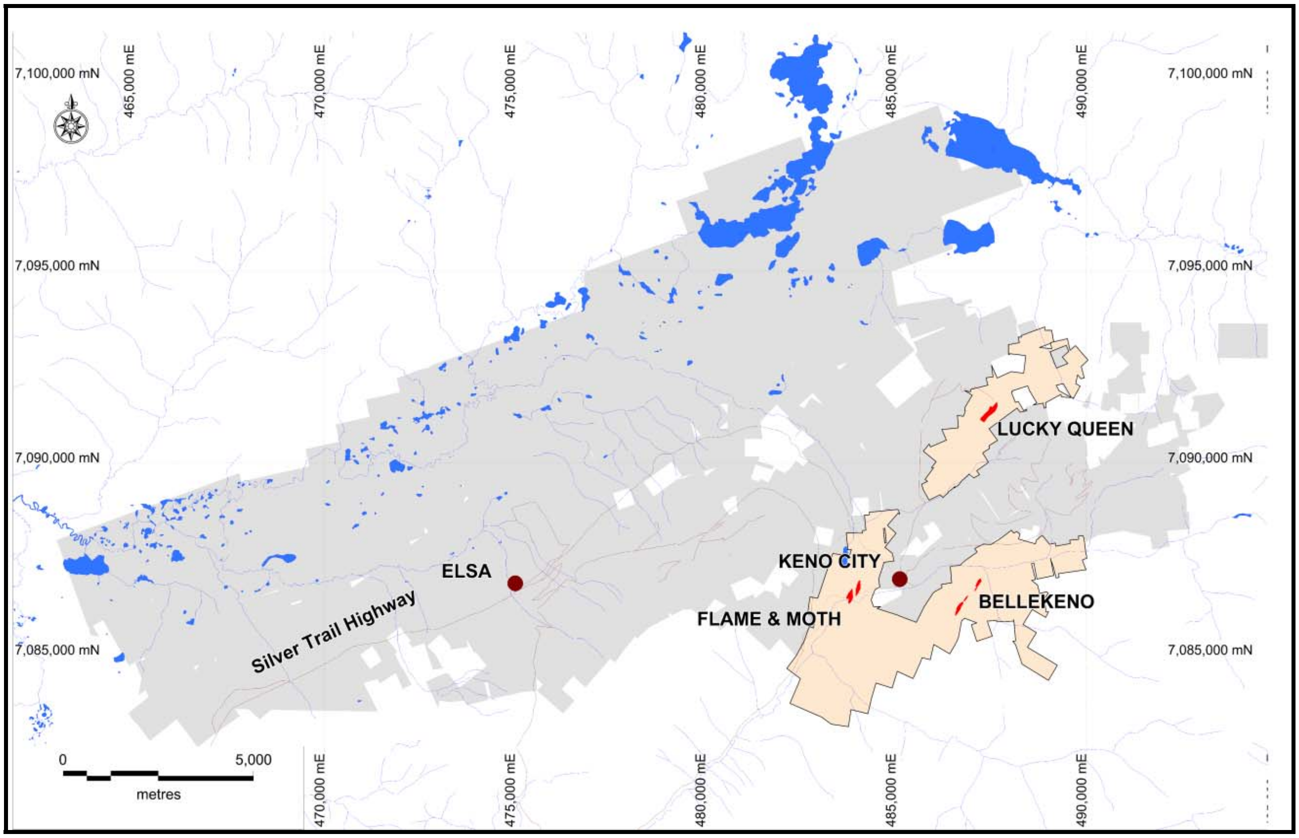


Figure 4-2: Alexco Claim and Lease Holdings in the Keno Hill Silver District (Alexco, 2013)
(Alexco land package shown in grey and tan. Tan is specifically the EKHSD project.)

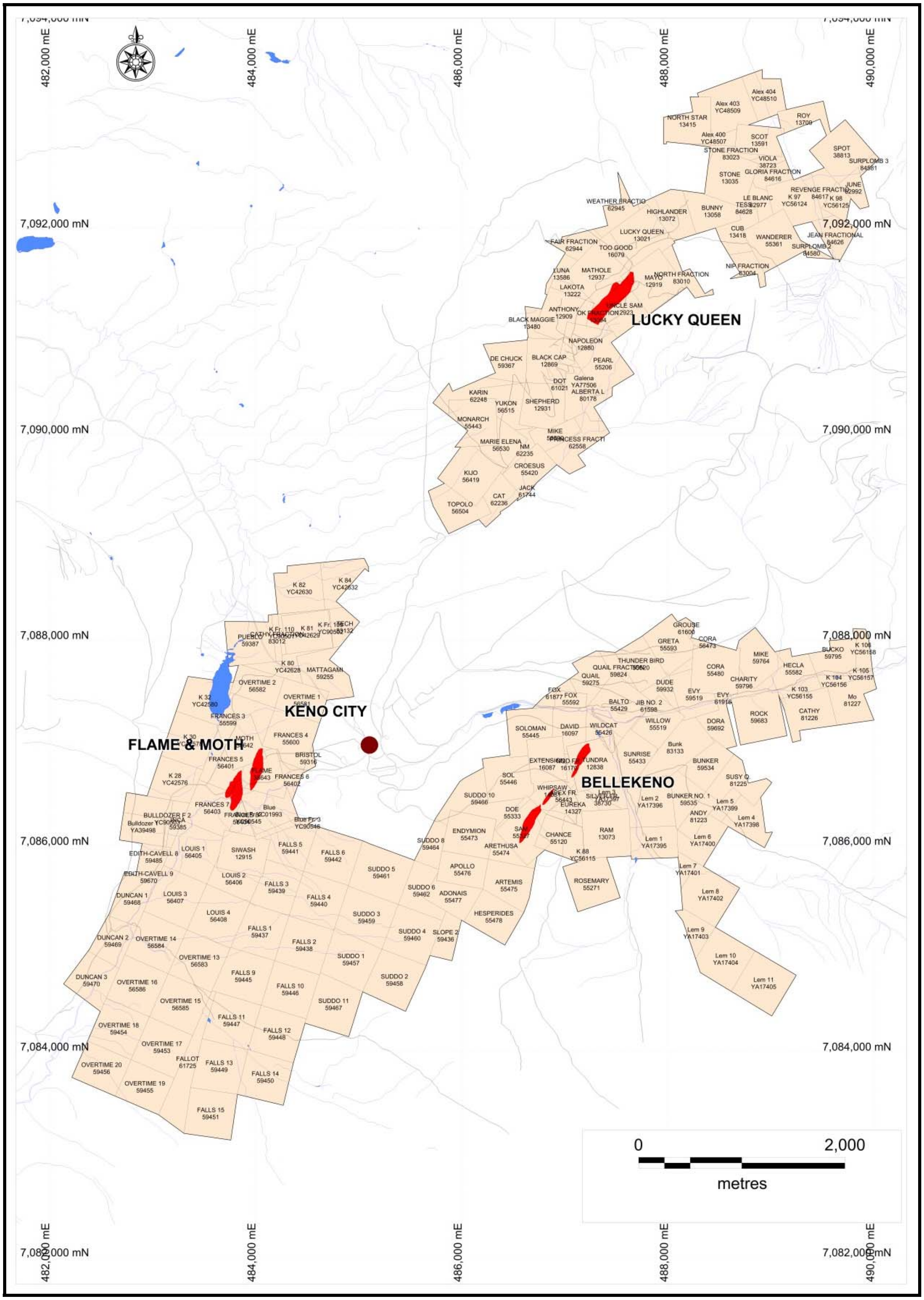


Figure 4-3: Eastern Keno Hill Silver District Project Claim Map (Alexco, 2013)

4.2 Underlying Agreements

Alexco's rights to much of the Keno Hill silver district properties are held through ERDC, an Alexco wholly-owned subsidiary.

In June 2005, PwC, a court appointed interim receiver and receiver-manager of United Keno Hill Mines Limited and UKH Minerals Limited (collectively UKHM), selected Alexco as the preferred purchaser of the assets of UKHM.

PwC and Alexco entered into an agreement (the "Purchase Agreement") dated August 4, 2005, as amended November 2, 2005 and January 31, 2006. Alexco assigned the Purchase Agreement to its wholly owned subsidiary ERDC on February 6, 2006.

In February 2006, following the negotiation of a Subsidiary Agreement between the Government of Canada, the Government of Yukon, and Alexco, the Supreme Court of Yukon approved the purchase of the assets of UKHM by Alexco through its wholly-owned subsidiary ERDC. The UKHM assets comprised two Crown grants, 674 mining leases, 289 mineral claims, a concentration plant, various buildings and equipment, as well as partial ownership interest in three mining leases, 36 mineral claims, in addition to a leasehold interest in one mineral claim.

Interim closing of the UKHM transaction was completed on April 18, 2006. Alexco assumed responsibility for care and maintenance operations at the UKHM property. On the initial closing, among other things, Alexco:

- Deposited C$10 M in trust to be used exclusively to fund ERDC's contribution to the cost of the reclamation of the pre-existing environmental liabilities of the UKHM property;
- Obtained possession of the mineral claims and leases, titled property, and Crown grants of UKHM and the equipment on the UKHM properties for the purposes of contracted care and maintenance and exploration by ERDC of the UKHM property.

Title to all UKHM assets was transferred to Alexco (final closing) in late November 2007, following the approval of a Type B Water Licence by the Yukon Water Board.

Alexco is formulating an Existing State of Mine Closure Plan for the entire Keno Hill silver district as part of its agreements with different levels of government.

All quartz mining leases have been legally surveyed, whereas the quartz mining claims have not.

Future production from the Keno Hill silver district, including the Bellekeno silver mine, is subject to a 1.5% NSR royalty, capped at C$4.0 M, payable to the Government of Canada. This royalty is a condition of the Subsidiary Agreement. Payment of the royalty does not begin until all pre-production capital has been recouped plus an additional allowance for Keno Hill silver district exploration of approximately C$6.2 M.

Alexco and Silver Wheaton entered into an agreement on October 2, 2008 (the "Silver Purchase Agreement") whereby 25% of all future silver production from Keno Hill silver district properties owned or controlled by Alexco at the time of the consummation of the Silver Purchase Agreement will be delivered to Silver Wheaton in exchange for a payment of US$3.90/oz as well as a payment by Silver Wheaton of US$50 M for use in the development and construction of the Bellekeno silver mine.

Alexco and Glencore Ltd., Stamford (Glencore), a branch of a wholly-owned subsidiary of the Swiss-based international resources group Glencore International AG, entered into a lead and zinc concentrate off-take agreement in December 2010, coincident with the initiation of concentrate shipments from Alexco's Bellekeno operations.

4.3 Permits and Authorization

Refer to report Section 20.2 Environmental Assessment and Permitting.

4.4 Environmental Liabilities

Refer to report Section 20.1 Site and Regulatory Context.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Keno Hill silver district is located in central Yukon. The closest sizable town is Mayo, located on the Steward River, approximately 40 km to the southwest. Mayo is accessible from Whitehorse via a 460 km all-weather road and is also serviced by the Mayo airport, which is located just to the north of Mayo. An all-weather gravel road known as the Silver Trail Highway leads from Mayo to the Keno Hill silver district, the historic company town of Elsa, and the village of Keno City.

5.2 Local Resources and Infrastructure

The Keno Hill silver district is well connected by a network of public and private gravel roads including the Silver Trail Highway and the Bellekeno haul road, which was built to skirt the village of Keno City. A large number of roads constructed for past mining operations are still serviceable.

The historic company town of Elsa, located toward the western end of the Keno Hill silver district, comprises several buildings that are currently being used for administrative offices, staff accommodations, core logging facilities, maintenance facilities, and storage. Warehousing and refueling facilities are also located at Elsa.

The main camp and kitchen are located at Flat Creek approximately 1 km west of Elsa.

The 400-tonne-per-day Keno Hill silver mill facility and associated tailings facilities are located in a valley near the village of Keno City, approximately 9.2 km east of Elsa.

Three phase power is available in many parts of the Keno Hill silver district.

Radio communication is well established throughout the Keno Hill silver district with phone service to key locations.

Local resources in terms of manpower, rental equipment, materials, and supplies are very limited.

5.3 Climate

The central Yukon is characterized by a subarctic continental climate with cold winters and warm summers. Average temperatures in the winter are between -15 and -20 degrees Celsius (°C) but can reach -60°C. The summers are moderately warm with average temperatures in July around 15°C. Exploration and mining work can be carried out year-round.

Because of its northern latitude, winter days are short with the sun low on the horizon such that north-facing slopes can experience ten weeks without direct sunlight around the winter solstice. Conversely, summer days are very long, especially in early summer around the summer solstice. Annual precipitation averages 28 centimetres (cm); half of this amount falls as snow, which starts to accumulate in October and remains into May or June.

5.4 Physiography

The landscape around the Keno Hill silver district is characterized by rolling hills and mountains with a relief of up to 1,600 metres (m) (Figure 5-1). The highest elevation is Keno Hill at 1,975 m. Slopes are gentle except the north slopes of Keno Hill and Sourdough Hill.

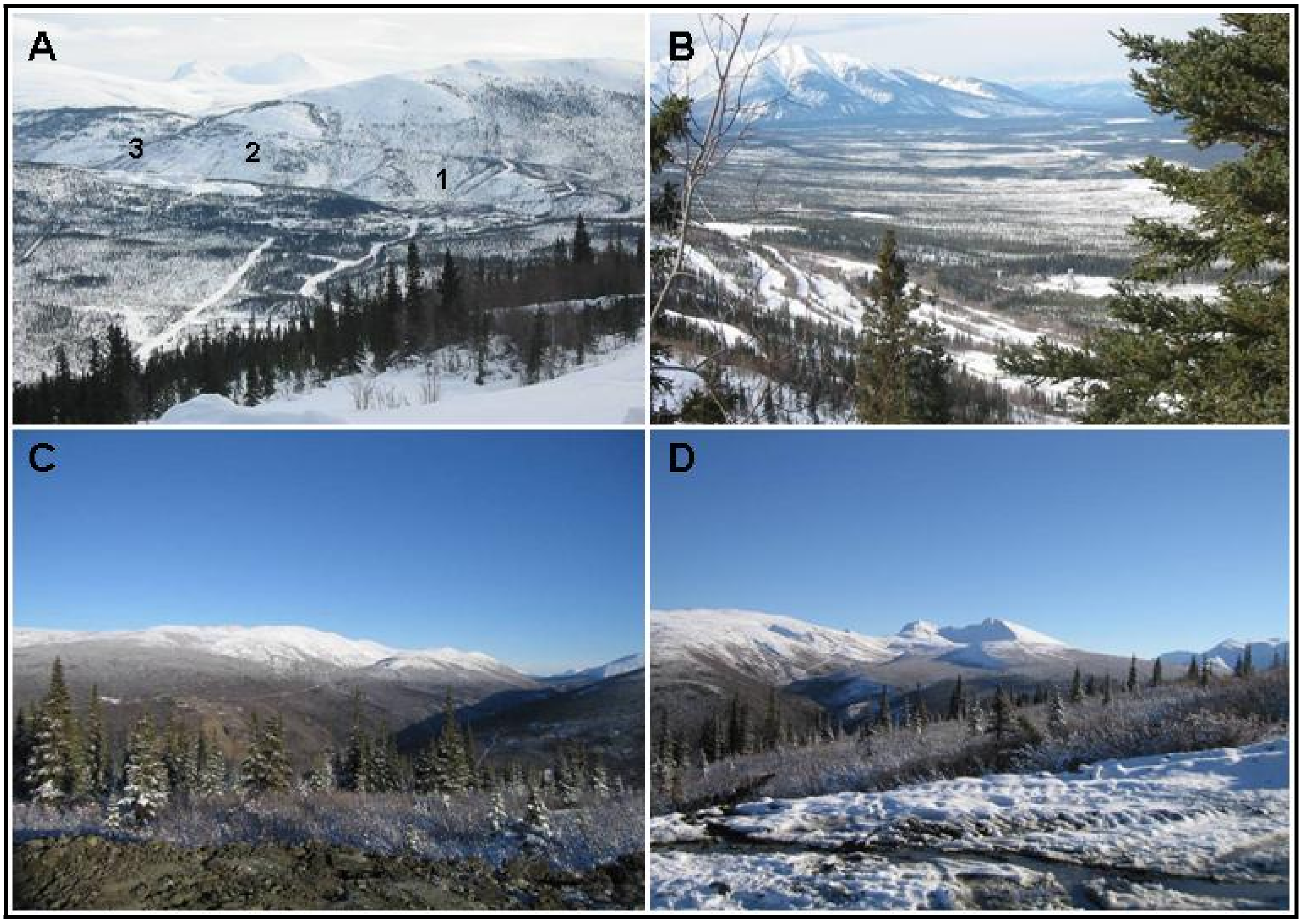


Figure 5-1: Typical Landscape in the Keno Hill District (SRK, 2011)

Photo A: Taken from Galkeno 300, looking southeast at (1) Keno City, (2) Lightning Creek Valley, (3) Bellekeno 600 adit is just out of sight from this view angle.

Photo B: View from road above Elsa, looking northwest.

Photo C and Photo D: Views looking north from the drilling sites at Bellekeno.

6 History

The history of the Keno Hill mining camp is described in Cathro (2006); the information presented in this section draws heavily from that source.

The Keno Hill mining camp area has a rich history of exploration and mining dating back to the beginning of the 1900s. Earliest prospectors had been working the area around Mayo for gold, especially after the Klondike gold rush of 1898. The first silver was found in 1901; however, interest was low due to the prospector’s interest in gold alone — despite an assay from 1905 yielding more than 11 kilograms per tonne (kg/t) silver. Small-scale mining finally commenced in 1913 with the first shipment of 50 tonnes of vein material to a smelter in San Francisco. Due to the shallow depth of the deposit and the First World War, interest in the area had dwindled by 1917.

The end of the First World War and high silver prices led to renewed and ultimately successful exploration activity in the area with the Yukon Gold Company and later Keno Hill Limited as the first truly commercial operators. Success at the Keno mine led to a staking rush, resulting in the discovery of a number of rich deposits.

In the early 1920s, the TYC became interested in the Keno Hill silver district area and under the leadership of Livingston Wernecke acquired a number of claims and started mining.

Wernecke’s death and the Second World War resulted in a sharp decline in activity in the Keno Hill camp until a new company, Keno Hill Mining Company Ltd., later UKHM, spearheaded by Thayer Lindsley, purchased all TYC properties and started production. Very good results led to another staking rush and the formation of a large number of junior exploration companies, many of which were purchased by UKHM.

The 1950s proved to be the most successful time of the mining camp. Starting in the early 1960s, new discoveries and additions to mineral inventory lagged production.

In 1972, the Husky mine went into production and, in 1977, open pit operations were introduced into the camp mainly in order to recover crown pillars. From 1982 to 1985 (Sadie-Ladue and Shamrock mines) and 1989 to 1990 (Shamrock, Silver King, Hector-Calumet, Lucky Queen, and Keno mines) float trains were mined on a small scale basis.

UKHM closed permanently in early 1989.

Between 1990 and 1998, the Dominion Mineral Resources and Sterling Frontier Properties Company of Canada Limited (Dominion), after acquiring a 32% interest in UKHM, carried out extensive reclamation, remediation, and exploration work at the Bellekeno, Husky Southwest, and Silver King mines in order to reopen the camp. Lack of financing forced Dominion to abandon its rights, in effect reverting back the rights to UKHM. Environmental liabilities and site maintenance costs drove UKHM into bankruptcy; the federal government inherited the assets.

In June 2005, Alexco was selected as the preferred purchaser of the assets of UKHM by PwC, the court-appointed interim receiver and receiver-manager of the Keno Hill silver district holdings. In February 2006, following lengthy negotiations with federal and territory governments, the Supreme Court of the Yukon approved Alexco’s purchase of UKHM’s assets through Alexco’s wholly-owned subsidiary ERDC.

Interim closing of the Keno Hill silver district transaction was completed on April 18, 2006, and an agreement governing management and future reclamation of the Keno Hill silver district was signed. Under the Keno Hill Subsidiary Agreement, ERDC is indemnified against all historical liability, has property access for exploration and future development and is not required to post security against pre-existing liabilities. ERDC will also be reimbursed for its future environmental reclamation activities — estimated at more than C$50 M — while itself contributing C$10 M to the clean-up of the Keno Hill silver district. ERDC has also assumed responsibility for ongoing environmental care and maintenance of the site under contract to the Yukon Government, and is actively conducting a baseline environmental assessment and site characterization program.

To finalize the Keno Hill silver district acquisition, ERDC applied for and received a water licence in November 2007. Upon receipt of the license, ERDC received clear title to surface and subsurface claims, leases, free-hold land, buildings, and equipment at the Keno Hill silver district.

During 2006, Alexco embarked on an aggressive exploration program in the Keno Hill silver district, targeting the historical resources at Bellekeno and Husky Southwest and subordinately other former mines in the Keno Hill silver district.

6.1 History of the Bellekeno Mine

The Bellekeno property hosts ten veins on the north facing slope of Sourdough Hill, across the Lightning Creek valley from the Keno mine. Initially staked in 1919 by Andrew Johnson following the discovery of the Tundra vein, the nearby Ram vein was staked the following year. During 1921, Alex Gordon staked the Eureka, Whipsaw, and Extension mining claims. Combined, these five claim groups covered all of the known veins in the Bellekeno deposit, as shown in Figure 6-1.

The Bellekeno deposit has been mined during four periods between 1921 and 2011. Each period of mining was followed by a period of extensive exploration to replace exhausted mineral inventory. Mining was historically from six veins by a series of shafts, adits, and trenches, also shown on Figure 6-1.

Between 1921 and 1928, 495 tonnes of hand sorted, vein material was sacked and shipped to San Francisco grading 281 oz/ton silver.

The Depression, World War II, and perhaps some litigation marked the transition into larger scale mining. In 1947, the claims were purchased by Mayo Mines Ltd. After extensive exploration and adit development, production briefly recommenced. Under the ownership of Mayo Mines, the Bellekeno mine extracted two products: a direct shipping high grade product, and a lower grade concentrate that was processed at the nearby Mackeno mill. With a high development requirements, small deposits and poor milling recovery (<70%), the company operated at a net loss between 1947 and 1954.

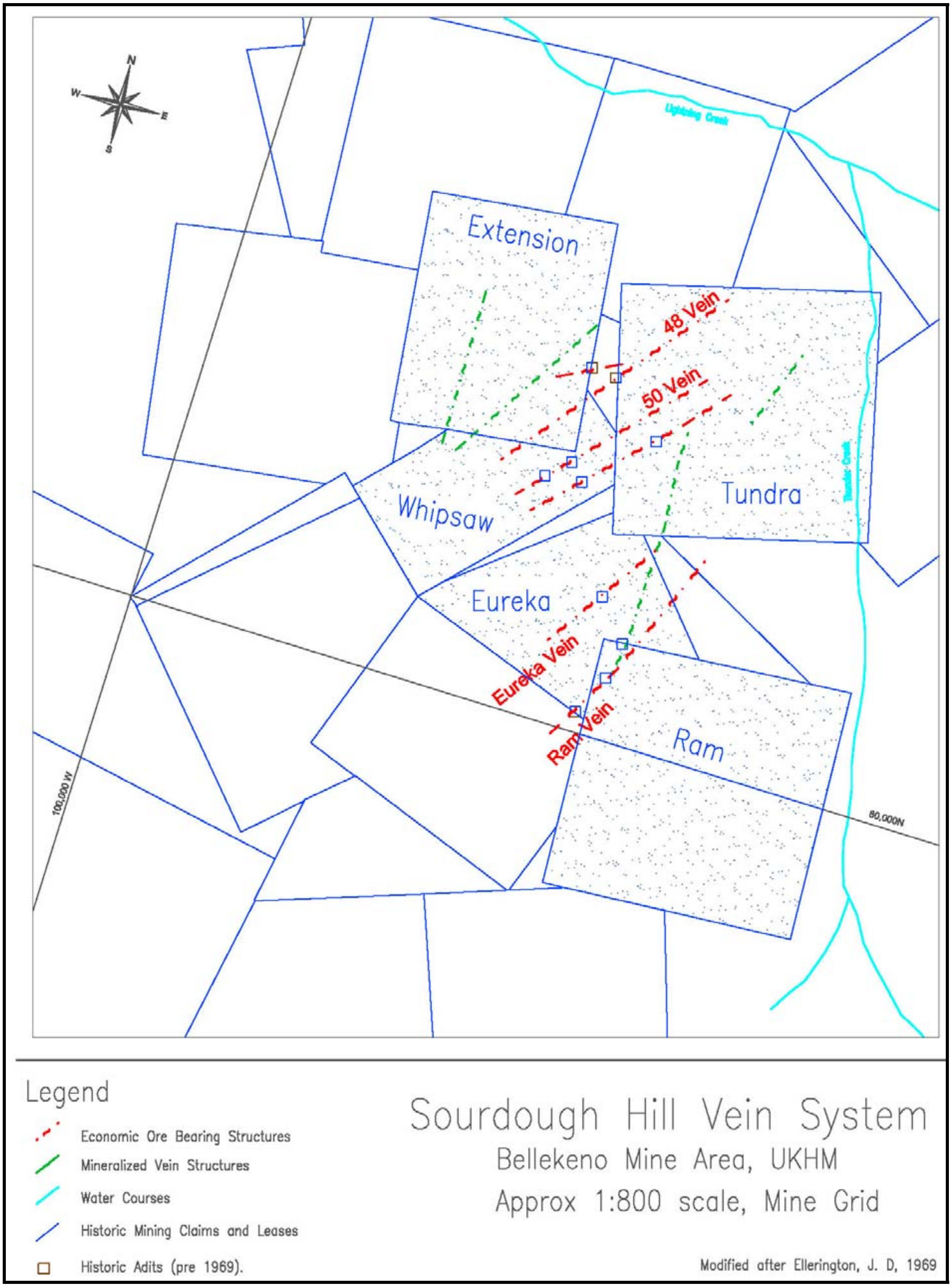


Figure 6-1: Historic Claim Boundaries of Sourdough Hill, Keno Hill Mining Camp, Bellekeno Mine Area (Modified from Ellerington, J. D., 1969)

Between 1955 and 1965, the property changed owners a number of times, as production attempts proved unsuccessful, before it was purchased by UKHM. After acquiring the deposit, UKHM began intermittent exploration, development, and rehabilitation programs, and the development of the Bellekeno 625 adit. Exploration programs included surface overburden drilling, soil and geophysics surveys, trenching, and core drilling. Bellekeno was in production between 1988 and 1989, until UKHM was forced into bankruptcy in 2000 and its assets were inherited by the Canadian federal government. Purchased in 2006 by Alexco, the small mineral inventory has been expanded and it has maintained production since 2011. Mining to date has extracted 6.5 million ounces of silver and 23,700 tonnes of lead along with zinc and gold. Production results are summarized in Table 6-1.

Table 6-1: Bellekeno Mine Production Summary, 1919 to 2013
(Data compiled from internal documents)

Year	Shipper	Claims	Tonnes	Ag (gpt)	Pb (%)[3]	Ag (Oz)
1921-27	Gordon	Eureka	186	10,900	73.9	65,200
		Whipsaw	6.8	8,280	61.9	1,810
		Extension	0.9	7,820	75.4	230
		Chance	1.4	5,420	71.1	240
1927-28	Johnson	Ram	266	8,850	64.0	75,690
			460	**9,660**	**68.0**	**143,100**
1947-52	Mayo Mines	Ram	several 100			
	Bellekeno - DS[1]		113	6,000	70.0	21,800
1953	Bellekeno - DS		131	6,690	72.0	28,200
	Bellekeno - MK[2]		4,690	1,880	11.6	283,500
1954	Bellekeno - DS		91	7,280	74.0	21,300
	Bellekeno - MK		4,980	2,030	9.3	325,000
			10,010	**2,110**	**12.5**	**679,800**
1966	UKHM		3,450	250		27,700
			170	2,430		13,300
			3,620	**352**		**41,000**
1988	UKHM		11,600	1,510		563,200
1989	UKHM		17,100	1,510		830,100
			28,700	**1,510**		**1,393,300**
2010	Alexco		18,600	210	9.2	125,600
2011	Alexco		71,992	834	10.2	1,930,400
2012	Alexco		86,354	760	9.6	2,110,000
2013	Alexco		65,206	705	7.7	1,478,000
			242,150	**725**	**9.2**	**5,644,000**
Grand Total			**284,940**	**862**	**8.4**	**7,901,200**

1. Direct shipping
2. Material processed at the historic Mackeno Mill
3. Pb grade based on tonnes with known production grades

6.2 History of the Lucky Queen Deposit

The Lucky Queen deposit was mined from 1927 to 1932 when mineral inventory was exhausted, producing 112,100 tonnes of vein material at 3,060 gpt silver from two mineralized shoots. Four levels of underground workings (50, 100, 200, and 300) totalling approximately 1,085 m, were developed, with level development roughly coincident with extensive stoping, resulting in the Lucky Queen production totals listed in Table 6-2. There were no historical mineral resources or mineral reserves remaining at the Lucky Queen mine.

Table 6-2: Past Production Records for the Lucky Queen Property

Mine	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Ag (Oz)	Pb pounds	Zn pounds
Lucky Queen	112,100	3,060	7.0	2.7	11,020,000	17,220,000	6,650,000

The Lucky Queen vein and strike extensions were explored intermittently by surface overburden drilling, trenching, and soil sampling throughout the decades from 1950 to the early 1980s.

A 500 level exploration drift, collared near the Black Cap prospect and totalling approximately 1,800 m, was developed by UKHM in 1985-1987. It was designed to come in underneath the historical Lucky Queen workings and to drive a raise up to the 300 level and connect with the No 2 inclined shaft. Poor ground conditions around the shaft, combined with difficulty in locating the vein and an urgent need for miners elsewhere in the Keno Hill silver district caused the adit to be abandoned.

Drilling by Alexco in the Lucky Queen prospect area totalled four surface core drill holes (875 m) in 2006, three surface core drill holes (557 m) in 2007, 12 surface core drill holes (2,999 m) in 2008, 14 surface core drill holes (3,048 m) in 2009, and 14 surface core drill holes (3,625 m) in 2010.

6.3 History of Flame & Moth Deposit

Claim staking and prospecting began at Flame & Moth in 1920. By 1923, numerous surface workings and a 13-metre inclined shaft had been sunk with a 4.6 m crosscut developed from it on the Moth claim. It is believed that a second shaft to a depth of 30.5 m was also sunk in this vicinity. An adit was developed along 12.2 m on the Frances 7 claim. Production for this period is not known.

Subsequent to this early work, little or nothing appears to have happened on the property until the acquisition by UKHM just prior to 1950. A 27.4-metre inclined shaft was sunk to a vertical depth of 21.3 m along the footwall of what was likely the Moth vein. A crosscut, through the zone 13.7 m below surface and 42.7 m of drifting 22.9 m below surface, identified quartz-carbonate vein hosted mineralization averaging 343 gpt silver, 1.6% lead, 5% zinc developed in quartzite and greenstone along a zone approximately 30.5 m long and up to 9.1 m wide. Thirteen horizontal core drill holes totalling 193 m were drilled from the drift, but the core recovery was poor.

During 1954 and 1955, mineralization of pyrite and minor arsenopyrite was reported up to 240 m along strike to the north. This was explored by bulldozer trenching, soil sampling, and ground geophysics, but was unsuccessful because of the depth of gravel overburden, reported to a 12 m depth.

UKHM returned to Flame & Moth in 1961 with a program of soil sampling and ground geophysics (self-potential, magnetics, Ronka EM), and drilled five surface core drill holes located around the shaft to test the mineralization at depth. The soil samples and geophysics yielded little information, and no veining was intercepted in the drilling.

In 1965, 28 vertical overburden drill holes were drilled, along with another attempt at soil sampling and geophysics. A proposal to excavate an open pit was first made at this date, based on a calculated resource of 3,360 tonnes grading 573 gpt silver, 1.4% lead, and 5.6% zinc. The pit would have reached to 18.3 m below the surface.

In 1974, four lines of angled overburden drill holes totalling 989 m were drilled for extensions along a 180 m strike length with limited success due to deep overburden and broken ground conditions, although a weakly mineralized structure was located at 76 m in the footwall of the main vein.

More overburden drilling was completed along strike in 1984 and four core drill holes were sited to test the downward projection of the known mineralization. The deeper drilling (60 to 90 m below surface) returned only very low values from a wide but diffuse pyritic vein zone. A small amount of vein material (368 tonnes at 699 gpt silver, 1.39% lead, 0.72% zinc) was sent to the mill, which may have come from vein material exposed during stripping of overburden in preparation for the open pit development. In May 1987, the open pit mineral resources were re-evaluated at 12,600 tonnes at 699 gpt silver and 4.0% lead to a depth of 24.4 m. The key assumptions used to estimate this historical estimate are not known. This historical estimate was prepared before the adoption of National Instrument 43-101 and therefore should not be relied upon. That estimate is superseded by the mineral resources reported herein.

Total production at the Flame & Moth property is listed (Table 6-3) as 1,440 tonnes grading 627 gpt silver, 1.1% lead, and 0.9% zinc (Cathro, 2006). It is assumed most of these figures came from the underground work in the 1950s.

Table 6-3: Past Production Records for the Flame & Moth Property

Mine	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Ag (Oz)	Pb pounds	Zn pounds
Flame & Moth	1,440	627	1.1	0.9	29,100	35,400	28,900

During 2006, Alexco embarked on an aggressive exploration program in the Keno Hill silver district. Drilling by Alexco in the Flame & Moth resource area totalled 14 surface core drill holes (3,986.2 m) in 2010, 32 surface core drill holes (7,149.2 m) in 2011, and 43 surface core drill holes (8,753.1 m) in 2012. The drilling completed in 2013 totalled 1,836 m in eight drill holes.

7 Geological Setting and Mineralization

7.1 Regional Geology

The Keno Hill mining camp is located in the northwestern part of the Selwyn Basin in an area characterized by the Robert Service and the Tombstone Thrust Sheets that are overlapping and trend northwest. The area is underlain by Upper Proterozoic to Mississippian rocks that were deposited in a shelf environment during the formation of the northern Cordilleran continental margin (Figure 7-1).

A compressional regime that possibly existed during the Jurassic, but certainly during the Cretaceous, produced thrusts, folds, and penetrative fabrics of various scales. Early large scale deformation (D1 and D2) produced recumbent folds, resulting in local structural thickening of strata. A third deformational event (D3) produced gentle southwest-plunging syn- and antiform pairs (Roots, 1997). The dominant structural fabric (foliation) is essentially axial planar to the early recumbent folds.

The Robert Service Thrust Sheet lying to the south of the Keno Hill silver district is composed of a Late Proterozoic to Cambrian coarse grained quartz rich turbidite succession with interbedded shales and locally limestone of the Hyland Group, Yusezyu Formation.

The Tombstone Thrust Sheet that lies to the north and underlies the Keno Hill silver district consists of Devonian phyllite, felsic meta-tuffs, and metaclastic rocks of the Earn Group that is conformably overlain by the Mississippian Keno Hill Quartzite. This latter unit is locally thickened due to folding and/or thrusting and is the predominant host of the silver-lead-zinc mineralization of the Keno Hill silver district.

Intrusive rocks formed during four episodes of plutonism. During the Late-Triassic, gabbro to diorite formed sills of various sizes in the Tombstone Thrust Sheet. A second phase of plutonism took place around 92 million years ago (My) in the early Cretaceous and resulted in widespread and voluminous Tombstone intrusions of commonly granitic to granodioritic composition. Cretaceous fine-grained lamprophyre dated at 89 My occurs as metre-scale dykes and sills. The youngest intrusions are the McQuesten intrusive suite that occurred around 65 My in the Upper Cretaceous and resulted in the formation of peraluminous megacrystic potassium feldspar granite.

In addition to the polymetallic veins of the Keno Hill mining camp, the area hosts a number of other mineral occurrences and showings of tungsten, copper, gold, lead, zinc, antimony, and barite.

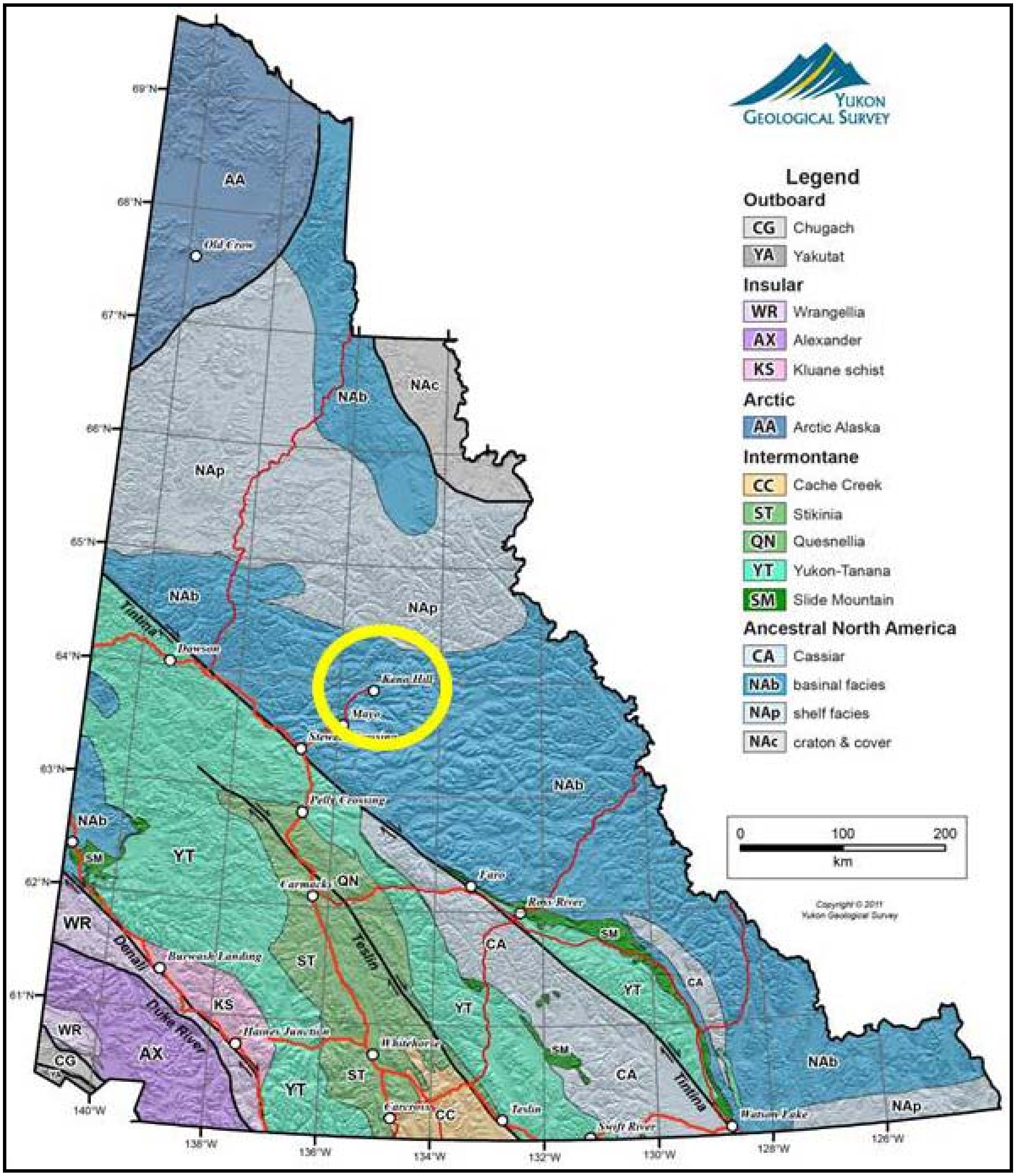


Figure 7-1: Regional Geology of the Keno Hill Area (Yukon Geological Survey)

7.2 Property Geology

The Keno Hill silver district geology is dominated by the Mississippian Keno Hill Quartzite comprising the Basal Quartzite Member and conformably overlying Sourdough Hill Member. The unit is overthrust in the south by the Upper Proterozoic Hyland Group Yusezyu Formation and is conformably underlain in the north by the Devonian Earn Group (McOnie and Read, 2009) as shown in the local stratigraphic column in Figure 7-2.

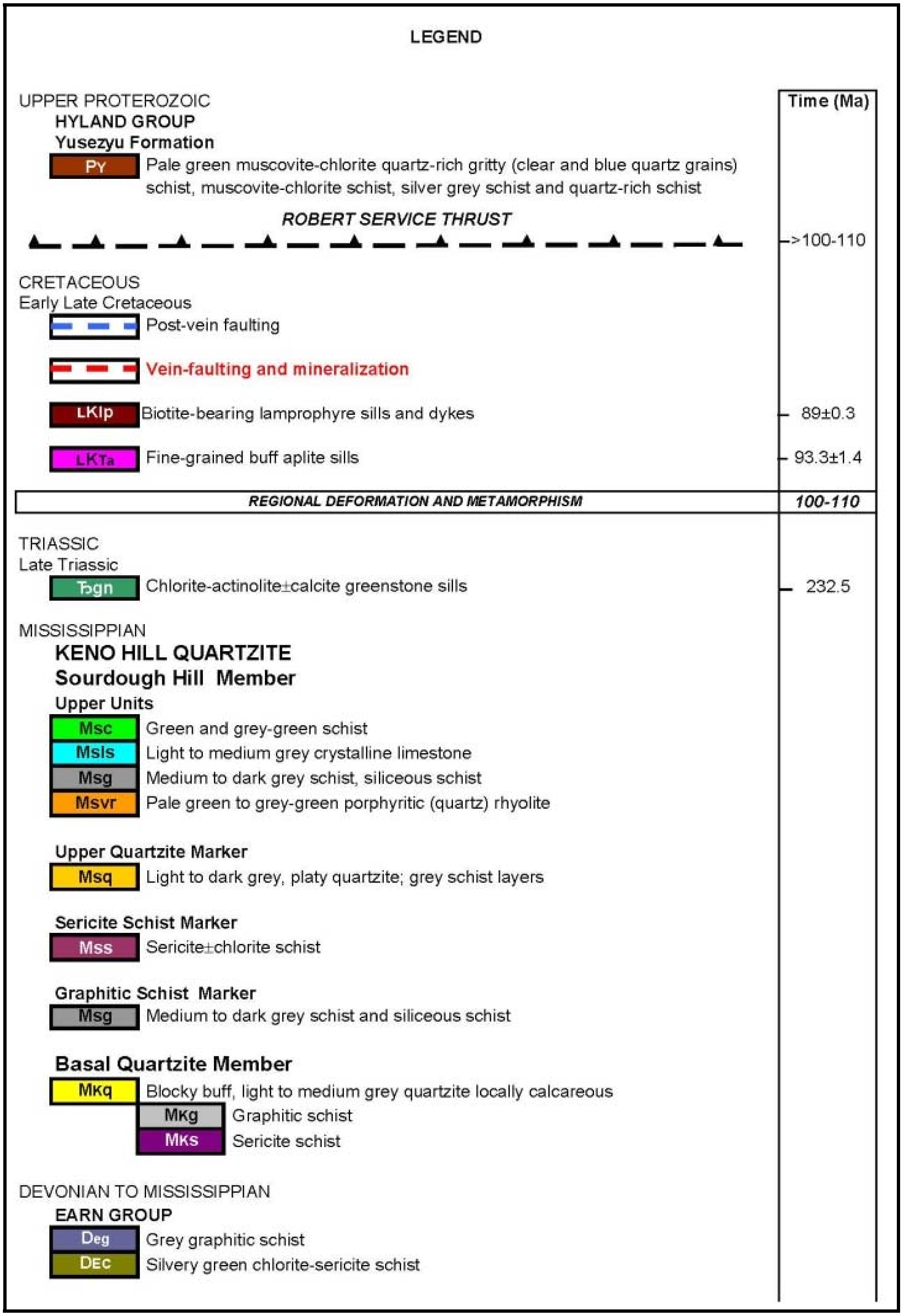


Figure 7-2: Keno Hill Silver District Simplified Stratigraphy (Alexco, 2013) (Light yellow is alluvial cover)

The Yusezyu Formation of the Precambrian Hyland Group is separated by the Robert Service Thrust Fault and, as seen in the Duncan Creek area, comprises greenish quartz-rich chlorite-muscovite schist with locally clear and blue quartz-grain gritty schist.

The Earn Group formerly mapped as the “lower schist formation” (Boyle, 1965) is typically composed of recessive weathering grey graphitic schist and green chlorite-sericite schist with an upper siliceous graphitic schist found locally.

Within the Keno Hill Quartzite, the Basal Quartzite Member is up to 1,100 m thick and comprises thick to thin-bedded quartzite and graphitic phyllite (schist). This is the dominant host to the silver mineralization in the Keno Hill silver district. The overlying Sourdough Hill Member, formerly mapped as the “upper schist formation” (Boyle, 1965) is up to approximately 1,050 m in thickness and comprises predominantly graphitic and sericitic phyllite, chloritic quartz augen phyllite, and minor thin limestone.

The Earn Group and Keno Hill Quartzite are locally intruded by Middle Triassic greenstone sills. The sequence is intruded by quartz-feldspar aplite sills or dikes that are correlated with the 92 My Tombstone intrusive suite found elsewhere in the Keno Hill silver district. The sequence was metamorphosed to greenschist facies assemblages during the Cretaceous regional deformation.

Three phases of folding are identified in the Keno Hill silver district. The two earliest phases consist of isoclinal folding with subhorizontal, east- or west-trending fold axes. The later phase consists of a subvertical axial plane and moderate southeast-trending and plunging fold axis. In the Keno Hill silver district, the first phases of folding formed three structurally dismembered isoclinal folds of which the Basal Quartzite Member outlines synforms at Monument Hill where the Lucky Queen mine is located and at Caribou Hill, while the Bellekeno mine and the Flame & Moth prospect are located on the limb of a third dismembered syncline between Galena Hill and Sourdough Hill.

Within the Keno Hill silver district, up to four main periods of faulting are recognized. The oldest fault set consists of south-dipping foliation-parallel structures that developed contemporaneously with the first phase folding. The Robert Service Thrust Fault truncates the top of the Keno Hill Quartzite and sets the Precambrian schist of the Yusezyu Formation above the Mississippian Sourdough Hill Member. The silver mineralization in the Keno Hill silver district is hosted by a series of north-east–trending pre- and syn- mineral vein-faults that display apparent left lateral normal displacement locally referred to as longitudinal veins that, depending on the competency of the host rock, can be up to 30 m wide with an anastomosing system of subveins. A related set of faults, known as transverse faults that strike north-northeast and dip moderately to the southeast, can reach up to 5 m in thickness.

High angle cross faults, low angle faults, and bedding faults offset veins and comprise post-mineralization faults. Most commonly, these comprise northwest-striking cross faults recognized by offset veins that show apparent right-lateral displacement. The geology of the EKHSD area is shown in Figure 7-3. (Figure 7-2 provides the rock type legend for Figure 7-3).

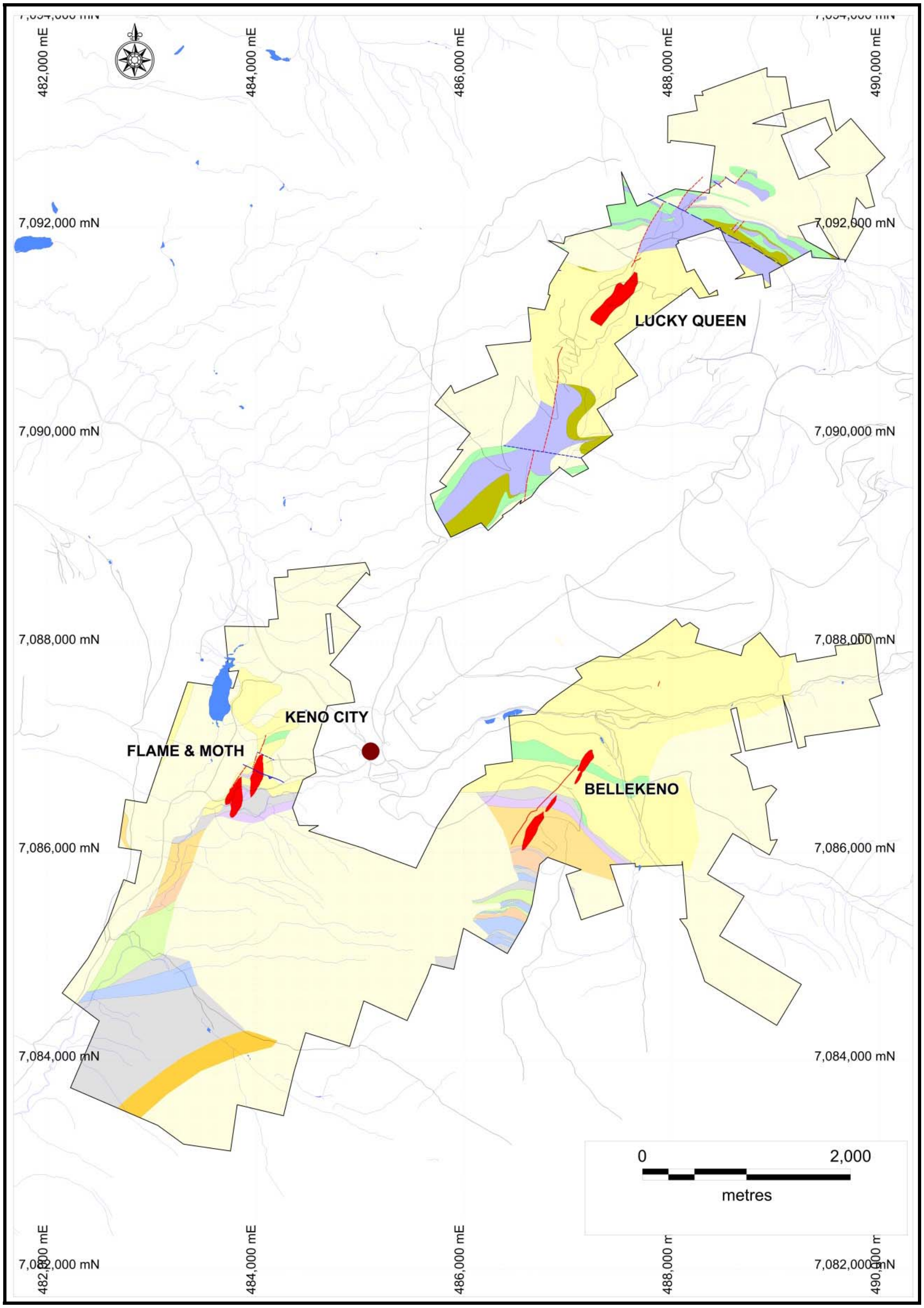


Figure 7-3: Local Geology of the EKHSD Project (Alexco, 2013) (Light yellow represents alluvial cover)

7.3 Mineralization

Summaries of the Keno Hill silver district silver-lead-zinc mineralization can be found in Boyle (1965), Cathro (2006), Murphy (1997), and Roots (1997). Mineralization in the Keno Hill mining camp is of the polymetallic silver-lead-zinc vein type that typically exhibits a succession of hydrothermally precipitated minerals from the vein wall towards the vein centre. However, in the Keno Hill silver district, multiple pulses of hydrothermal fluids or fluid boiling, probably related to repeated reactivation and breccia formation along the host fault structures, have formed a series of vein stages with differing mineral assemblages and textures. Supergene alteration may have further changed the nature of the mineralogy in the veins. Much of the supergene zone may have been removed due to glacial erosion.

In general, common gangue minerals include (manganiferous) siderite and, to a lesser extent, quartz and calcite. Silver predominantly occurs in argentiferous galena and argentiferous tetrahedrite (freibergite). In some assemblages, silver is also found as native silver, in polybasite, stephanite, and pyrargyrite. Lead occurs in galena and zinc in sphalerite, which at the Keno Hill silver district can be either an iron-rich or iron-poor variety. Other sulphides include pyrite, pyrrhotite, arsenopyrite, and chalcopyrite.

Cathro (2006) suggested that the mineralized veins may exhibit a vertical zonation in mineralogy with a typical mineralized shoot displaying a vertical zoning from lead-rich at the top to zinc-rich at the bottom. He reported mineralogical changes to the mineralization with increasing depth from galena to galena-freibergite, to galena-freibergite-sphalerite-siderite, to sphalerite-freibergite-galena-siderite, to sphalerite-siderite, to siderite-pyrite-sphalerite that have been historically interpreted to indicate a silver-poor, sphalerite-rich base to the economic mineralization. Historically, it was also believed that economic mineralization in the Keno Hill mining camp was restricted to a shallow zone of about 120 m thickness. However, the 370 m depth of production from the Hector-Calumet mine and drill indicated mineralization to over 350 m depth at Flame & Moth demonstrate that silver-rich veins exist over greater vertical intervals and that other known veins exhibit exploration depth potential.

Across the district, favourable environments for mineralization are considered to be:

- Quartzite or greenstone present on one wall of the vein-fault. (Veins pinch down significantly in schist bound structures);
- Adjacent to, or in the footwall of cross faults (015° vein sets);
- Where the vein splits or forms cymoid loops;
- Where the vein changes dip.

7.3.1 Bellekeno Mine Mineralization

The Bellekeno vein system consists of ten known veins with variable characteristics. Vein material has been extracted from the Ram, Eureka, Tundra, 48, 49, and 50 veins. Veins generally strike 030° to 040°, with dip directions varying 60° to 80° southeast or northwest. Mechanized mining has focused on the larger 48 vein structure, while conventional mining has focused on the smaller, higher grade vein structures.

Within the 48 vein structure, there are three main zones: Southwest, 99, and East, as shown in Figure 7-4. The zones have distinctive silver to lead ratios, zinc content, and accessory mineral assemblages within the 48 vein structure. Vein true thickness ranges between a few centimetres to upwards of 5.5 m. Post- and syn- vein-faults have been observed during mining activities. Post-vein-faults typically show intense iron carbonate alteration and local brecciation, while syn-vein-faults have a strong impact on silver grades and mineral textures (Figure 7-5). Sinstral-normal movement along the 48 vein structure is estimated at 35m.

Mineralized zones are commonly hosted within manganese-rich siderite structures that may have pervasive limonitic alteration when exposed to ground water. Minerals of economic interest include silver-bearing sulphosalts, galena, and sphalerite. Common accessory minerals include pyrite, arsenopyrite, and chalcopyrite. Anglesite, cerrussite, smithsonite, malachite, and azurite have been occasionally observed. The mineralized shoots within the vein structures are not continuous.

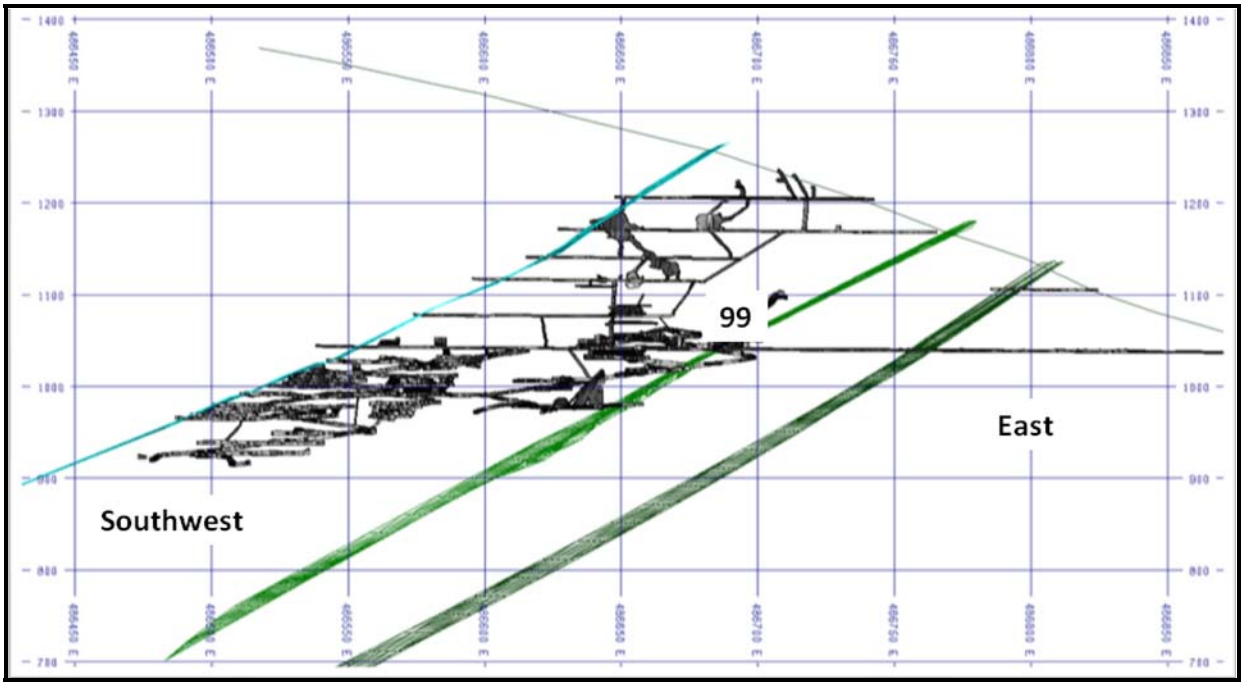


Figure 7-4: Schematic Longsection of the Bellekeno Mine (View west-northwest [290°]. Distribution of active mining zones within the 48 vein. Workings as of May 2012) (Alexco, 2013)

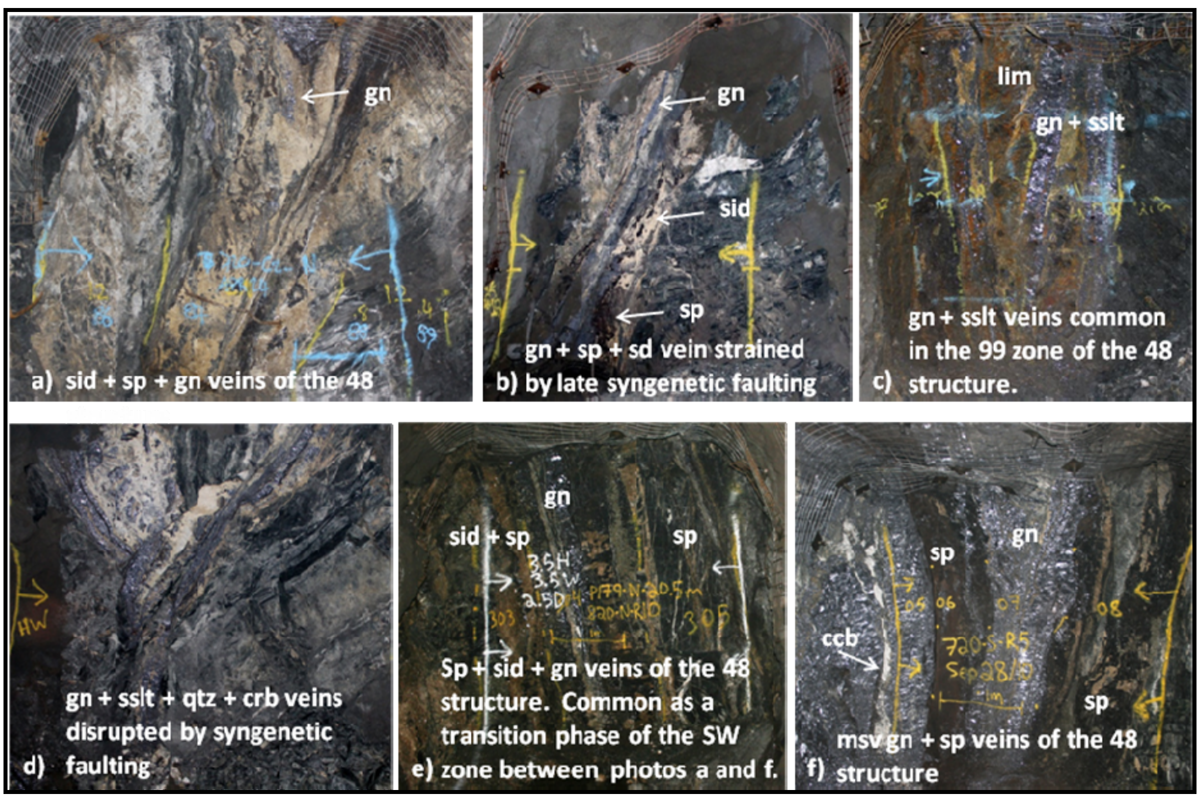


Figure 7-5: Vein Structures and Major Mineralogies Commonly Observed in the 48 Structure of the Bellekeno Mine Abbreviations are: (gn) galena; (sid) manganese rich siderite; (sp) iron rich; (Fe 65) sphalerite; (lim) limonitic alteration of carbonate facies; (sslts) non-specific sulphosalts; (qtz) siliceous floods and concretions associated with late breccias; (ccb) white carbonate. (Alexco, 2013)

7.3.2 Lucky Queen Mineralization

The Lucky Queen vein structure has an average strike of approximately 043° with local variations ranging from 025° to 060°, and an average dip of around 045° to the southeast, within a range of 30° to 55°. The main structure has a strike length, as defined by drilling, of approximately 650 m and is open along strike to both the northeast and southwest. Stratigraphic units correlated across the structure show a normal separation of approximately 30 – 35 m. Reported vein thickness ranges from just a few centimetres to several metres. Mineralized zones are largely composed of brecciated wall rock, siderite (± limonite), vein quartz, and minerals of economic interest including silver sulphosalts, galena, sphalerite, and native silver, as seen in Figure 7-6. Minor primary minerals present include arsenopyrite and pyrite.

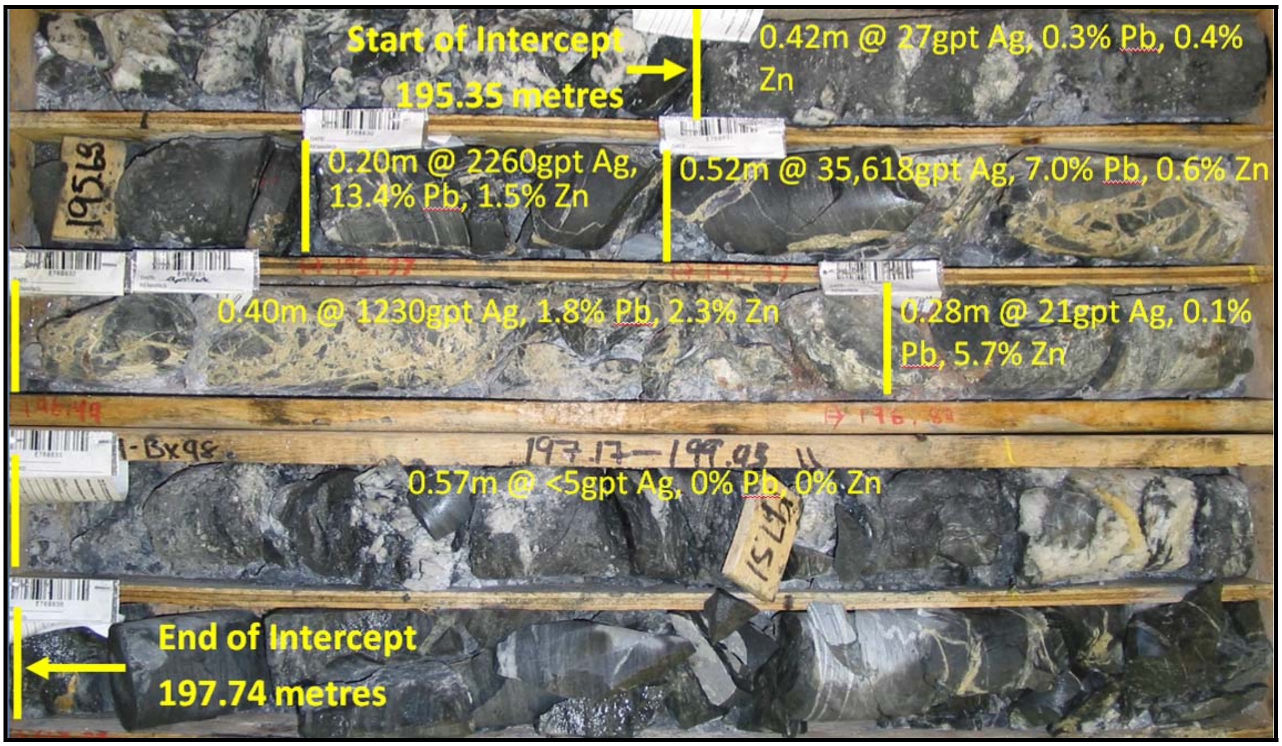


Figure 7-6: Vein-Fault Intercept in Drill Hole K-07-0114, in the Central Part of the Lucky Queen Deposit (Alexco, 2013)

7.3.3 Flame & Moth Mineralization

Two main styles of banded and locally brecciated mineralized veining are noted. An early phase comprises dominantly quartz gangue with abundant but irregular pyrite, sphalerite, and arsenopyrite, while a later phase is siderite-dominant with abundant sphalerite and irregular pyrite and galena development. Other minerals commonly observed include pyrrhotite and chalcopyrite, with trace amounts of the argentian tetrahedrite, pyrargyrite, jamesonite, boulangerite, and cassiterite identified in petrologic samples. The veining often displays multiple periods of brecciation and re-healing (Figure 7-7).

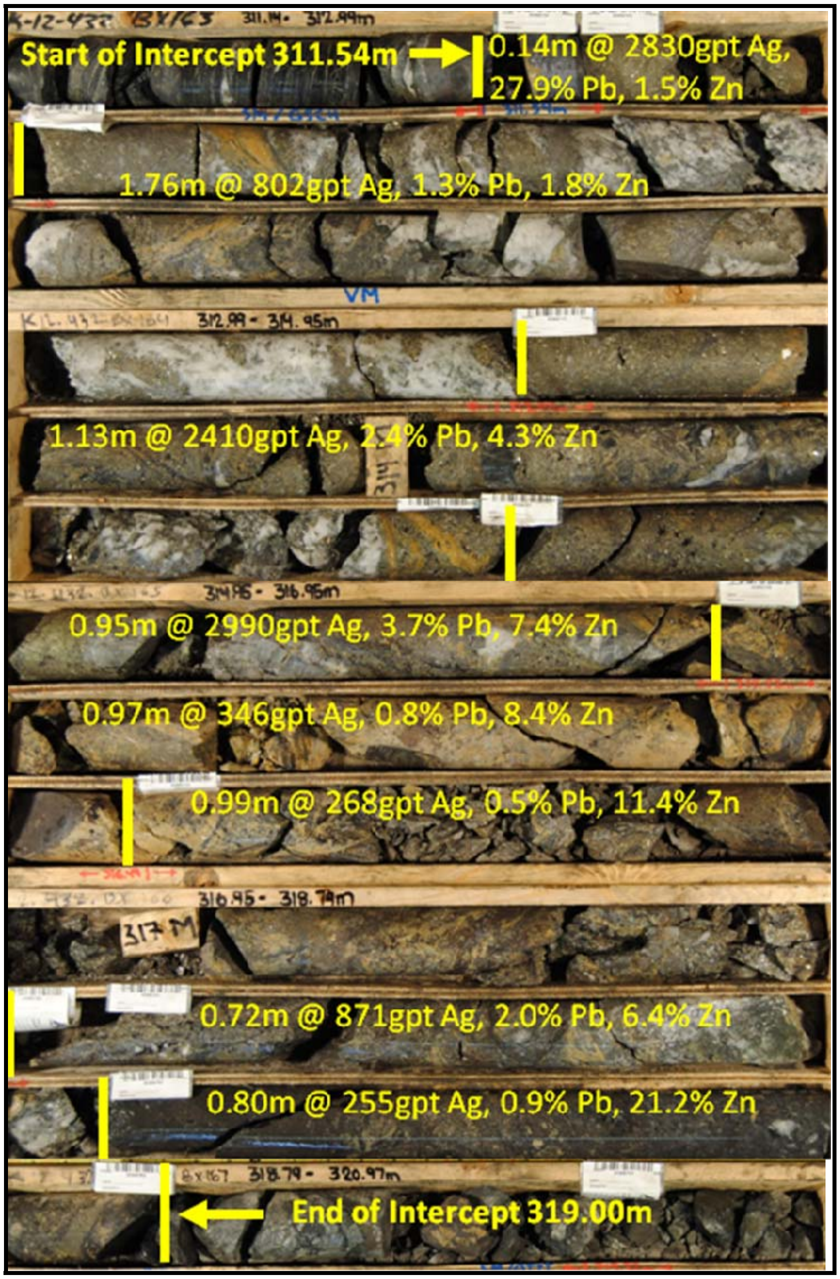


Figure 7-7: Vein-Fault Intercept in Drill Hole K-12-432, in the Flame & Moth Deposit (Alexco, 2013)

8 Deposit Types

The Keno Hill mining camp has long been recognized as a polymetallic silver-lead-zinc vein district with characteristics possibly similar to other well-known mining districts in the world. Examples of this type of mineralization include the Kokanee Range (Slocan), British Columbia; Coeur d'Alene, Idaho; Freiberg and the Harz Mountains, Germany; and Príbram, Czech Republic.

The common characteristics of these locales are their proximity to crustal-scale faults and the occurrence in a package of monotonous clastic metasedimentary rock, which have been intruded by plutons. The intrusions may have acted as a heat source for hydrothermal circulation, and the mineralization may be locally related to the intrusions. Mineral precipitation occurred where metal-laden hydrothermal fluids, with a temperature of 250 to >400°C, travelled through open fractures caused by a local tensional stress regime in an otherwise compressional environment and precipitated metals as in multiple pulses as pressure and temperature changed and boiling or fluid mixing took place (Lynch, 2009). The metals were likely leached from crustal rocks by hot circulating fluids with mineral precipitation occurring at estimated depths of up to 11 km.

In the Keno Hill silver district, the largest accumulation of minerals of economic interest occurred in areas of increased hydrothermal fluid flow in structurally prepared competent rocks such as the Basal Quartzite Member and Triassic Greenstone. Incompetent rocks like phyllites tend to produce fewer and smaller (if any) open spaces, limiting fluid flow and resulting mineral precipitation.

9 Exploration

Most past exploration work in the Keno Hill silver district was conducted as support to the mining activities until the mines closed in 1989. A good summary of the early exploration work is provided by Cathro (2006). This historic work involved surface and underground drilling designed to explore areas surrounding the main underground working areas. It is beyond the scope of this report to describe all historical exploration work completed in the Keno Hill silver district. Only the relevant historical work is included below.

The current exploration conducted by Alexco is the first comprehensive exploration effort in the Keno Hill silver district since 1997. During the initial phase of Alexco's involvement at the Keno Hill silver district, a program of geologic data compilation, aerial geophysical surveying (conducted by McPhar Geophysics), and surface core drilling was completed.

Past operator UKHM accumulated a large number of paper maps and documents relating to nearly 70 years of district mining, but the documentation and data were never assembled into a coherent database that could be used to decipher the geology on a district scale. Beginning in late 2005 and continuing through 2008, Alexco converted this historic data to over 100 gigabytes of digital form by scanning and data entry that was used to construct district scale maps and three-dimensional (3D) mine models.

Two diamond drilling rigs were mobilized to the Keno Hill silver district during the summer of 2006.

A district-wide surface geological mapping and structural study, started in 2008, was continued through the 2012 field season.

9.1 Exploration of Bellekeno Deposit

A series of core drilling programs and geophysical surveys have been conducted on the Bellekeno deposit since 2006. The combined drilling programs have produced 41,843 m of drill core from 405 drill holes. Drill holes targeted mineralized zone extensions and were used to verify historical results and to estimate mineral resources. Compiled geochemical and structural data has been used to continuously develop a better understanding of the mineralizing fluids on a Keno Hill silver district and local scale.

Five surface core drilling campaigns since 2006 totalling 19,861 m delineated regions of the Bellekeno deposit and adjacent targets. Underground drill campaigns were initiated in 2009 with major targets including the Ram, Eureka, and the 48 vein systems, including the projected 48 vein extension, known as the Thunder zone. Exploration and resource infilling drill programs between 2009 and 2012 have totalled 26,080 m (357 drill holes).

Mining activities have allowed for structural mapping, that in conjunction with daily geologic mapping and sampling of all active faces, has been used to continually update the Bellekeno geologic model.

Geophysical surveys that have been conducted over the Bellekeno property since 2006 include aerial magnetic & time domain EM, and a trial gravity line. Distinct signatures for known mineralized zones were not resolved, however, stratigraphic and structural points of interest were identified.

9.2 Exploration of Lucky Queen Deposit

Drilling by Alexco in the Lucky Queen prospect area totalled four surface core drill holes (875 m) in 2006, targeting the vein structure below the southwest end of the historical workings and around the lowermost reaches of the internal winze.

Core drilling at Lucky Queen late in the season in 2007 consisted of three surface core drill holes (557 m), of which only one reached the target depth before inclement weather forced an end to the drilling season. In 2008, 12 surface core drill holes (2,999 m) were drilled as stepouts along the vein strike to the southwest. Closer spaced and infill drilling around the 2007 drill hole intercept was the focus of the 2009 (14 surface core drill holes for 3,048 m) and 2010 (14 surface core drill holes for 3,625 m) drill campaigns that formed the basis for the resource estimate.

A district-wide surface geological mapping and structural study, started in 2008, was continued through the 2010 field season with findings incorporated into the Lucky Queen geologic model where applicable.

Two geophysical techniques have been used over the Lucky Queen property: aerial magnetic & time domain EM surveys. The results generated by these surveys were successful in helping to identify possible hidden structures and covered stratigraphy, however, no obvious signature unique to known mineralization was identified.

9.3 Exploration of Flame & Moth Deposit

Field mapping by Alexco (McOnie and Read, 2009) identified the possible presence of northeast-trending vein-faults thought to have movement of approximately 450 m based on the offset of local stratigraphy. In conjunction with review of the past exploration results on the property, this led to the generation of drill targets with 3,986 m of drilling in 14 drill holes completed in 2010 that provided the Flame Vein discovery hole (K-10-0264) intercepting 693 gpt silver over a 4.64 m interval (Alexco Press Release, 16 February 2011).

During 2010 a soil geochemical and a ground magnetic geophysical survey were also completed over the area. A further 32 drill holes for 7,150 m were drilled in 2011, with the results leading to the publication of the initial resource estimate (SRK, 2012). Follow up drilling of 43 drill holes for 8,753 m completed in 2012 supported a revised resource estimate (Alexco, 2013).

Drilling completed in 2013 (3 holes, 1,257 m) has extended the strike length of the mineralization for at least 220 m to the southwest to over 900 m, but these results are not included in the current resource estimate.

10 Drilling and Trenching

10.1 Trenching

Limited historical trenching work was completed along vein strike extensions, with very limited assaying and little geological information was documented. No trenching work has been completed by Alexco.

10.2 Drilling

In 2006, core drilling was performed by Peak Diamond Drilling, based out of Courtney, British Columbia, utilizing two skid mounted drill rigs, a LF-70 drill, and an EF-90 drill. Drilling employed the wireline method using N-size equipment (NQ2).

In 2007 and 2008, core drilling was performed by Quest Diamond Drilling, based out of Abbotsford, British Columbia, utilizing four skid mounted drill rigs, two LF-70 drills, and two LF-90 drills in 2007; and two skid mounted drill rigs, one LF-90, and one QD-4 drills in 2008. Drilling employed the wireline method using H-size equipment (HQ).

The 2009 surface drilling was performed by Kluane Drilling of Whitehorse, Yukon, utilizing two skid mounted KD-1000 drills. Drilling employed the wireline method using N- and H-size equipment.

Surface drilling in 2010 was split among three contractors: Cabo Drilling based in Surrey, BC, Kluane Drilling out of Whitehorse, Yukon, and Ensign Encore Drilling from Calgary, Alberta.

Boart Longyear, based in Saskatoon, Saskatchewan, completed the 2011 to 2013 drilling programs using LF70 or LF90 wireline drill rigs with core recovered in PQ, HQ and NQ sizes.

For all campaigns the drilling was well supervised, the drill sites were clean and safe, and the work was efficiently done. Diamond drill operational safety inspections were conducted on each drill rig at various times throughout the drilling programs.

Underground core drilling at Bellekeno in 2009, 2010, 2011, and 2012 was completed in NQ or HQ core size by Boart Longyear utilizing skid-mounted LM90 diamond drill rigs.

Proposed surface drill hole collars were located using a hand held Garmin GPS device, with the completed collars being surveyed with either an Ashtech GPS device utilizing post-processing software or a Sokkia GRX1 RTK GPS.

All underground collars and drill stations were surveyed by underground surveyors (employed by Procon Mining & Tunnelling Ltd. or Alexco) using a total station survey instrument.

All coordinates are recorded in the Universal Transverse Mercator UTM NAD 83 Zone 8 map projection coordinate system. Down hole surveys are recorded using Reflex survey tools at regular intervals of between 15 – 30 m depending on the hole location and geologic conditions.

Standard logging and sampling conventions are used to capture information from the drill core. Between 2006 and 2010 core was logged in detail using paper forms with the resulting data entered into a commercial computerized logging program either by the logging geologist or a technician. Since then all core logging data has been directly digitally entered to the geology database with data including comments captured in separate tables including:

- Lithology: rock type, including significant Fault or Mineralized vein-faults, and textural modifiers;
- Structure: type of structure and measurements relative to core axis;
- Mineralization to identify type and intensity of oxidation, metamorphic, hydrothermal, or disseminated phases, and abundance of veining;
- Alteration;
- Stratigraphy: units consistent with the surface mapping;
- Geotechnical: percentage recovery and rock quality determination and fracture intensity.

Alexco systematically measured core specific gravity (CSG) of mineralized material as well as basic rock types. Specific gravity was measured using a balance and measuring the weight of core pieces in air and in water. The core weighted in water was not covered by wax or plastic film. Pulp specific gravity (PSG) measurements were obtained by pycnometry on select assay intervals of mineralized zones for Alexco drilling by ALS Chemex Laboratories and AGAT Labs.

10.2.1 Historical Drilling at the Bellekeno Mine

Historical percussion and core drilling for the Bellekeno area extended from 1975 to 1996. Although all of the data has been compiled, sections are most likely incomplete.

Between 1975 and 1996, UKHM drilled four surface, and two underground percussion programs. These drill holes were logged, sampled and assayed at 4- and 5-foot intervals, respectively (1.22 m and 1.52 m). Originally, percussion drilling and sampling was undertaken to mitigate loss of vein material observed in coring programs. However, the nature of chip logging, recirculation of water and rock material within these types of drill holes are considered poor data sources for technical reports and were not used for the resource estimation.

Coring programs between 1986 and 1996 were drilled from underground totalling 4,944 m across 60 drill holes under UKHM. Drill holes were drilled with BQ and NQ bits, but generally resulted in moderate to poor recovery in areas where foliation and stratigraphy were subparallel to the core angle, heavily fractured, and or friable material was encountered. Drill holes were generally designed to test for the downward extension of the 99 zone, and smaller programs for the Southwest and East zones, as illustrated in Figure 10-1. Archived drilling data and procedures were briefly reviewed by G. David Keller, PGeo, of SRK as part of the updated PEA technical report issued by Wardrop in 2009. As part of this review, Mr. Keller discussed the drill core sampling procedures with UKHM staff active during the mining operations at Bellekeno. The drilling procedures were deemed reasonable based upon the limited information available (Wardrop, 2009), and thus considered reliable for geologic interpretation and resource calculations.

10.2.2 2006 – 2012 Alexco Drilling at the Bellekeno Mine

A total of 41,843 m of drilling from both surface and underground was completed at the Bellekeno deposit between 2006 and 2012 (Table 10-1).

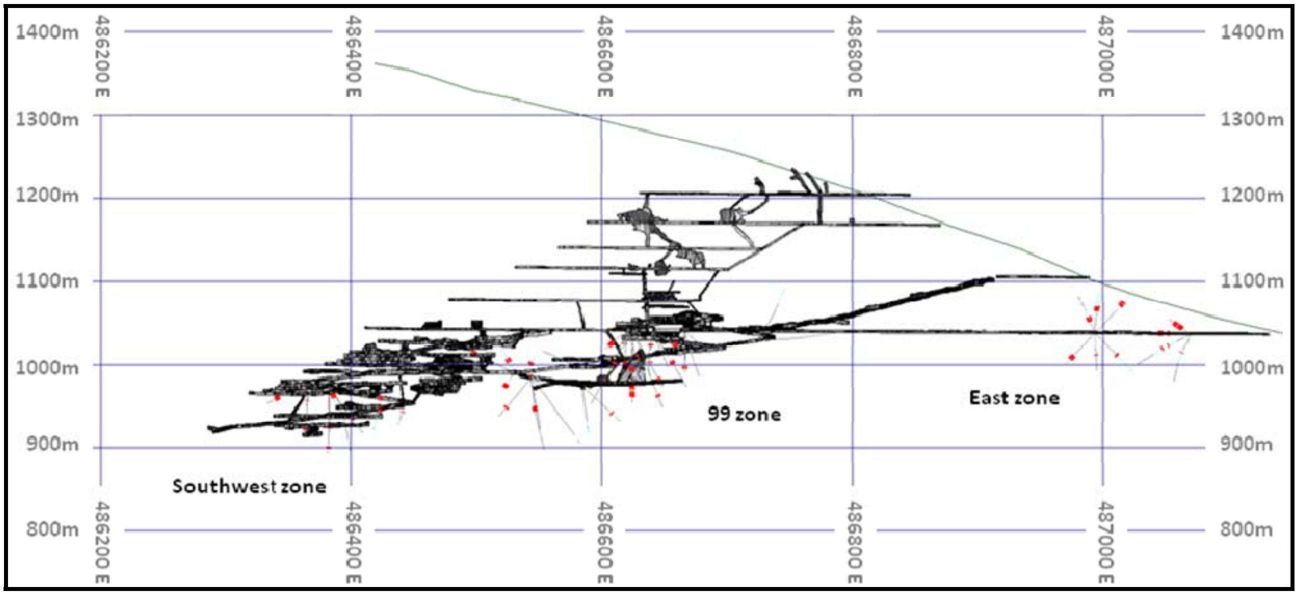


Figure 10-1: Bellekeno Mine Long Section, 1986 – 1996 UKHM Core Drill Holes (48 vein intercepts highlighted in red. Image view is 312 AZ, looking northwest.) **(Alexco, 2013)**

Table 10-1: 2006 to 2012 Bellekeno Property Core Drilling Summary

Year	No of Drill Holes	Length (m)
Surface Drilling		
K-2006	9	3728
K-2007	36	11,063
K-2008	2	782
K-2009	17	2,729
K-2010	5	1,559
Total	**69**	**19,862**
Underground Drilling		
2009	134	7,714
2010	50	5,178
2011	87	4,341
2012	64	4,518
Service	1	230
Total	**336**	**21,981**

An aggressive core drilling program by Alexco began in 2006 to confirm and test the 1997 historical mineral inventory and block model, as well as to extend the known mineralization for the 2009 PEA of the Bellekeno resource. Between 2006 and 2009, 198 drill holes of HQ and HQ3 size were drilled resulting in 26,015 m focussed on the 48 and 49 vein structures from underground and surface platforms. The drill core sampling and logging procedures were reviewed, and later compared against the UKHM drilling programs, and active mining. The larger core diameter, along with triple tube chambers helped to limit core loss in the vicinity of the vein, but did not fundamentally change core recovery. Drill core programs, surveying, and sampling procedures were considered reliable for geological modelling and mineral resource estimation.

More recent core drilling on the Bellekeno property has focused on resource definition, and to a lesser degree exploration programs. The underground drilling programs included infill, geotechnical, and exploration targets between 2010 and 2012. Surface drill holes are illustrated on Figure 10-2, while underground core drill hole traces are shown in Figure 10-3. Drilling procedures and results were reviewed and considered reliable for geologic interpretations and resource calculations.

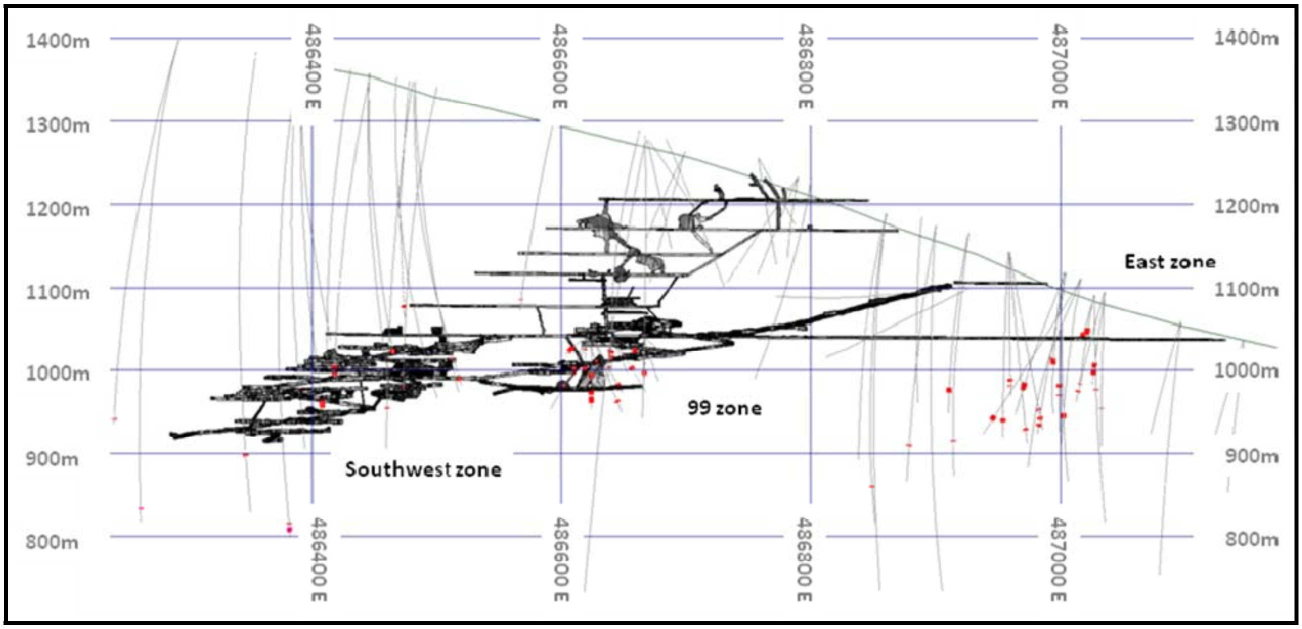


Figure 10-2: Bellekeno Mine Long Section, Surface Core Drill Holes, 2006 – 2012
(Vein intercepts are highlighted in red. Image view is 312AZ, looking northwest.) (Alexco, 2013)

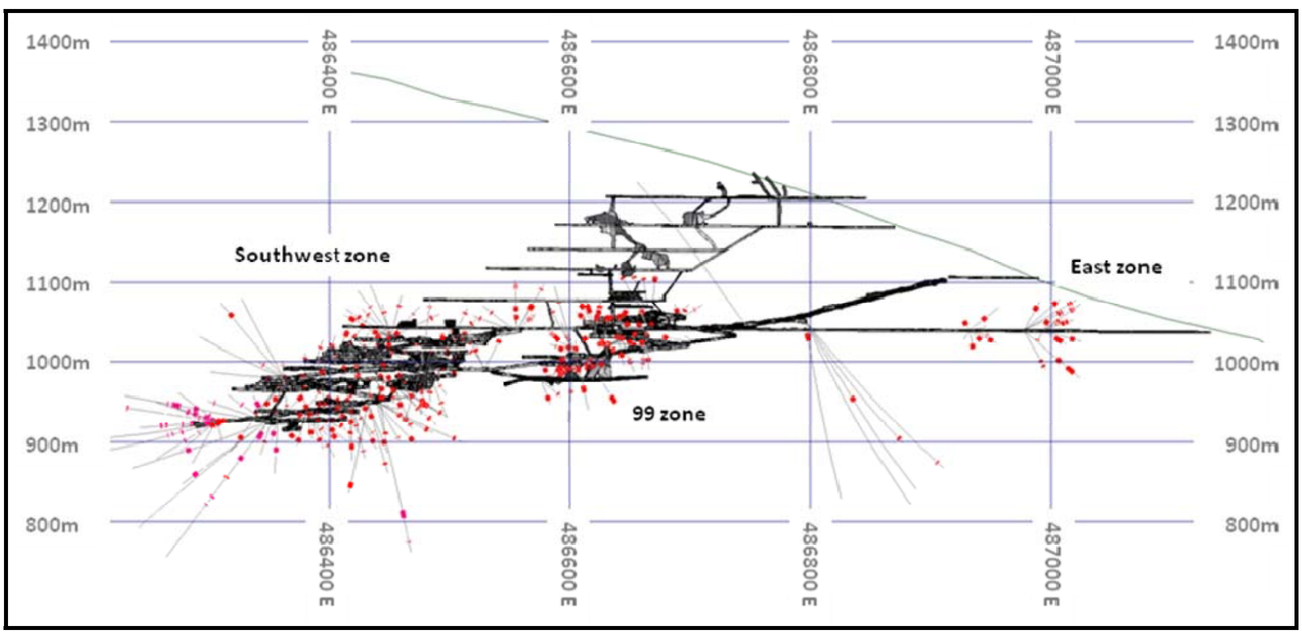


Figure 10-3: Bellekeno Mine Long Section, Underground Core Drill Holes, 2006 – 2012
(Vein intercepts are highlighted in red. Image view is 312 AZ, looking northwest.) (Alexco, 2013)

During 2010, five surface core drill holes were drilled (1,599 m): two drill holes on the southern offset of the 48 vein structure, and three drill holes to the north of the 99 zone. The drill holes ranged in length from 124 to 615 m, generally oriented northwest to southeast, with a declination between -55 to -72°. These orientations provided drilling intercepts almost perpendicular to the vein structure strike and resulted in vein intercepts that are as close as possible to true thickness. Down-hole surveys were generally taken every 30 m, using a Reflex down-hole survey tool.

Underground core drill holes were drilled almost continuously from 2010 through 2012. During this time, 201 drill holes were drilled with completed lengths between 15 and 285 m. Resource infilling drill holes were typically targeted on 15-metre centres, while larger step outs of 25 and 50 metres were more common on exploratory drill holes. Attempts were made to intersect the vein structures at orientations that would provide intercepts close to true thickness. Orientations generally ranged from northwest to southeast, with delineations between +65 to -55°, as depicted in Figure 10-3. Resource definition drill holes were generally drilled on a 15-metre dice pattern, while geotechnical and stratigraphic drilling targets were placed as required. This drilling pattern is considered operationally feasible and an accurate strategy for resource estimations given the heterogeneity over the vein composition.

A summary of core recovery by year is summarized in Table 10-2 and Table 10-3.

Table 10-2: Summary of Surface and Underground Core Recovery Statistics 1996 – 2009

Zone	Core Recovery		NQ	HQ
	%*	%**	Intervals	Intervals
East	81	83	5	0
99	67	75	30	5
SW	79	88	45	13
Average	**76**	**83**	**Sum 80**	**18**

* NR Zones are treated as 0% recovery

** NR Zones are excluded

Table 10-3: Summary of Underground Core Recovery Statistics 2009 – 2012

Zone	Core Recovery Percent			
	2009	2010	2011	2012
East Zone				
Number	14	3		
Avg	67	21		
Min	24	2		
Max	91	34		
99 Zone				
Number	44		13	20
Avg	72		58	62
Min	44		26	36
Max	89		99	86
SW Zone				
Number	64	27	53	4
Avg	80	73	62	80
Min	25	16	36	74
Max	98	98	86	84

Vein heterogeneity and moderate to poor vein recovery during drilling has been overcome by the incorporation of chip data into the geological model. An example of vein heterogeneity is illustrated in Figure 10-4.

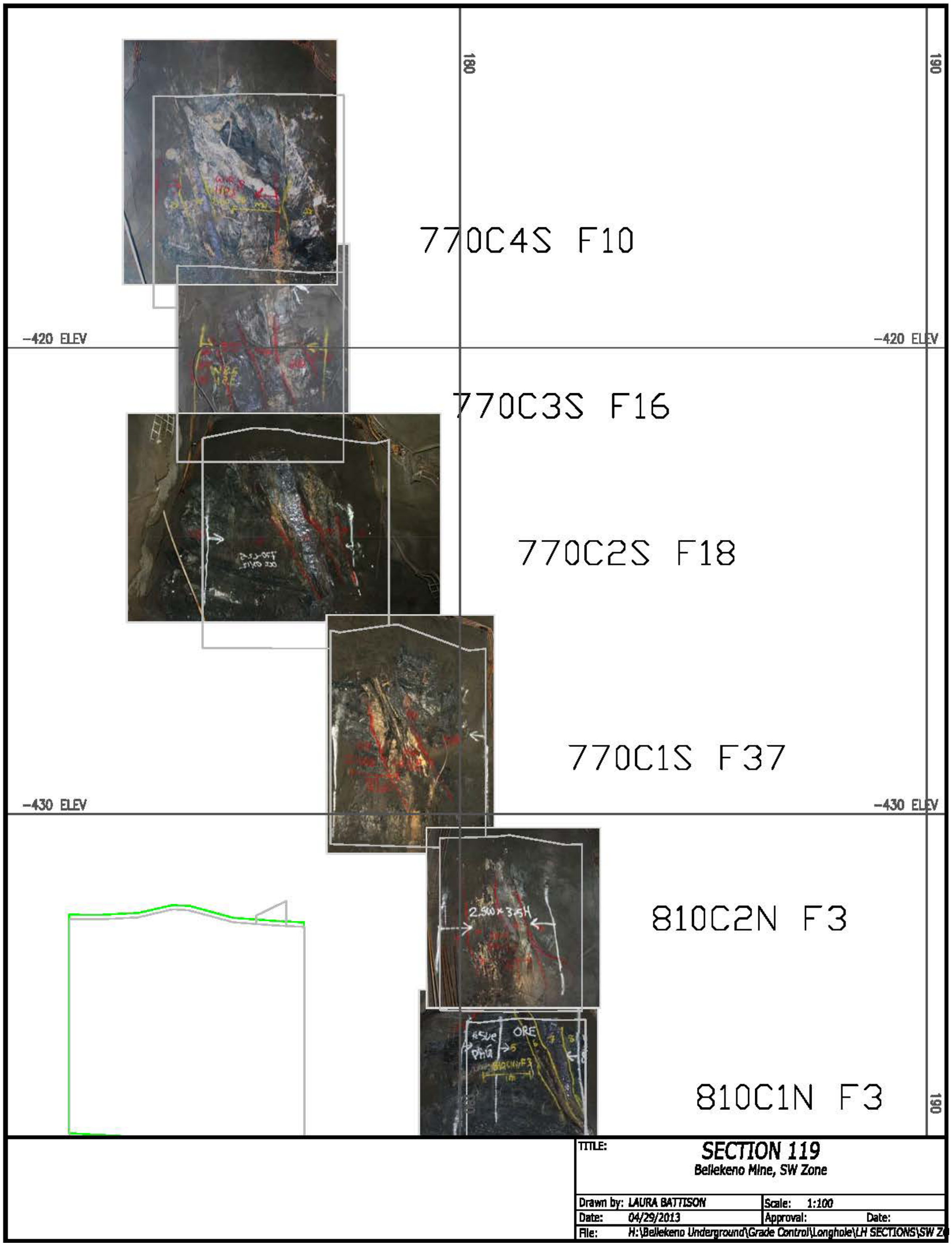


Figure 10-4: Photographic Section of 48 Vein Heterogeneity, Bellekeno Mine (Alexco, 2013)

10.2.3 Historical Drilling at Lucky Queen

For the Lucky Queen area, historical drilling information is available from the 1950s through the 1980s.

In 1957, UKHM drilled two surface core drill holes (LQ2 and LQ4) that intercepted the main Lucky Queen structure below the existing 300 level workings, however core recovery was very poor. For example, across a 50.90 m interval (from a depth of 156.06 m to 206.96 m in drill hole LQ4), in the approximate vicinity of the vein, recorded recovery averaged only 22%. The fractured, friable nature of vein material makes its retrieval very unlikely given the already poor recovery conditions. No assays exist for drill holes LQ2 or LQ4 because vein material was either not intercepted or was not recovered and, thus, assaying was likely deemed unnecessary. In addition, survey control for these drill holes is sparse. For the above reasons the historical surface core drilling data was not used in the Lucky Queen resource estimate.

In 1985 – 1987, UKHM drilled underground test drill holes from the Lucky Queen 500 level adit. These percussion drill holes were sampled and assayed at 4-foot intervals. Percussion drilling does not present reliably the accurate location of a sample. No recovery data was obtained by UKHM. On this basis, historic assays were not used in this resource estimate. The test drill holes did provide some useful geological information and were used to help constrain the geometry of the main Lucky Queen structure and associated splay structures during wireframe construction.

Shallow, rotary percussion surface drill holes were also drilled in the Lucky Queen area in the 1970’s through 1980 totalling approximately 20,400 m in 507 drill holes. As with the underground rotary percussion drill holes, these data were not deemed reliable for mineral resource estimation. The data were used in select geostatistics (variography) and in construction of mineralization and geological models, where applicable.

10.2.4 2006 – 2010 Alexco Drilling at Lucky Queen

Alexco conducted surface core drilling programs at Lucky Queen from 2006 to 2010 with 47 core drill holes totalling 11,104 m drilled (Figure 10-5). The drilling was designed to test along strike and down-plunge of the historical workings.

Surface drill holes ranged in length from 18 to 324 m, averaging 235 m. Most drill holes were drilled on a northwest azimuth with a declination of between 45 and 80°. In most cases, the drill holes were designed to intercept the mineralized zones perpendicular to the strike direction to give as close as possible a true thickness to the mineralized interval. Down-hole surveys were taken approximately every 60 m in 2006, 30 m in 2007 and 2008, and 15 m in 2009 and 2010 using a Reflex survey tool.

Drilling was designed to have a regular grid pattern with vein pierce point spacing on the order of 20 to 30 m.

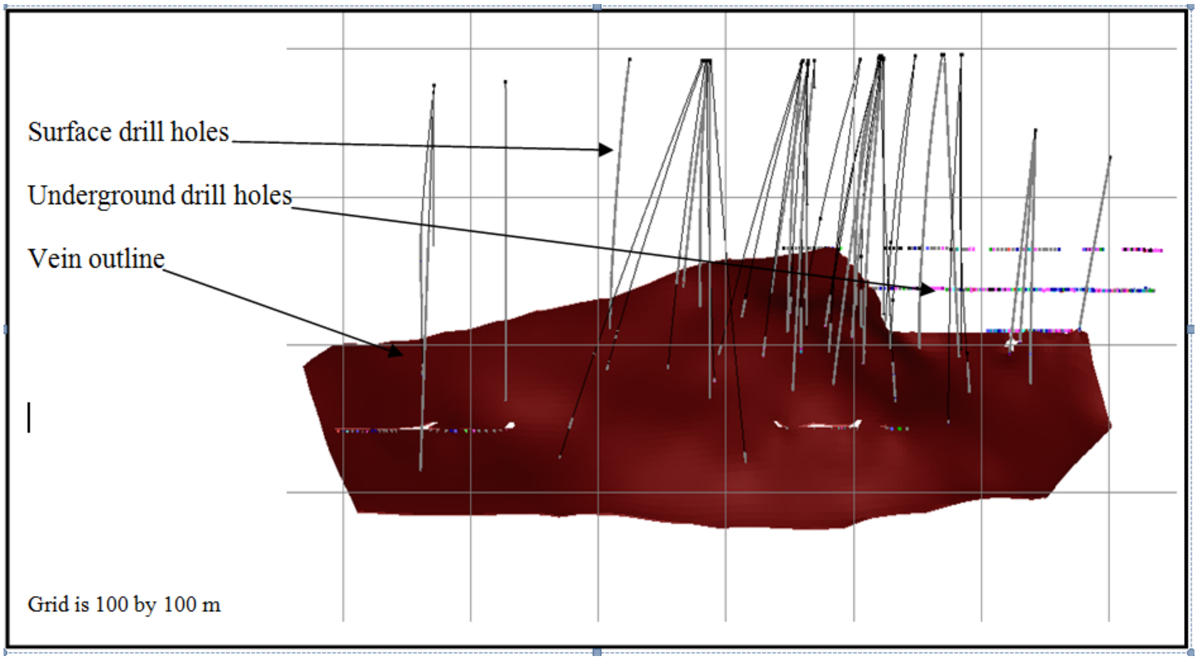


Figure 10-5: Location of Surface Drill Holes Drilled from 2006 to 2010 at Lucky Queen, Section is Looking Northwest (SRK, 2011)

10.2.5 Historical Drilling at Flame & Moth

Historical drilling at Flame & Moth was predominantly shallow surface percussion overburden drill holes with 133 overburden drill holes totalling 4,044 m drilled on an average azimuth of 320^{o}. Nine core drill holes totalling 731 m were drilled from surface and 13 drill holes totalling 193 m were drilled from underground. Core recovery was generally poor, particularly in silver-lead-zinc mineralized zones, and core assays were restricted to mineralized zones.

Due to recovery issues for the historical core drill holes, lack of careful sampling techniques, and the open-hole nature of the percussion drilling, drilling data from these programs were not deemed reliable for use in the mineral resource estimation, although the data were used in the construction of geological models where applicable.

10.2.6 2010 – 2012 Alexco Drilling at Flame & Moth

Alexco conducted surface core drilling programs within the resource area at Flame & Moth in 2010, 2011, and 2012. The programs initiated 89 core drill holes (19,888 m), of which 76 drill holes were completed to target, for a total of 19,292 m. Theses drill holes were used in the geological modelling to develop the wireframes for resource estimation. The exploration drilling was initially designed to test geologically derived targets in the vicinity of the historical Flame & Moth workings. Following new discoveries, additional drilling was successful in outlining two zones of silver-lead-zinc mineralization on the Flame vein that were offset by the post-mineral Mill fault. Sufficient density of drilling has been completed to support mineral resource estimation.

In 2010, 14 drill holes were collared to target the structure identified by surface mapping. After losing the first drill hole in deep overburden, 11 other drill holes intercepted silver-lead-zinc mineralization that defined a mineralized structure striking 025^{o} and dipping 62^{o} southeast (Christal zone). One drill hole that was drilled furthest to the southwest, encountered silver-lead-zinc mineralization much deeper than anticipated and implied a right lateral fault offset of the structure. In total, 13 drill holes were drilled to target depth in 2010 for a total of 3,974 m.

In 2011, 32 drill holes were collared; however, eight were lost or abandoned. The majority of these drill holes targeted the up-dip extension of the mineralized vein located in the hangingwall of the Mill fault (Lightning zone) located in the 2010 drilling campaign. In total, 24 drill holes were completed to target depth for a total of 6,708 m.

In 2012, 43 drill holes were collared to infill and extend the initially defined resource. Of these four were abandoned. About half of the drill holes targeted the upper part of the Lightning zone not previously drill tested, while the remaining drill holes were drilled in the lower and southwestern part of the Lightning zone and various infill areas in the Christal zone. In total, 39 drill holes were drilled to target depth in 2012 for a total of 8,610 m. Refer to Figure 10-6.

Surface core drill holes in the mineral resource area that were drilled to target depth ranged in length from 74 to 482 m. Most drill holes were drilled on a northwest azimuth with a declination of between 45 – 80°. In most cases, the drill holes were designed to intercept the mineralized zones perpendicular to the strike direction to give as close as possible a true thickness to the mineralized interval. Drill hole spacing is on the order of 25 to 60 m, with a closer spaced grid pattern in the core of the higher grade mineral resource areas.

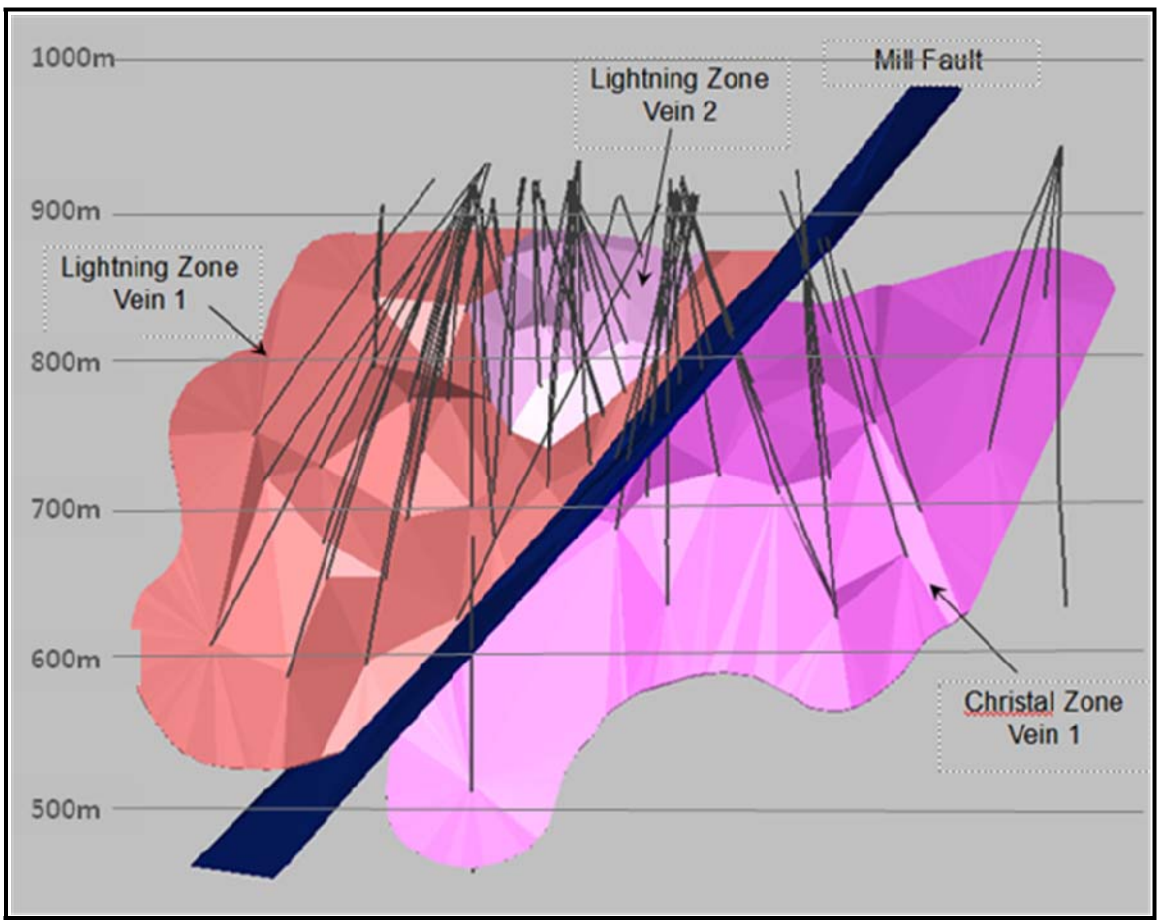


Figure 10-6: Location of Surface Drilling from 2010 to 2012 at Flame & Moth Used in Resource Estimation, Section is Looking North-Northwest (Alexco, 2013)

10.3 SRK Comments

SRK reviewed the geological model and drill hole database for the Flame & Moth deposit and is of the opinion that the drilling density at Flame & Moth is sufficient for the estimation of mineral resources.

11 Sample Preparation, Analyses, and Security

11.1 Sample Preparation and Analyses

11.1.1 Historical Sampling (Pre-Alexco)

Information regarding historical (pre-Alexco) sampling approach and methodology is limited. The available documentation is outlined below.

A 1965 UKHM document outlines the sampling procedures for a newly purchased percussion drill. It was found that in most cases the frozen ground gave sufficient support for the drill hole without additional casing. In a few cases where the ground was not frozen, casing was advanced with the drill bit.

Drill cuttings were collected using a locally designed cone-shaped deflector with a catch pan shaped to fit around the casing. During drilling operations, cuttings were blown upwards between the drill rod and the casing, where they hit the deflector and were caught by the catch pan. Runs were 5 feet (1.5 m) in length, and provided 10 to 15 lb of sample material. At the end of each shift, several hundred grams were split from each sample in the geochemical laboratory; the remainder of the sample material was screened to -14 mesh. Constituents of the fine and coarse fraction were identified separately.

A document dated 1994 by Watts Griffis and McQuat (WGM) outlines sampling procedures for the reverse circulation drilling. Two samples were to be collected for each 5-foot interval. One sample was sent to the laboratory while the other sample stayed at the drill for reference. The samples were collected in porous plastic bags and were dried prior to analysis. The document stresses cleanliness during the sampling procedure in order to avoid contamination.

An undated UKHM document outlines underground chip sample procedures as well. In addition to the above information, emphasis is put on clean faces in order to prevent sample contamination from previous blasting activities. Samples were to be taken within a 1.5 feet (0.5 m) wide area across the rock face. In addition to separate samples per rock type, this undated document requires separate samples for a change in structure. The sample location was to be measured from the nearest survey station; the resulting distance measurement was used to plot the samples (and assay results) on level plans. More detailed information was listed regarding the direction in which samples were to be taken for various kinds of underground openings.

11.1.2 Alexco Core Drilling Sampling - Exploration Programs (2006 – 2012)

The sampling protocol has remained relatively unchanged for the 2006 – 2012 surface and underground drill programs conducted by Alexco.

Core logging and sampling was completed by Alexco staff, where a logging geologist marked the sample intervals on the core. After logging, the core was digitally photographed and sawn in half lengthwise using a diamond saw where possible with attention paid to core orientation, or for broken core, manually split in half. One half was returned to the core box for storage at the site and the other bagged for sample shipment. No further on-site processing was performed.

Samples are typically 2 m in length within major rock types. Sample intervals are broken at lithological contacts and at significant mineralization changes, and where identified, exclude zones of no recovery. Sample intervals within mineralized zones range from 0.10 to 1.0 m, based on consistency of mineralization. In initial work at the prospects, drill holes were sampled top to bottom. However, once a considerable body of geochemical data was available and the nature and distribution of the mineralization better understood, some intervals of barren material were not sampled where in close proximity to adjacent drill holes that had been sampled continuously.

Some minor modification in the sample shipment procedure has occurred over time, primarily in response to changing laboratory locations and the logistics surrounding available commercial transport. In all cases, approximately four to five individual samples were placed in rice bags (grain sacks) for shipment.

In 2006, samples were sent to Whitehorse, Yukon via Kluane Transport then to the ALS Chemex facility in North Vancouver, British Columbia for preparation and analysis via Manitoulin Transport. Beginning in 2007, each rice bag was sealed with a numbered security tag. Bags were then placed on pallets and wrapped for shipping.

In 2007/2008, samples were transported to the Canadian Freightways facility in Whitehorse, Yukon by Alexco personnel. Canadian Freightways then trucked the samples to the ALS Chemex facility in Terrace, British Columbia for preparation. Pulverized subsample splits were then sent to the ALS Chemex facility in North Vancouver, British Columbia for analysis.

In 2009, samples were transported to the Eco Tech Labs preparation facility in Whitehorse, Yukon by Alexco personnel. Pulverized subsample splits were then sent to the Eco Tech facility in Kamloops, British Columbia for analysis.

In 2010, samples were shipped via Manitoulin Transport to Whitehorse, Yukon where they were couriered to the preparation facilities of either AGAT Labs or ALS Minerals in Whitehorse. The pulverized subsample splits were then sent to the AGAT Labs facility in Mississauga, Ontario, or the ALS facility in North Vancouver, British Columbia, for analysis.

In 2011 and 2012, samples were shipped via Manitoulin Transport to Whitehorse, Yukon where they were delivered directly to the preparation facilities of ALS Minerals in Whitehorse. The pulverized subsample splits were then sent to the ALS facility in North Vancouver, British Columbia, for analysis.

ALS Minerals, Eco Tech, and AGAT Laboratories are all accredited to ISO 17025 by the Standards Council of Canada for a number of specific test procedures, including fire assay for gold and silver with atomic absorption and gravimetric finish; multi-element inductively coupled plasma optical emission spectroscopy; and atomic absorption assays for silver, copper, lead, and zinc. ALS Minerals laboratories also participate in a number of international proficiency tests, such as those managed by CANMET and Geostats.

Sample preparation and analyses were consistent for the 2006 – 2012 Alexco programs. Sample preparation consisted of initial fine crushing of the sample to better than 70% passing 2 millimetres (mm) with the crusher cleaned with “barren material” after every sample. A nominal 250-gram split of this material was then pulverized to greater than 85% passing 75 micron (μm) for analyses with the pulverizer cleaned with “barren material” after every sample. Duplicate samples were prepared at the preparation facility by collecting a second 250-gram split from the crushed material taken from the preceding sample when noted.

Samples were analyzed for gold by fire assay and atomic absorption spectrometry on 30-gram subsamples and for a suite of 27 to 48 elements by four acid digestion and either inductively coupled plasma atomic emission spectroscopy (ICP-AES) or induced coupled plasma mass spectroscopy (ICP-MS) (on 0.5-gram subsamples). Elements exceeding the concentration limits of ICP-AES or ICP-MS were re-assayed by single element four acid digestion and atomic emission spectroscopy. Silver results exceeding ICP-AES limits were re-assayed by fire assay and gravimetric finish on 30-gram subsamples. Lead and zinc results exceeding concentration limits were analyzed by volumetric titration.

11.2 Quality Assurance and Quality Control Programs

Alexco implemented standard assay quality control procedures for all Keno Hill silver district drilling campaigns. Each 20-sample batch sent for assaying included three control samples: a commercial standard reference material (SRM), a blank, and a duplicate. The location of control samples in the sample stream was defined by the logging geologist (standard reference material or SRM, blank, and duplicate). Control samples were inserted when the core was sawn or when the whole core was sampled. The SRM was already processed to a pulp and was inserted as ~50-100–gram sample. The blank was commercially purchased "landscape rock," either dolomite or basalt. Approximately 0.35 to 1.5 kg of this material was inserted. An empty sample bag was inserted at the location of the duplicate, which was prepared during sample preparation at the laboratory prep facility. The duplicate consisted of a coarse reject split of the preceding sample.

11.3 SRK Comments

The quality control program developed by Alexco is considered mature and overseen by appropriately qualified geologists. The data collected by Alexco on the EKHSD project was acquired using adequate quality control procedures that generally met or exceeded industry best practices for an exploration property at the resource delineation stage.

In the opinion of SRK, the sampling preparation, security, and analytical procedures used by Alexco are consistent with generally accepted industry best practices and are, therefore, adequate for inclusion in this study.

12 Data Verification

12.1 Verifications by Alexco

During almost 100 years of exploration and mining in the Keno Hill silver district, large amounts of data and documents were produced; much of this material is accessible to Alexco.

Large amounts of data were scanned by Alexco with documents initially labelled with the location where they were found (e.g., file cabinet number and drawer) before being moved from the storage sites to the scanning facility. The scans of large maps and sections were stored as image files (JPEG format) where the file name contained original title block information. Individual files were stored in directories that mimicked the physical storage location. Smaller maps and reports were scanned and saved as Adobe® PDF files.

Naming convention and file hierarchy were the same as for the large maps. Each file was also given a five digit number that was added in front of the file name. These numbers were listed in an Excel spreadsheet that also contained the file name, the file extension, the file size, the scanning date, the directory location, and a key word index for each file. The scans were also organized into descriptive folders for each mine/prospect.

12.1.1 Historical Core Drilling Data

All accessible core drill hole logs were transcribed onto standardized spreadsheets as close to verbatim as possible; the original logs were scanned and file names and numbers were recorded in the new spreadsheets as well. These first spreadsheets were then inspected by geologists for consistency. The next step was to "normalize" the original transcribed data in order to match current nomenclature; data verification was ongoing. Collar information, as well as survey, assay, and recovery data were then verified by a person other than the original data entry person; the final step was to amalgamate separate spreadsheets into one global database.

12.1.2 Bellekeno Historical Core Drilling Data

Bellekeno underwent three phases of core drilling: 1986, 1994 – 1996, and 2006 – 2013. Alexco's access to mine workings in 2009 allowed resurveying of the 1986 and 1994 – 1996 historical (UKHM) drill hole collars in UTM coordinates, thereby assuring all collar locations were tied to a common datum.

In instances where 2009 underground drilling and historical drilling were twinned, the positioning of the 2009 composite locations were honoured, as historically down-hole surveying was irregularly spaced or not done at all.

In instances where surface drilling and underground drilling had conflicting contact locations, 2009 underground drilling was honoured. This was the case in the Southwest zone with surface drill hole K-07-0101. The vein intercept in this drill hole is 376 m down-hole. Within 15 to 20 m on each side are two Alexco underground drill holes of 15 m length of similar grade and thickness. In this case, the grade from K-07- 0101 was used in the estimation but its position is assumed to be defined by the adjacent underground drill holes.

Drilling programs under the supervision of UKHM were given careful scrutiny prior to being incorporated into the Alexco resource estimation. Historic data was evaluated and checked by processing paper drilling logs into electronic formats, resurveying of underground drill hole collars, and twinning of historical vein pierce points. Early programs were deemed reasonably complete and accurate for the purpose of resource and geologic modelling.

Two phases of underground core drilling occurred at the Bellekeno mine under UKHM management, 1986 and 1994-1996. During this time, most of the drilling operated off the local Treadwell grid system. For verification purposes, Alexco resurveyed the collar positions of the core and percussion drill holes in 2009 on the areas where the mine rehabilitation had been completed. The collar data was then verified against the UTM NAD 83 Zone 8 map projection coordinates. Only minor discrepancies were found in the underground percussion drilling. While the collar positions were updated, these drill holes were not included in the resource evaluation.

As part of the due diligence for the 2009 updated PEA conducted by Wardrop, twinning of the core drill hole vein pierce points were conducted. Twinned intercepts were commonly within 0.5 to 1.5 m of the original pierce point. In most cases, the intercepts of both drill holes were commonly useable for interpretations. However, in instances where the two pierce points were significantly different, the 2009 underground drilling was given precedence. Surface drill holes were assumed to have more deviation because of down-hole depth, and irregularly spaced or incomplete down-hole survey data.

12.1.3 Lucky Queen Historical Core Drilling Data

Historical drilling data is not deemed reliable and, therefore, was not considered for mineral resource estimation.

12.1.4 Flame & Moth Historical Core Drilling Data

Historical drilling data is not deemed reliable and, therefore, was not considered for mineral resource estimation.

12.1.5 Historical Chip Sample Data

Data verification by Alexco personnel was done on the TYC and UKHM underground chip sample data from the assay plan maps for each deposit where they were available. The verification procedure consisted of cross-checking the assay values in the database to the values on the original scanned historic assay plan maps. The sample interval points and respective silver assays were imported from the database and overlain on the original maps. All points were visually inspected to ensure that chip sample lines fell within the boundaries of the drift outlines. Then all assay intervals in the database were checked to ensure they matched with what was originally written on the maps.

12.1.6 Bellekeno Historical Chip Sample Data

Both historical (UKHM) chip sample and Alexco chip sample data was used in the grade estimation. Historical chip samples were commonly analyzed for silver, lead, and zinc only. Chip samples were generally taken as cuts across the vein and into the hangingwall and footwall rocks. The wireframe was constructed regardless of chip sample location. Chip samples were not used to define wireframe contacts or wireframe width. The determination of which chip samples to use in the grade estimation was made by “capturing” the chip sample intervals within the wireframe and tagging those intervals for composite. An interval had to be at least 25% within the wireframe to be tagged and used for compositing. The 25% rule was used because of the location uncertainty in the historical surveying of upper levels and stopes that were inaccessible to Alexco.

The high density of chip sample composites warranted declustering so that drill hole data influence on estimation would be honoured and chip sampling bias would be reduced. Chip sample composites were declustered on a 10 x 6 x 10 m grid.

Historical chip sample data was extensively reviewed by Alexco as part of the 2009 updated PEA. Chip assay values and string traces were visually referenced against the grades plotted on level plan view maps. During this early review, chip data was accepted if: a) the chip lines matched the UTM co-ordinates in the database within 0.1 m; b) the chip lines fell within the boundaries of the drift outline; c) the assays were real values; and d) the grades checked against the face grade sheets. Literary reviews of UKHM practices suggest a strong emphasis was placed on chip sampling, and chip sample protocols were well established by the time stoping began at Bellekeno in 1988. Mine correction factors issued across the Keno Hill silver district suggest the chip samples from Bellekeno were very representative of the vein material received; the mine was assigned a correction factor of 1.0.

Chip samples collected by UKHM were commonly analyzed for silver, lead, and zinc, while chip samples above the 400 level were commonly only analyzed for silver. Data tracking for Bellekeno during 1988 – 1989 included car sampling of the vein material before it was transported to the mill. A production review of the data showed a 12% variance between the car and chip data. Further analyses of the chip data using declustered data by zones is summarized in Table 12-1. This table summarizes a 14 to 40% variance in silver assay by zone. Results are significantly higher than anticipated, and do not reflect the chip sample to mill sample variations currently observed with active production. Sampling tests conducted by Alexco in 2011 showed a good mixing trend between chip samples, truck samples, and belt samples taken at the mill over a one month period. After reviewing the historical statistical data, the declustering analysis was considered excessively conservative given the reconciliation of the active chip samples with smelter products, and the chip-truck-belt cut mixing curves observed. Alexco considers the historical chip data from the Bellekeno resource area to be reliable.

Table 12-1: Statistical Review of UKHM Bellekeno Production Chip Data

	Mean		
	Ag (ppm)	**Pb (%)**	**Zn (%)**
99 Zone			
Chip Sample Data	1,269	6.93	2.89
Declustered Chip Sample Data	897	5.19	2.31
Difference	-29%	-25%	-20%
Southwest Zone			
Chip Sample Data	1,047	10.15	3.53
Declustered Chip Sample Data	626	5.85	2.58
Difference	-40%	-42%	-27%
East Zone			
Chip Sample Data	391	0.57	6.83
Declustered Chip Sample Data	338	0.49	6.2
Difference	-14%	-14%	-9%

12.1.7 Lucky Queen Historical Chip Sample Data

No historical chip data was used for mineral resource estimation. The data was used in select geostatistical analyses (variography) and in the construction of mineralization and geological models, where applicable.

12.1.8 Flame & Moth Historical Chip Sample Data

No historical chip data was available for the Flame & Moth deposit.

12.1.9 Verification of 2006 to 2012 Data by Alexco

Alexco maintains an SQL database of all Keno Hill silver district drill and sample data. Each property is assigned an identifier to extract property specific subsets from the master database. Until 2010, all data was entered or imported into the database via Datashed database management software, and subsequently via customized GeoSpark software. The data for individual properties is exported from the SQL database by scripted routine to comma separated values (CSV) files, which are imported into MineSight. The following drill hole files are generated: collar, survey, drill hole assay, chip sample assay, lithology, mineralization, structure and geotechnical. During the 2006 – 2012 drilling programs, Alexco personnel conducted routine visual verifications to ensure the reliability of the drilling data, including a 100% check of the collar and survey tables and a minimum 10% verification of the remaining exported tables. The process uncovered a low level of data entry errors, which were corrected.

The Alexco assay quality control procedures are outlined in Section 11.2. Three control samples (standard, blank, duplicate) were included in each 20-sample batch sent for assaying. During the 2006 – 2012 drill campaigns, Alexco used one of 16 standard reference material (SRM) purchased from WCM Sales Limited of Burnaby, British Columbia: eight polymetallic copper, lead, zinc, and silver reference materials (PB 111, PB 112, PB 113, PB 116, PB 129, PB 131, and PB 137) and eight silver reference materials (PM 1107, PM 1108, PM 1116, PM 1117, PM 1128, and PM 1133) for inclusion in each 20-sample batch (Table 12-2).

Table 12-2: Commercial Standard Reference Material Used by Alexco for the 2006 – 2012 Drilling Programs for the EKHSD project

SRM	Cu (%)	S.D.	Pb (%)	S.D.	Zn (%)	S.D.	Ag (gpt)	S.D.	Ag (oz/t)	S.D.	Au (gpt)	S.D.
PB111	0.69	0.01	2.12	0.04	0.45	0.02	195	6				
PB112	0.85	0.01	0.92	0.02	1.27	0.03	222	2				
PB113	0.47	0.01	1.11	0.02	1.40	0.05	22	1				
PB116	0.43	0.01	1.40	0.06	0.85	0.02	22	1				
PB129	0.28	0.01	1.24	0.02	2.00	0.06	23	1.7				
PB131	0.47	0.01	1.04	0.04	1.89	0.06	262	11				
PB137	0.21	0.01	2.62	0.09	2.69	0.115	111	2				
PB141	1.02	0.013	6.68	0.146	3.78	0.136	173	3				
PM1107							1194	34	34.8	1.0		
PM1108							658	10	19.2	0.3		
PM1116							769	23	22.4	0.7		
PM1117							386	16	11.3	0.5		
PM1123	0.31	0.0082					31	1.2851			1.42	0.046
PM1128							592	12	17.3	0.4		
PM1132							2287	54.334	66.69	1.5847		
PM1133							757	19	22.1	0.5		

In 2012, Alexco also started using a series of certified standard reference material developed from the Bellekeno deposit: polymetallic standards (Table 12-3), that were certified by Smee & Associates Consulting Ltd. (BK-C, BK-M, BK-S, BK-R and BK-W) that are now commercially available, and CDN Resource Laboratories Ltd. (ME-4, ME-5) that are used as internal lab standards at the Keno Hill silver district assay lab. These standards were tested internally before insertion into batches containing commercial SRMs.

Table 12-3: Standard Reference Material Used by Alexco during the 2012 Drilling Program for the Bellekeno mine

SRM	Pb (%)	S.D.	Zn (%)	S.D.	Ag (gpt)	S.D.	Ag (oz/t)	S.D.
BK-C	14.62	0.58	12.32	0.23	1162	23.5		
BK-M	14.02	0.63	7.85	0.20	971	19		
BK-R	36.19 (**Provisional**)	2.33	5.08	0.13	2224	47		
BK-S	12.47	0.38	13.17	0.41	1094	20		
BK-W	3.06	0.06	1.79	0.05	270	10		
ME-4	4.25	0.12	1.10	0.03	402	12.5		
ME-5	2.13	0.06	0.579	0.01	206.1	6.55		

Assay results for quality control samples were monitored on an ongoing basis during all drill programs (2006 to 2012). Each potential quality control failure was investigated and appropriate remedy action was taken, including the re-assaying of batches containing abnormal quality control samples. In some instances, the potential failures occurred in batches of samples outside potentially mineralized areas. In such cases no remedy actions were taken.

All mineralized chip samples collected concurrent with mining activities between 2011 and 2012 that were included in the Bellekeno mineral resource were sent to external laboratories for check assays. Duplicate pulps samples were made at the Alexco laboratory facility from coarse reject material and submitted for external assay checks. All standards submitted with the chip sample assaying returned within +/- 2 standard deviations of the mean. Duplicate pulp sample results suggest the silver, lead and zinc grades are reasonably reproducible.

The Bellekeno 2006 – 2012 analytical quality control data produced by Alexco is summarized in Table 12-4.

Table 12-4: Quality Control Data Produced by Alexco from 2006 to 2012 for Bellekeno

Quality Control Type	Count	Ratio
Core Samples	4,627	
Blanks	230	5.0% (1:20)
Standards	313	6.8% (1:15)
Duplicates	380	8.2% (1:12)
Chip Samples	2,078	
Blanks	21	1.0% (1:100)
Standard Reference Material	228	11.0% (1:9)
Coarse Reject Duplicate	109	5.2% (1:19)

The Lucky Queen 2006 to 2010 external analytical quality control data produced by Alexco is summarized in Table 12-5.

Table 12-5: Quality Control Data Produced by Alexco from 2006 to 2010 for Lucky Queen

Quality Control Type	Count	Ratio
Core Samples	3,144	
Blanks	185	1:17 (5.9%)
Standard Reference Material	183	1:17 (5.8%)
Coarse Reject Duplicate	186	1:17 (5.9%)

The Flame & Moth quality control data produced by Alexco is summarized in Table 12-6.

Table 12-6: Quality Control Data Produced by Alexco from 2010 to 2012 for Flame & Moth

Quality Control Type	Count	Ratio
Core Samples	3996	
Blanks	248	1:16 (6.2%)
Standard Reference Material	240	1:16 (6.0%)
Coarse Reject Duplicate	251	1:16 (6.3%)

All standards consistently returned values within ±2 standard deviations of the mean, with only occasional values falling outside this limit, but then within ±3 standard deviations of the mean.

Analysis of assays from coarse reject duplicate samples suggests that silver, lead, and zinc grades can be reasonably reproduced with no apparent bias.

12.2 Verifications by SRK

12.2.1 Site Visits

Dr. Gilles Arseneau and Chris Elliott of SRK carried out a visit to examine the Lucky Queen and Onek deposits. In total, SRK spent two and half days at the sites between July 26 and 28, 2010 examining drill core, core logging and sampling procedures; visiting drill sites; and examining the mineralization exposed in surface cuts. Alexco provided SRK with information related to these activities during the site visit.

12.2.2 Verifications of Analytical Quality Control Data for Lucky Queen

SRK reviewed and verified the Lucky Queen drill hole data and quality control assay data from 2006 to 2010 and found the data to be reliable for resource estimation purposes.

The 2006 to 2010 quality control data collected by Alexco was considered comprehensive and the assaying results delivered by ALS Chemex and AGAT Laboratory are considered reliable for the purpose of resource estimation.

SRK aggregated the assay results for the external quality control samples and duplicate assay pairs. Time series bias charts and assay pair precision plots were constructed for applicable elements. The charts are presented below in Figure 12-1 to Figure 12-3.

A total of 185 samples of unknown composition designated as blanks were submitted by Alexco during the drilling operations. Performance of the blank samples was reasonably good, with no systematic failures noted for silver, lead, or zinc. For gold assays, 6% of the submitted blanks returned a grade higher than 0.01 gpt.

A total of 183 commercial standard reference samples were submitted by Alexco during the drilling operations. All reference standards used by Alexco were purchased from WCM Minerals, Burnaby, British Columbia. Performance of the commercial standard reference samples was reasonably good, with only the analytical results for one standard (PM-1107) being consistently less than the average grade of the standard.

A total of 186 samples were analyzed as duplicates by Alexco. No significant discrepancies were noted between the original and duplicate analyses, and the correlation between samples is good (Figure 12-3).

Upon completion of the review, SRK considered that the analytical data produced by Alexco are sufficiently reliable to support mineral resource estimation.

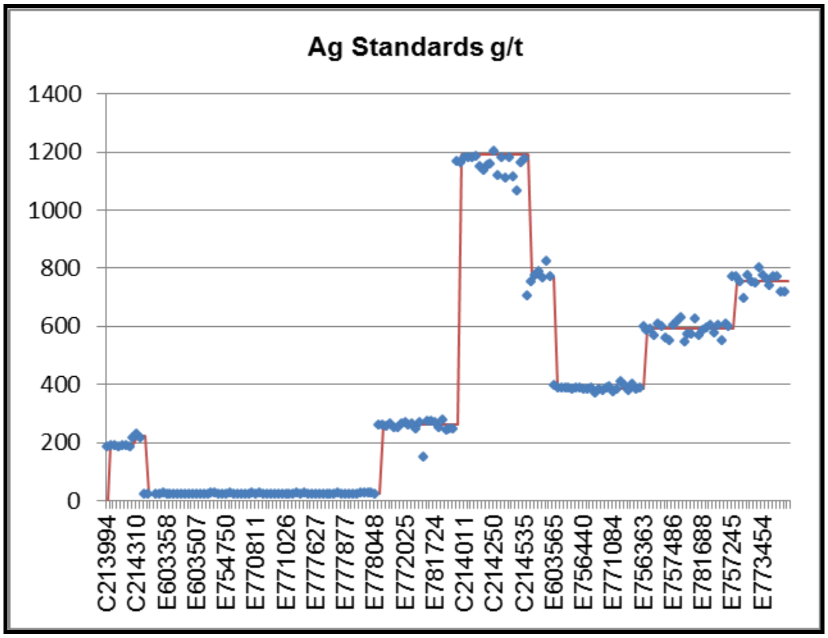


Figure 12-1: SRM Performance for Silver (SRK, 2011)

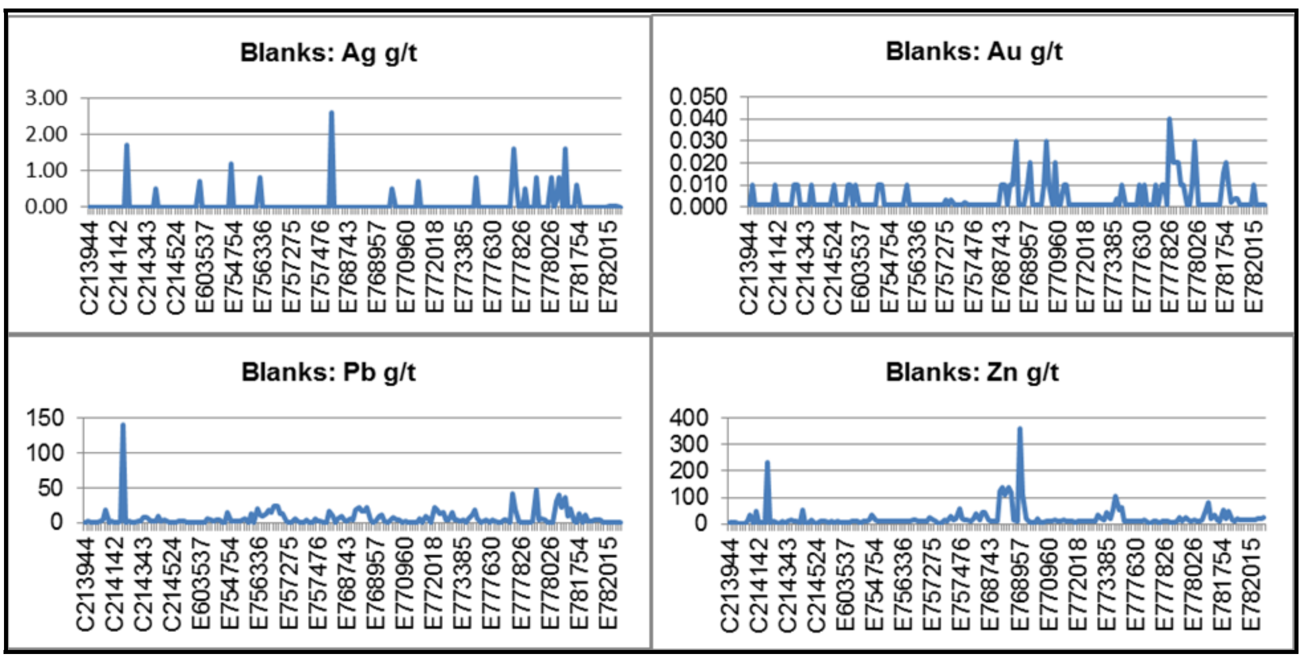


Figure 12-2: Blank Analytical Results Plotted Against Time (SRK, 2011)

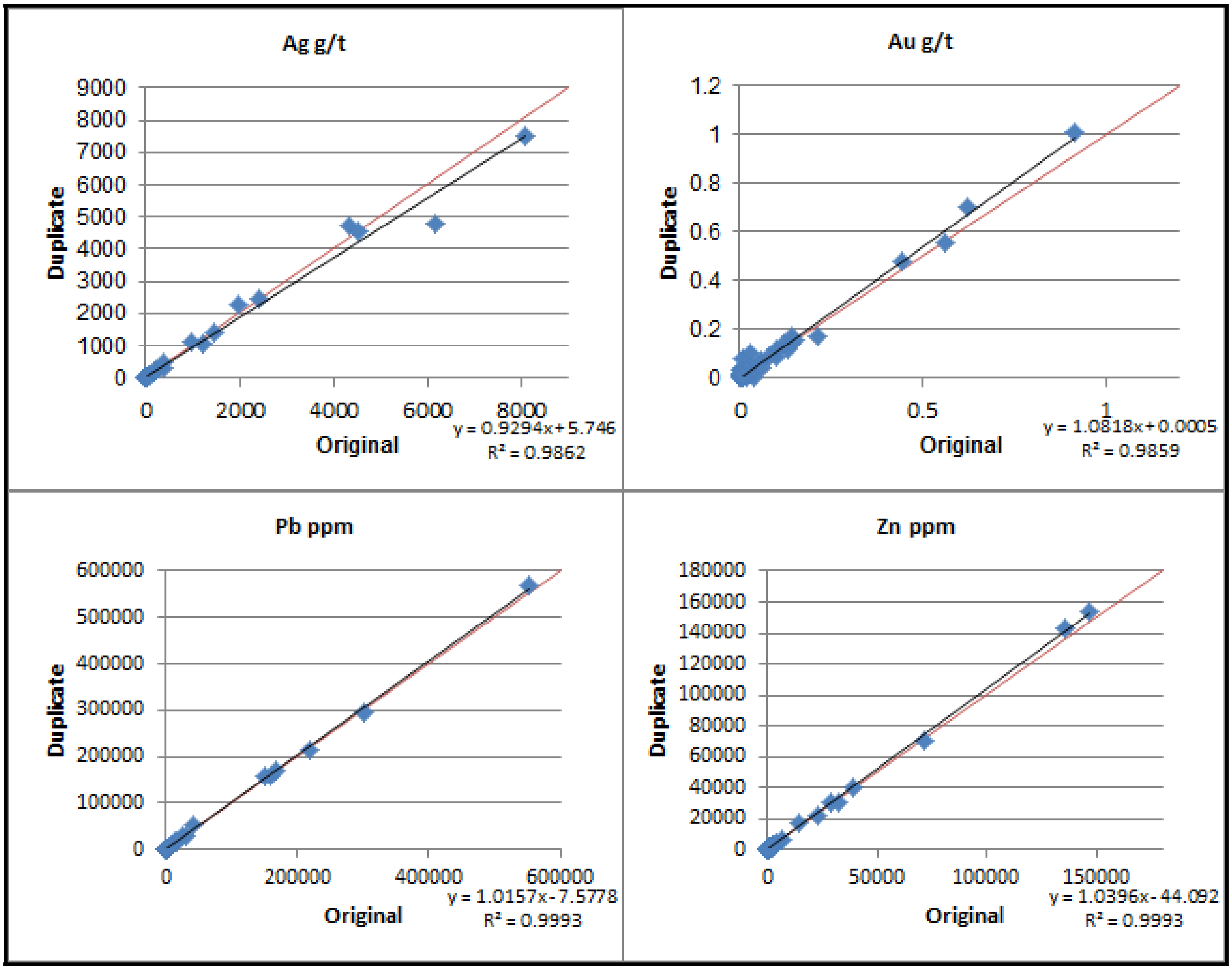


Figure 12-3: Duplicate Analyses Comparison (SRK, 2011)

13 Mineral Processing and Metallurgical Testing

13.1 Background

Metallurgical testwork has been conducted independently on each of the three deposits included in the production plan independently. The Bellekeno Development Plan reported by Wardrop in 2009 summarized the metallurgical program results at that time. Testwork performed from 1996 through 2009 was the basis for the design and construction of the mill facility in 2010. Alexco's Bellekeno silver-lead-zinc mine and mill complex achieved commercial production in January 2011, processing an average of 253 tpd in 2012. Since 2011, samples from Lucky Queen and Flame & Moth mineralization were tested to assess flotation performance only.

To date, no testwork has been conducted on a blended sample from any of the three deposits. The production schedule discussed in report Section 17 Recovery Methods indicates that significant blending of the different deposits is planned.

Historical testwork program reports are listed in report Section 27 References.

Table 13-1 summarizes the total tonnes, contribution by deposit, and average head grades for the life-of-mine (LoM) production plan incorporated in this PEA technical report.

Table 13-1: Summary of LoM Grades and Tonnes per Deposit

PEA LoM	Bellekeno	Lucky Queen	Flame & Moth	Total
Ore (kt)	86	129	593	807
Lead grade (%)	6.7	2.4	2.2	2.7
Zinc grade (%)	4.1	1.5	5.4	4.7
Gold grade (gpt)	-	0.1	0.5	0.4
Silver grade (gpt)	660	1,054	690	745
Total mass (%)	11	16	73	100

As shown in Table 13-1, the average head grades among the three deposits varies considerably. For example, compared to the lead grades currently being processed by the mill facility, the two new deposits have less than half the lead grade. Mill performance will be sensitive to the feed blend especially for zinc recovery. Lucky Queen material will lower the zinc grade leading to a decrease in zinc recovery.

At 73% of the total mill feed, Flame & Moth material will significantly impact the project economics, as it will represent a large portion of the mill feed blend from the last quarter of 2015 onwards. To date, only one composite sample has been tested with variable results and additional testing on the Flame & Moth mineralization is warranted.

13.2 Hardness Testwork

Three test programs included Bond rod work index, Ball work index and abrasion testwork for grindability on Bellekeno samples. The test results are summarized in Table 13-2. The hardness results are considered to be in the soft to medium-soft range with low variability.

No hardness testing has been completed on Lucky Queen or Flame & Moth samples.

Table 13-2: Grindability Test Results

Test Program	Deposit	Sample	Ball Mill (kWh/t)	Rod Mill (kWh/t)	Abrasion Index (g)
1996	Bellekeno	BK Comp	9.3 *		
2007	Bellekeno	Bellekeno Comp	9.5**		
2008/2009	Bellekeno	Master Comp		8.7	0.438
	Bellekeno	East Zone Comp	8.7**		
	Bellekeno	SW Zone Comp	9.0**		

* At closing screen size of 106 µm; ** at closing screen size of 150 µm

13.3 Mineralogy

Mineralogical investigations were included in the 2007 and 2008/2009 testwork programs. In 2007, SGS completed a QEMSCAN™ analysis on Bellekeno samples indicating galena and sphalerite as the principal lead and zinc minerals. Pyrite accounted for less than 4% of the mass and trace sulphide minerals included chalcopyrite, bornite, chalcocite, tetrahedrite, and arsenopyrite.

The 2008/2009 microscope examination confirmed galena and sphalerite as the main minerals for the Southwest zone composite. Proustite-pyrargyrite was identified as the only specific silver mineral found, and was present as small inclusions in galena. Tennantite-tetrahedrite and sphalerite may be additional silver carriers. Native gold was found as fine inclusions in chalcopyrite.

Both studies reported coarse texture with the 2007 data indicating liberation at a relatively coarse size. At an 80% passing (P80) grind size of 170 µm, 96% of the sphalerite and 95% of the galena particles analyzed were present as liberated phases.

No mineralogical work has been completed to date on Lucky Queen or Flame & Moth to confirm if the deposits share the same characteristics and liberation sizes as Bellekeno.

13.4 Flotation Testwork

All three deposits have been individually tested for flotation performance. The testwork program for Bellekeno was completed in 2009 and is detailed by Wardrop in their report (Wardrop, 2009). The Bellekeno program included an assessment of primary grind size, regrinding, reagent schemes, and variability on bench-scale, open cycle flotation test performance. The open cycle flotation tests included cleaning of lead and zinc concentrates. The Bellekeno flotation program also included bench-scale, locked cycle tests (LCTs), which were part of the 1996, 2007, and 2008/2009 test programs.

Primary grind size was investigated in the 2007 and 2008/2009 test programs. The results indicated rougher flotation performance was not sensitive to primary grind up to a P80 size of 174 µm.

The effect of regrinding on both lead-silver and zinc cleaner flotation was investigated in all three test programs. The effect of regrinding lead-silver rougher concentrate down to a P80 size of 15 µm was variable. Similarly, regrinding down to a P80 size of 65 µm in the 2007 test program showed a slight improvement in zinc concentrate grade.

The mill facility operated in 2012 with a target primary grind P80 size of 175 µm without regrinding of any flotation concentrates prior to cleaning. It should be noted that most of the testwork to date has been conducted at a finer primary grind size than is being achieved by the mill facility. However, an additional ball mill will be commissioned in Q1 2015 to increase the grinding circuit capacity to achieve the design throughput of 400 tpd. In addition, any effects observed in the testwork of regrinding flotation concentrates prior to cleaning cannot be applied to the current Bellekeno flowsheet. While the design criteria for the mill facility included a regrind circuit, it is not part of the current process flowsheet.

Since 2011, Lucky Queen and Flame & Moth samples have been tested at the Inspectorate laboratory in Vancouver, British Columbia (only raw datasheets were made available to SRK for review). The open cycle flotation tests included rougher and cleaning stages using a flowsheet similar to the current mill facility. Testwork results were provided but no formal reports were provided to SRK for review.

The details and results for the Bellekeno LCTs, as well as the Lucky Queen and Flame & Moth test results are discussed separately in the following sections.

13.4.1 Bellekeno Locked Cycle Testwork

Bench-scale LCTs were part of the test programs of 1996, 2007, and 2008/2009. The 1996 LCT was performed on a blended sample from the Bellekeno and Silver King deposits and is described in the 2009 Wardrop report. Table 13-3 below shows the measured head grades for the 2007 and 2008/2009 LCT samples.

Table 13-3: Head Grades for Bellekeno Locked Cycle Test Samples

Test Program	Sample	Test #	Head Assay		
			Lead (%)	Zinc (%)	Silver (gpt)
2007	Bellekeno Comp	LCT	12.2	11.6	1227
2008/2009	Master Comp	LCT 1	13.1	11.2	933
	Master Comp	LCT 2	13.8	10.5	964
	East Zone Comp	LCT 3	1.9	17	270

The flowsheet for the 2007 LCT is shown in Figure 13-1. The 2007 test was performed at a primary grind P80 size of 175 µm with regrind ahead of the lead cleaning circuit to a P80 size of 23 µm and zinc rougher concentrate regrinding to a P80 size of 83 µm.

The 2008/2009 test program included three LCTs. Two different flowsheets were tested on the Master composite and one test was completed with the East zone composite. Figure 13-2 illustrates the flowsheet for LCT 1 on the Master composite. LCT 1 was at a primary grind P80 size of 144 µm, with regrinding to a P80 size of 6 µm for lead cleaning and zinc rougher regrind to a P80 size of 26 µm. LCT 2 test had a simplified flowsheet, as illustrated in Figure 13-3. LCT 2 kept the same primary grind as LCT 1 without any regrind. The lead cleaner scavenger stage was also eliminated. LCT 3 followed LCT 2 procedure with a primary grind P80 size of 130 µm.

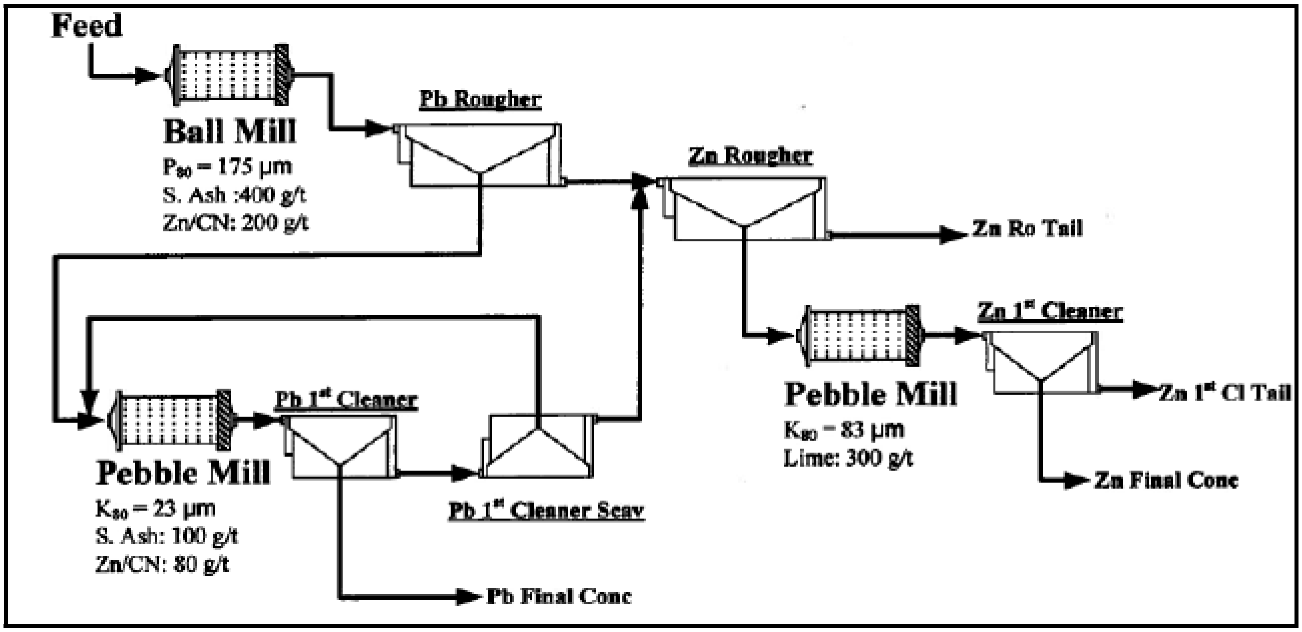


Figure 13-1: Bellekeno Locked Cycle Test Flowsheet for LCT (SGS, 2008)

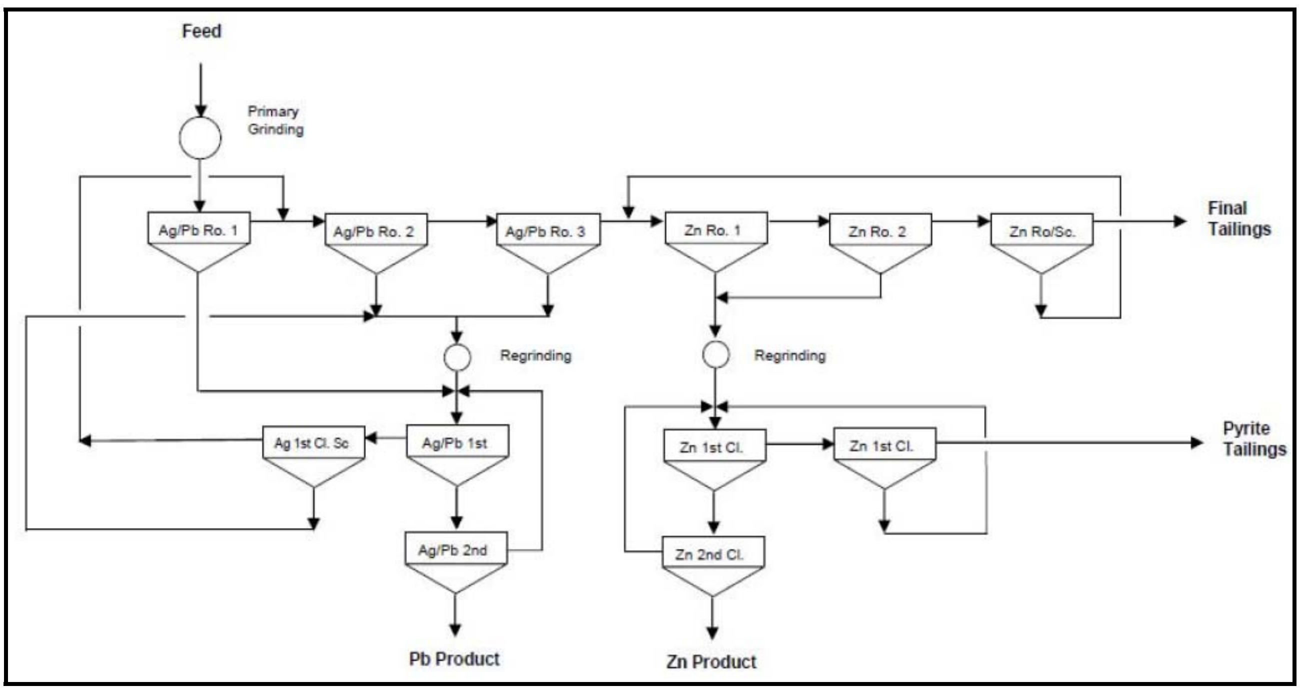


Figure 13-2: Bellekeno Flowsheet for LCT 1 (Inspectorate, 2009)

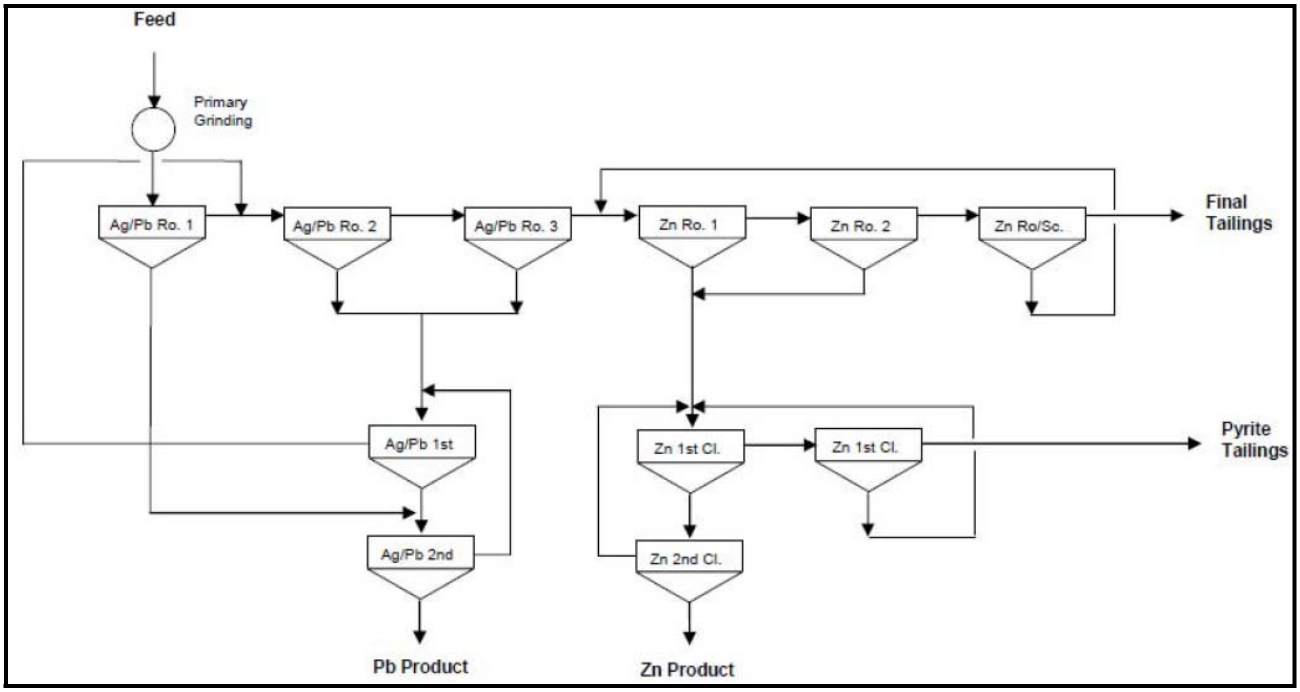


Figure 13-3: Bellekeno Flowsheet for LCT 2 and LCT 3 (Inspectorate, 2009)

Figure 13-4 shows the lead recovery and grade of lead concentrate against head grade. The Bellekeno Master composite responded well to all three flowsheets tested with an average lead recovery of about 95% at a concentrate grade of 72%. The East zone composite (with lower lead head grade) achieved 90% recovery at a lead concentrate grade of 53%.

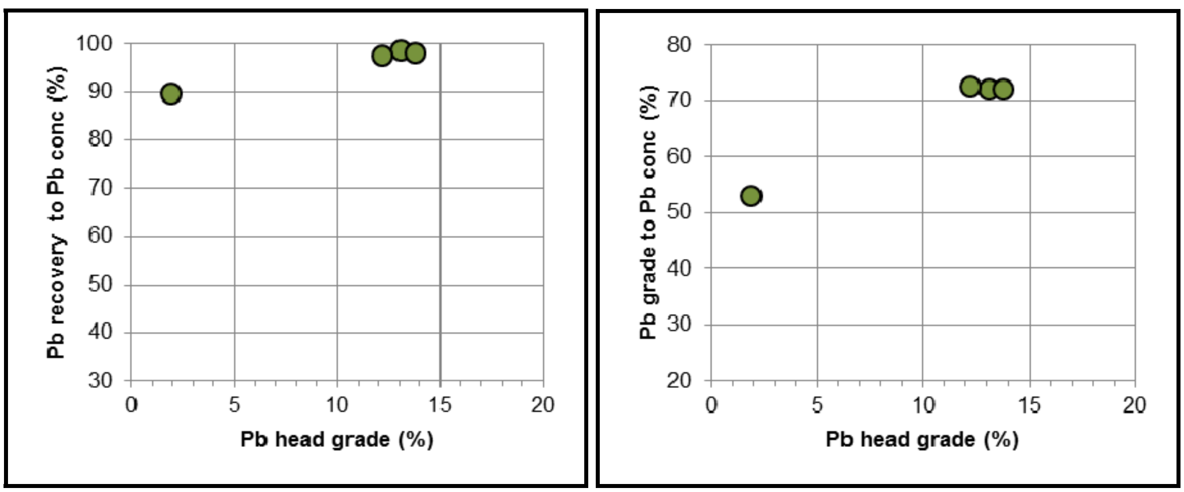


Figure 13-4: Bellekeno Lead Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

Figure 13-5 shows zinc recovery and zinc concentrate grades for the LCTs against head grade. The zinc recovery for all the 2008/2009 tests were above 92% with concentrate grade between 53% and 61% zinc. The 2007 LCT reached 72% recovery at a concentrate grade of 56% zinc. LCT 3 achieved the best zinc recovery at 98% with a concentrate grade of 59% zinc.

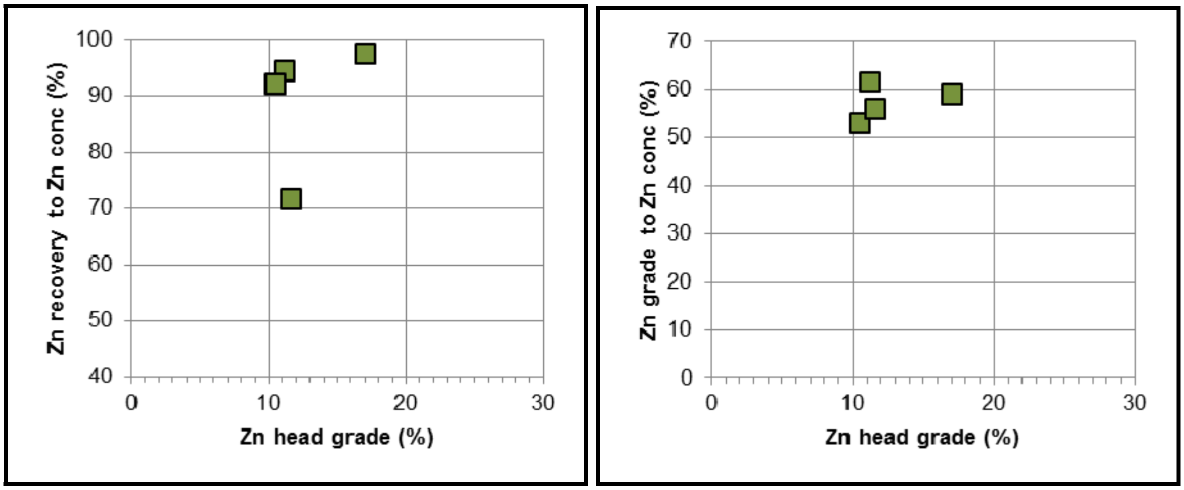


Figure 13-5: Bellekeno Zinc Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

Figure 13-6 shows silver recovery to lead concentrate and the silver grades of the lead concentrate against head grade. The 2007 LCT silver recovery to lead concentrate was 78% at a concentrate grade just below 6,000 gpt. The metallurgical performance of the Master composite for silver recoveries and grades to lead concentrate for the 2008/2009 tests was not affected by changes in the test flowsheet.

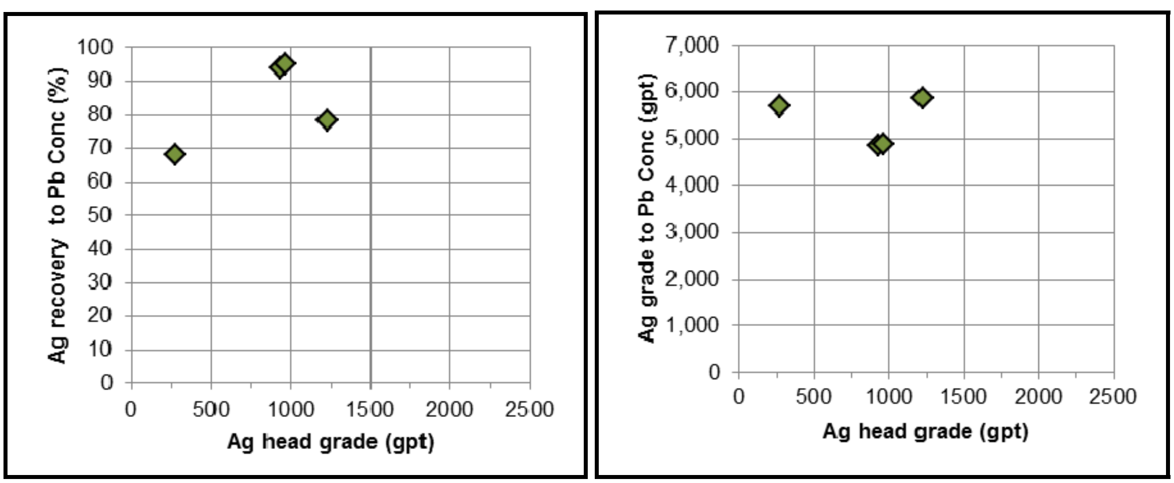


Figure 13-6: Bellekeno Silver Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

13.4.2 Lucky Queen Testwork

In 2011, two samples from the Lucky Queen mineralization were tested. Grinding conditions were kept constant and the flotation tests were performed following the standard mill facility procedure with the aim of recreating the mill facility flowsheet.

Flotation performance was assessed on open circuit, bench-scale testwork, not locked cycle testing as described above for Bellekeno. Flotation was performed at an average P80 size of 83 µm without regrinding of rougher concentrates. Lucky Queen samples were also tested under optimized conditions for increased zinc recovery. Table 13-4 shows the calculated head grades for the Lucky Queen samples.

Table 13-4: Head Grades for Lucky Queen Test Samples

Test - Sample	Calc Head Assay		
	Lead (%)	Zinc (%)	Silver (gpt)
F9 - LQ Global comp (opt)	4.5	3.4	2,322
F10 - LQ HG comp (opt)	9.7	4.8	4,965

The grind sizes reported in the flotation program were finer than the mill facility design criteria of P80 size of 175 µm. The Lucky Queen test average primary P80 size was 83 µm and testwork did not include regrinding. The testwork results showed that a finer primary grind could increase flotation selectivity, resulting in higher recoveries and concentrate grades.

Figure 13-7 shows lead recovery and lead concentrate grade and Figure 13-8 shows the silver grade and recovery to lead concentrate against head grade. Silver recovery to lead concentrate averaged 89%, while lead recoveries to lead concentrate averaged 91%. Lead concentrate grade was 68% lead and 34,000 gpt silver.

Figure 13-9 shows zinc recoveries and concentrate grades for the Lucky Queen testwork against head grade. The zinc recovery was 73% at a concentrate grade of 59% zinc.

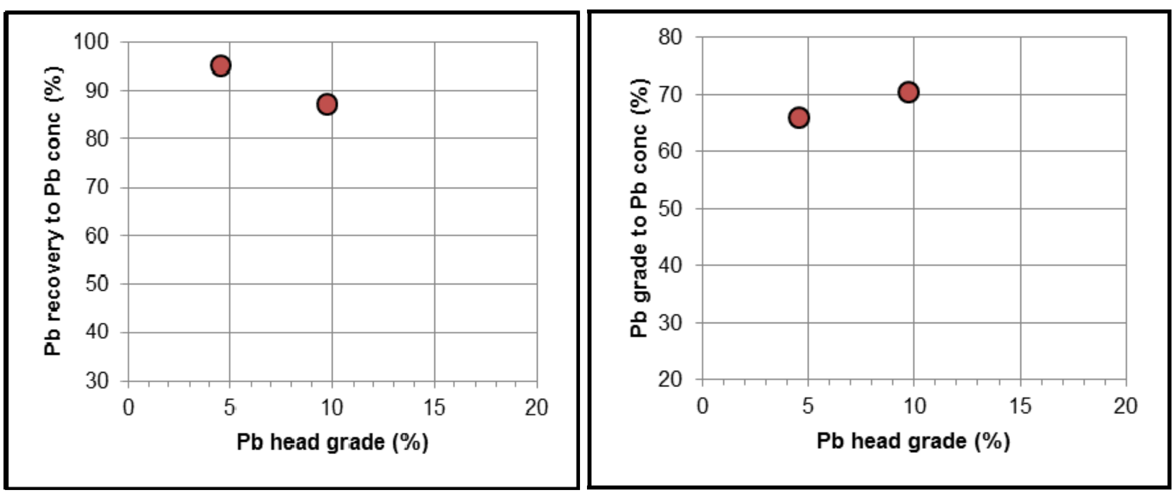


Figure 13-7: Lucky Queen Lead Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

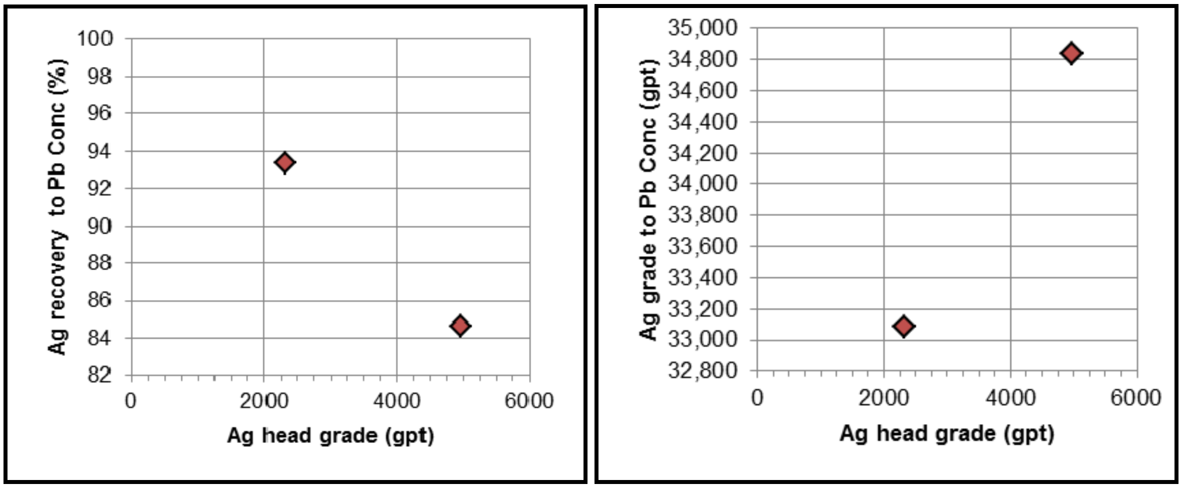


Figure 13-8: Lucky Queen Silver Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

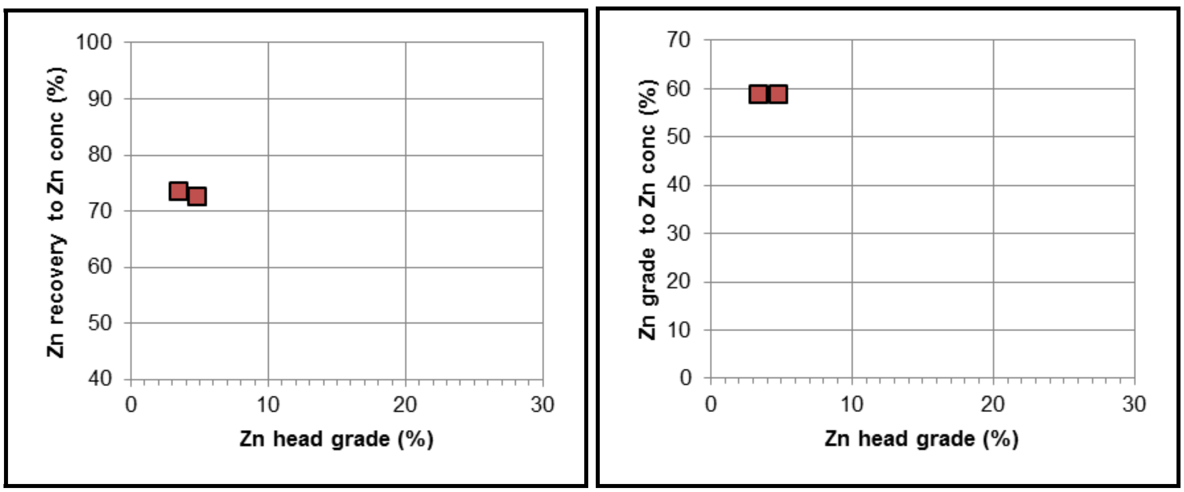


Figure 13-9: Lucky Queen Zinc Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

13.4.3 Flame & Moth Testwork

In 2013, one composite sample from the Flame & Moth mineralization was tested at the Inspectorate laboratory in Vancouver, British Columbia (only raw datasheets were made available to SRK for review). Test procedures were initially the same as the Lucky Queen program, however, changes were made to improve zinc recovery and concentrate grade for subsequent tests. The grinding time was kept constant for all tests and the average P80 grind size was 115 µm.

Table 13-5 shows the calculated head grades for the Flame & Moth samples.

Table 13-5: Head Grades for Flame & Moth Test Samples

Test – Samples Flame & Moth	Calc Head Assay		
	Lead (%)	Zinc (%)	Silver (gpt)
F4 - master comp	2.2	7.2	593
F5 - master comp	2.3	5.9	613
F6 - master comp (regrind)	2.2	7.2	609

Flame & Moth tests F4 and F5 followed the same procedure as the Lucky Queen optimized tests. Test F6 included regrinding of the zinc rougher concentrate. The regrinding of rougher concentrates was to a P80 size of 72 µm and tests F5 and F6 had an additional zinc cleaning stage at a higher pH of 12.

Figure 13-10 shows lead grade and recovery to lead concentrate for the Flame & Moth test F4, while Figure 13-11 shows silver grade and recovery to lead concentrate. As the values achieved for lead concentrate were considered satisfactory, no further lead cleaning tests were performed on the Flame & Moth sample.

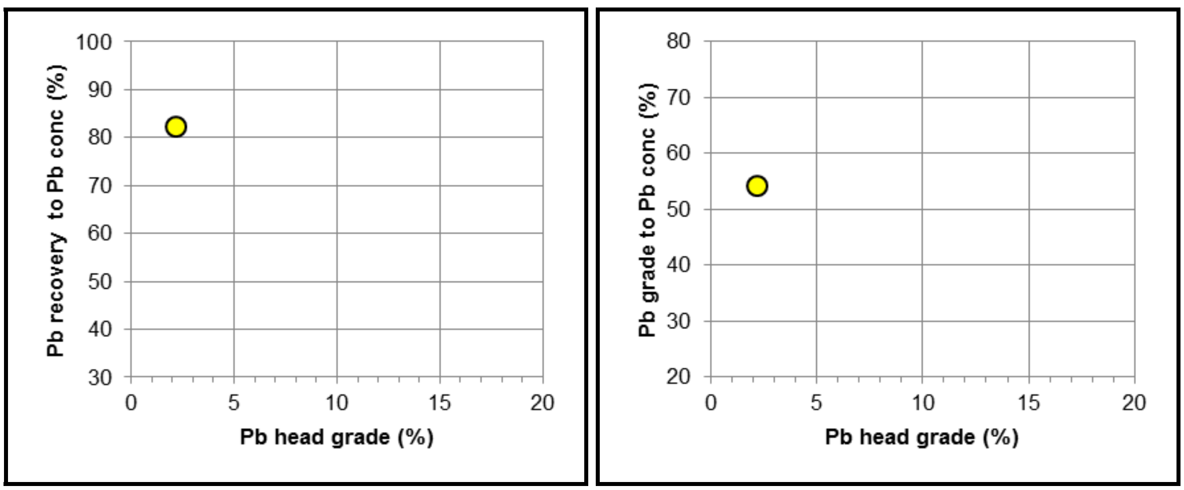


Figure 13-10: Flame & Moth Lead Recovery and Concentrate Grade vs. Head Grade (Test F4) (SRK, 2013)

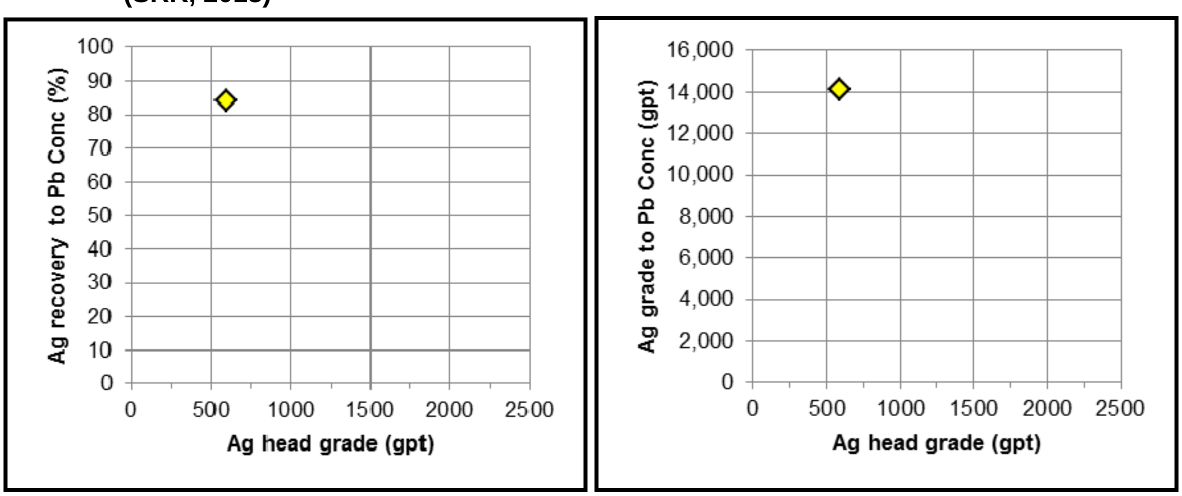
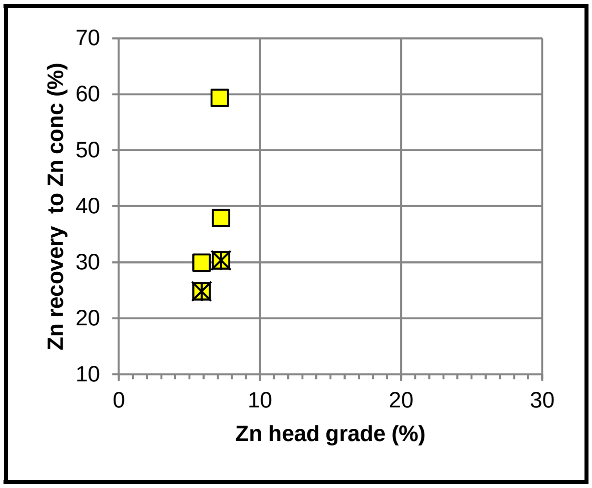


Figure 13-11: Flame & Moth Silver Recovery and Concentrate Grade vs. Head Grade (Test F4) (SRK, 2013)

Figure 13-12 shows zinc recoveries and concentrate grades for the Flame & Moth testwork. Test F4 achieved the best zinc recovery of 59% at a concentrate grade of only 24% zinc. Regrinding improved the zinc recovery from 30% to 38% and concentrate grade from 23% to 46% zinc. Test F5 and F6 were conducted with an additional cleaning stage and the results are marked in Figure 13-12 with an asterisk. The additional cleaning stage on test F6 improved concentrate grade to about 54% zinc at only 30% zinc recovery. These results suggest that Flame & Moth material could be sensitive to regrinding and zinc cleaning capacity in terms of zinc recovery and final concentrate grade.

Based on the variability and, in general, poor response of the Flame & Moth composite sample, additional testwork is warranted to determine the effect of regrinding on zinc performance.



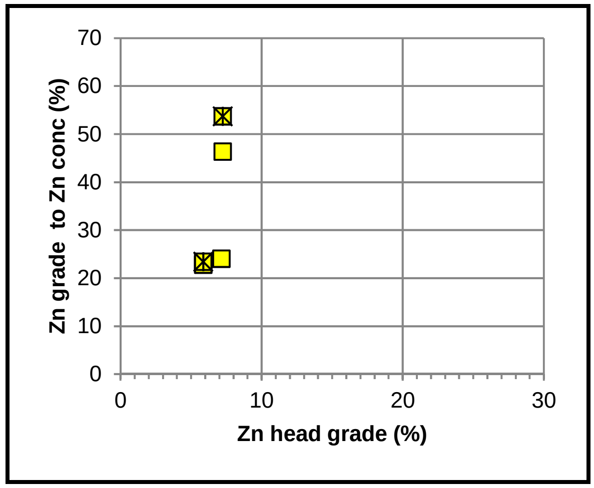


Figure 13-12: Flame & Moth Zinc Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

* Icons marked with an asterisk had one additional cleaning stage

13.4.4 Comparison of Deposits

Figure 13-13 shows lead recovery and lead concentrate grade against head grade for all three testwork programs. When looking at the full data set, all deposits show a similar flotation response considering the differences in head grade. Variations in performance are also expected due to differences in test conditions as well as different grind sizes.

Figure 13-14 shows silver grade and recovery to lead concentrate against head grade for all three deposits. The left graphs of Figure 13-13 and Figure 13-14 show a very similar non-linear relationship for lead and silver recovery to lead concentrate, as recovery increases with head grade. A strong relationship with good continuity can be observed between lead grade in concentrate versus head grade in Figure 13-13.

Figure 13-15 shows the zinc recovery and concentrate grade relationships against zinc head grade for all three deposits. Although good continuity can be observed in zinc performance, a wider variability in the results is expected due to variations in test procedures to optimize zinc recovery.

The results to date for Flame & Moth indicate the potential for low zinc recovery; particularly with the existing mill facility flowsheet.

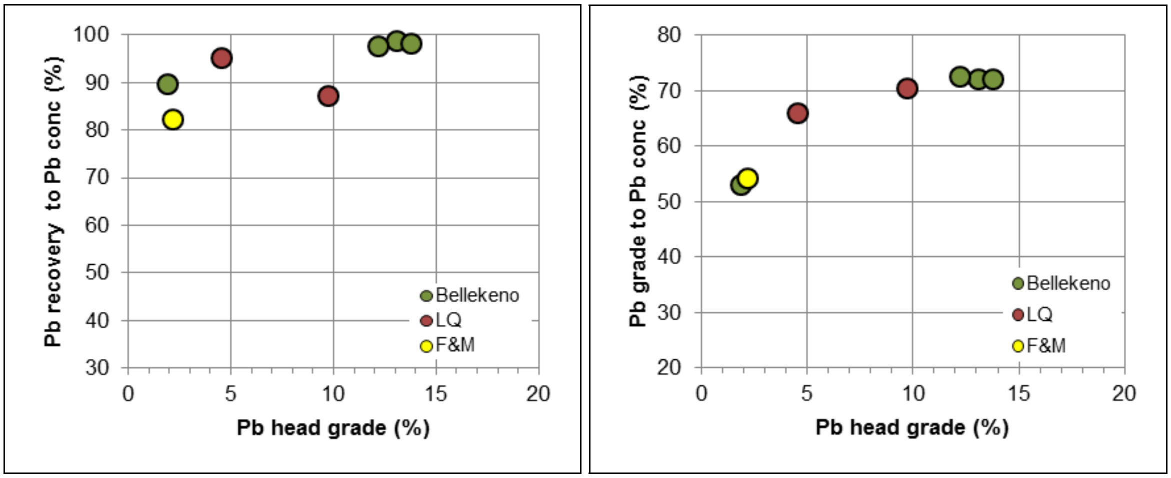


Figure 13-13: All Deposits – Lead Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

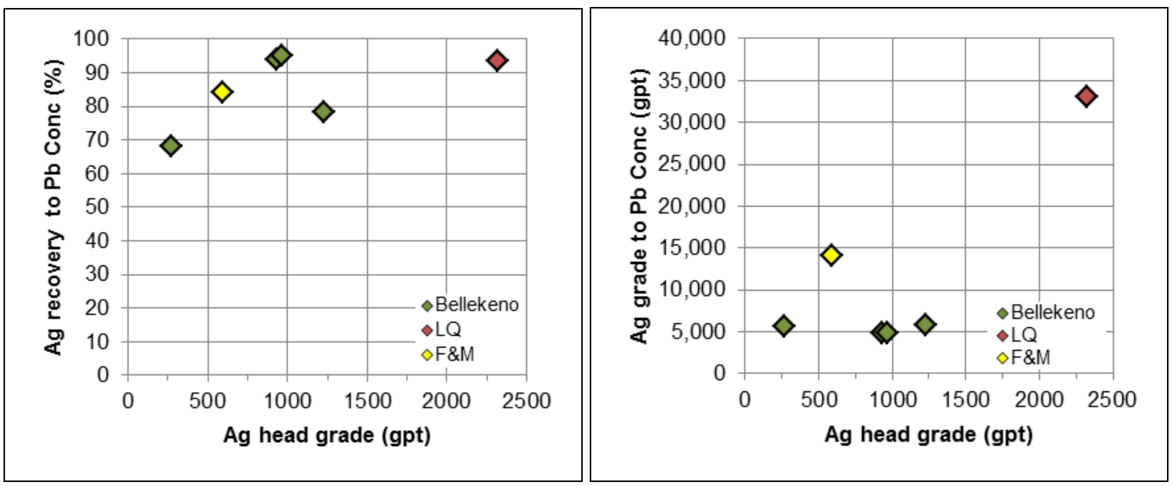


Figure 13-14: All Deposits – Silver Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

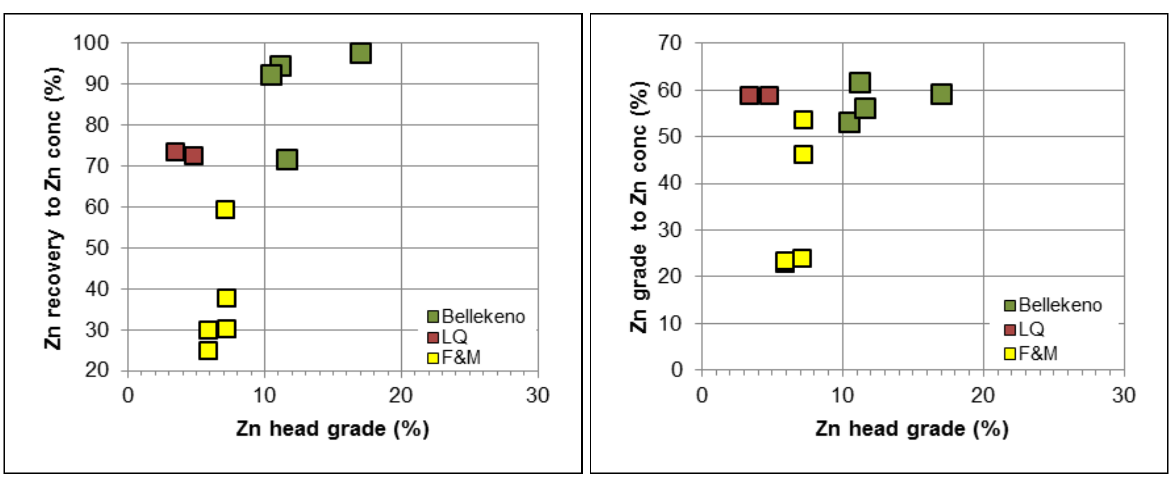


Figure 13-15: All Deposits – Zinc Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

As all three deposits appear to follow similar relationships between concentrate grade and recovery versus head grade, this suggests similar mineralogy but at significantly different grades. Mineralogical investigations should be conducted on the two new deposits to confirm this assumption. In particular, the liberation of the lead and zinc minerals at the design grind P80 size of 174 µm for the mill facility. The data presented in Figure 13-13 through Figure 13-15 were used to generate preliminary recovery estimates for the blended feed conditions expected in the PEA production plan (refer to report Section 17).

Testwork results indicated that a primary grind size finer than that currently achieved by the mill facility could increase flotation selectivity, resulting in higher recoveries and concentrate grades. The test results reported by Inspectorate may not be achievable in the mill facility without a finer primary grind size and possibly the inclusion of regrinding ahead of flotation cleaning to a final concentrate.

13.5 Miscellaneous Testwork

The 2008/2009 test program included a series of miscellaneous tests and the results are presented in greater detail in the Wardrop report.

Settling tests were performed on samples of both Bellekeno concentrates and tailings. Two flocculants were tested and an average unit thickener area of 0.02 square metres (m^2)/t/d was identified for the mill design criteria. Filtration tests were also performed on samples of lead-silver and zinc concentrates without any issues reported.

Whole rock assay and inductively coupled plasma analysis were performed on bulk tailings samples with the main components identified as being silicon and iron. The tailings water was also assayed by inductively coupled plasma scan. Acid base accounting tests were performed on low and high sulphide tailings samples to determine their acid generating potential. In the mill facility flowsheet design described in report Section 17, the circuit generates both a high pyrite and low pyrite tailings stream for separate impoundment.

13.6 Recommendations for Further Testwork

The current PEA study assumes the mill facility production will increase to a nominal rate of 400 tpd once the additional ball mill is commissioned in Q1 2015 and production from Flame & Moth comes on line.

The LoM plan is generally based on the mill processing a variable blend of two deposits at a time, first a Bellekeno and Flame & Moth blend, and later a blend of Lucky Queen and Flame & Moth. Flame & Moth represents 73% of the total plant feed.

To date, testwork has only been conducted on samples from individual deposits with no blends being tested to better predict mill performance over the production plan. Future testing should include samples of different blends with head grades within the planned range to properly assess flotation performance and concentrate qualities. Mineralogical studies are recommended to verify the assumed similar mineralogy among all deposits.

Variability in feed hardness has been reported by mill personnel and fluctuations in mill throughput were observed in the plant production data for 2012, possibly due to hardness. If core samples become available, hardness testwork should be performed to improve confidence in mill throughput forecasting.

Further optimization work is necessary for the Flame & Moth zinc flotation, as recoveries were low and zinc concentrate grades below 45% zinc will incur lower payables.

Mineralogical studies should be conducted on the Lucky Queen and Flame & Moth deposits to confirm their similarity to Bellekeno. In particular, liberation of the lead and zinc minerals at the current design grind size of the mill facility.

Testing of additional samples for settling and geochemical characteristics is also warranted.

14 Mineral Resource Estimates

14.1 Introduction

This section describes the assumptions and methodologies used to prepare the mineral resource estimates for the three deposits included in this PEA technical report:

- Bellekeno deposit;
- Lucky Queen deposit;
- Flame & Moth deposit.

The mineral resources have been estimated in conformity with the generally accepted CIM *Estimation of Mineral Resources and Mineral Reserves Best Practices Guidelines* (CIM, 2003) and are reported in accordance with the Canadian Securities Administrators' National Instrument 43-101. Mineral resources are not mineral reserves and have not demonstrated economic viability. There is no certainty that all or any part of the mineral resource will be converted into mineral reserve.

In the opinion of SRK, the resource evaluations reported herein are a reasonable representation of the global polymetallic mineral resources in the Bellekeno and Lucky Queen mines and the Flame & Moth deposit given the current level of sampling.

The updated Bellekeno Mineral Resource Statement presented herein represents the third mineral resource evaluation prepared for the Bellekeno deposit in accordance with the Canadian Securities Administrators' National Instrument 43-101. The mineral resource model was prepared by Alexco personnel under the supervision of a third party consulting geologist and considers 405 core drill holes drilled by Alexco during the period of 2006 to 2012 as well as historical drilling and chip sampling data collection during production undertaken both historically and by Alexco. The resource estimation work was completed by David Farrow, PGeo, of GeoStrat Consulting Services Inc, a QP as defined in National Instrument 43-101.

The updated resource model for the Bellekeno mine was reviewed by Dr. Gilles Arseneau, PGeo, of SRK and found to be completed to a standard acceptable to SRK and in accordance with the Canadian Securities Administrators' National Instrument 43-101

The mineral resource model for the Lucky Queen deposit was prepared by SRK and published in an independent technical report on September 8, 2011. The author of the report was Dr. Arseneau. The report is entitled "Technical Report on the Lucky Queen Deposit, Lucky Queen Property, Keno Hill District, Yukon."

The mineral resource model for the Flame & Moth deposit was prepared by David Farrow, PGeo, GeoStrat Consulting Services Inc, and published in an independent technical report entitled "Updated Technical Report on the Flame & Moth Deposit, Flame & Moth Property, Keno Hill District, Yukon" on March 15, 2013.

The databases used to estimate the Bellekeno mine updated mineral resource and the Flame & Moth updated mineral resource were audited by SRK. SRK is of the opinion that the current drilling information is sufficiently reliable to interpret with confidence the boundaries for the polymetallic mineralization and that the assay data are sufficiently reliable to support mineral resource estimation.

Mintec's MineSight software was used to construct the geological solids for Bellekeno, Lucky Queen and Flame & Moth. The Lucky Queen mineral resource database was imported into GEMS format Access databases for geostatistical analysis, block model construction, metal grades estimates, and the tabulation of the mineral resources. Isatis was used for geostatistical analysis and variography, block model construction, estimating metal grades, and mineral resource tabulation for Bellekeno and Flame & Moth.

14.2 Resource Estimation Procedures

The resource evaluation methodology for the three deposits employed the following procedures:

- Database compilation and verification;
- Construction of wireframe models for the boundaries of the polymetallic mineralization;
- Definition of resource domains;
- Estimation of specific gravity;
- Data conditioning (compositing and capping) for geostatistical analysis and variography;
- Block modelling and grade interpolation;
- Resource classification and validation;
- Assessment of "reasonable prospects for economic extraction" and selection of appropriate cut-off grades;
- Preparation of the Mineral Resource Statement.

14.3 Resource Database

14.3.1 Database for the Bellekeno Mine

The Bellekeno database comprises a cumulative database from all sampling campaigns undertaken on the deposit. These data include recent exploration drilling, from both surface and underground, and underground face (chip) samples, both recent and historical. Summary of the data available is shown in Table 14-1. Samples from within the defined geological solids were used in the resource estimation and are summarized in Table 14-2.

Table 14-1: Bellekeno Deposit Sample Database

Sample Type	Count	Number of Samples	Length (m)
Chip	1,666	5,232	4,226.9
Core (Surface)	65	8,541	15,273.9
Core (Underground)	348	7,645	12,003.6
Total	2,079	21,418	31,504.4

Table 14-2: Bellekeno Deposit Samples Used for Mineral Resource Estimation

Sample Type	Count	Number of Samples	Length (m)
Chip	1,064	2,617	2,006.7
Core (Surface)	37	156	135.0
Core (Underground)	183	776	649.9
Total	1,284	3,549	2,791.6

The mineral resource database was imported into a ISATIS database, and validated by checking for inconsistencies in naming conventions, analytical units, duplicate entries, length, distance values, or sample intervals less than or equal to zero, blank or zero-value assays, out-of-sequence intervals, intervals or distances greater than the reported drill hole length, inappropriate collar locations, and missing interval and coordinate fields. A few minor inconsistencies were noted and corrected. No other significant validation errors were noted in the supplied database.

14.3.2 Database for the Lucky Queen Mine

The Lucky Queen data were exported from the SQL database by scripted routine to CSV files, which were imported into MineSight. The following drill hole files were generated: collar, survey, drill hole assay, chip sample assay, geology, and geotechnical.

The Lucky Queen database comprises descriptive information and assay values both from historical underground sampling and from exploration drilling carried out by Alexco from 2006 through 2010. The database was provided to SRK as an Excel format spreadsheet and contains a total of 558 records encompassing 47 core drill holes and 511 historical underground channel samples (Table 14-3). From the drilling results, Alexco has identified a total of 106 core drill hole intervals as primary vein intercepts and 26 intervals as secondary splay intercepts, based on a combination of geological logging and assay grades.

Table 14-3: Lucky Queen Deposit Sample Database

Type	Count	Ag (gpt)	Au (gpt)	Pb (ppm)	Zn (ppm)	Vein Width (m)
Historical Chip	511	2,175	NA	50,661	39,216	1.20
Alexco Core Vein	106	1,426	0.19	36,523	21,222	0.67
Alexco Core Splays	26	1,128	0.06	18,340	6,905	0.78
Alexco Core other	3,012	3.6	0.02	322	378	1.84

The mineral resource database was imported into a GEMS format Access database and validated by checking for:

- Inconsistencies in naming conventions or analytical units;
- Duplicate entries;
- Overlapping intervals;
- Length or distance values less than or equal to zero;
- Blank or zero-value assay results;
- Out-of-sequence intervals;
- Intervals or distances greater than the reported drill hole length;
- Inappropriate collar locations;
- Missing interval and coordinate fields.

Two trivial terminal interval survey distances were noted and corrected; no other significant validation errors were noted in the supplied database. Assay intervals marked as below detection limit were assigned a nominal grade of 0.001 parts per million (ppm) prior to importing into GEMS.

14.3.3 Database for the Flame & Moth Deposit

The Flame & Moth drill hole database comprises descriptive information and assay values from exploration drilling carried out by Alexco from 2010 through 2012. The database was provided to GeoStrat as an Excel format spreadsheet and contains 104 core drill holes (Table 14-4) drilled in the Flame & Moth area, of which 89 were used in the geological modelling in the resource area with 84 intercepts used in the resource estimation (Table 14-5).

Table 14-4: Flame & Moth Deposit Sample Database

Drill Hole Type	Drill Hole		Number of
	Number	Length (m)	Samples
Core	104	23,521	4,857

Table 14-5: Flame & Moth Deposit Core Drill Hole Vein Intercepts

Vein	Drill Hole		Number of
	Number	Length (m)	Samples
Flame Vein - Christal Zone	26	124	178
Flame Vein - Lightning Zone 1	46	208	337
Flame Vein - Lightning Zone 2	12	25	63
Total	**84**	**578**	**367**

The mineral resource database was imported into ISATIS, and validated by checking for inconsistencies in naming conventions, analytical units, duplicate entries, length, distance values, or sample intervals less than or equal to zero, blank or zero-value assays, out-of-sequence intervals, intervals or distances greater than the reported drill hole length, inappropriate collar locations, and missing interval and coordinate fields. A few minor inconsistencies were noted and corrected by Alexco. No other significant validation errors were noted in the supplied database. Assay intervals marked as below detection limit were assigned nominal grades as per Table 14-6 prior to importing into ISATIS.

Table 14-6: Values Assigned to Flame & Moth Sample Assays below Detection Limit

Metal	Detection Limit	Assigned Value
Au ppm	-0.002	0.001
Au ppm	-0.01	0.005
Ag ppm	-0.5	0.25
Pb ppm	-2.00	1.00
Pb ppm	-1.00	0.5

14.4 Solid Body Modelling

3D wireframe solids were constructed by Alexco to accurately represent the geometry of the Bellekeno mine, Lucky Queen and Flame & Moth vein structures. These wireframes were reviewed and validated by SRK before mineral resource estimation.

14.4.1 Solid Body Modelling for the Bellekeno Mine

Wireframes were constructed for three portions of the Bellekeno deposit: the Southwest (SW) vein and splay, 99 vein and splay, and the East vein and splay (Figure 14-1). The wireframes were constructed using Mintec's MineSight 3D software. All points of construction on the veins are from Alexco's core drilling and mapping of underground exposure during mining. Individual points were constructed on the hangingwall and footwall of each drill hole vein/structure intercept. These points were chosen based on the fault/vein structure where, in most cases, the hangingwall and footwall contacts were clear and the mineralization was contained within a well-defined structure.

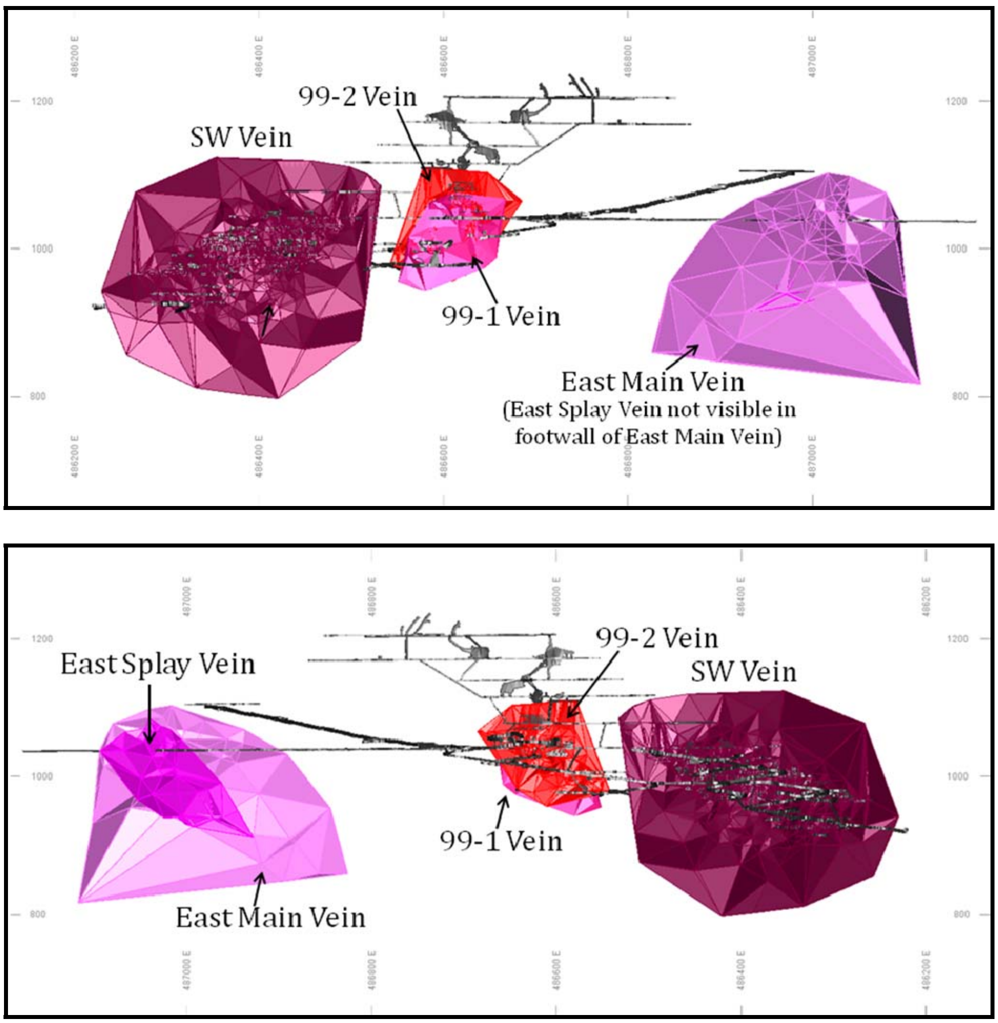


Figure 14-1: Bellekeno Mine Long Section, Wireframes, Looking North-Northwest (top) and Looking South-Southeast (bottom) (Alexco, 2013)

14.4.2 Solid Body Modelling for the Lucky Queen Mine

At Lucky Queen, the majority of high-grade, silver-bearing vein material is confined between relatively intact rock of the hangingwall and footwall and is manifested as vein mineral and highly deformed fault rock (in varying proportions). High silver values are only rarely found outside the main structure as stringer zones or splays. Coincidence of high grade mineralization within identifiable structural limits made it sensible to base the wireframe interpretation on structural and geological controls, and contacts were chosen accordingly. In addition to Alexco drill hole data, historical drill hole data and geological mapping conducted by UKHM were used to constrain the geometry of the main Lucky Queen structure and associated splay structures, where applicable.

Historical drift and stope mapping is considered by Alexco to be accurate and representative. Field verification of the mapping could not be performed by Alexco geologists because the underground workings are inaccessible. However, historical maps of other mines in the Keno Hill silver district have been verified and found to be generally accurate in their representation of the geology. Historical maps were scanned, geo-referenced, and imported into MineSight. The images were then draped onto drift solids at the appropriate elevation. This mapping was used to tag hangingwall and footwall contacts on the wireframe.

The main Lucky Queen mineralized body occupies a central part of the primary wireframe and the most important constraints delineating it are the lower grade drill intercepts that occupy locations above, below, and to the northeast. Beyond these drill holes, the wireframe is cut off (approximately) along the deepest extents of the 200 and 300 level historic workings. Fault 3 and 5 cut off the wireframe to the northeast and at shallow elevations, respectively. The earlier Lucky Queen workings include extensive stoping. As a result, it was decided to exclude the entire area containing the 50, 100, 200 and 300 level workings from the wireframe solid. Those areas of the 500 level workings that intersect the wireframes were also removed from the wireframe solid (Figure 14-2).

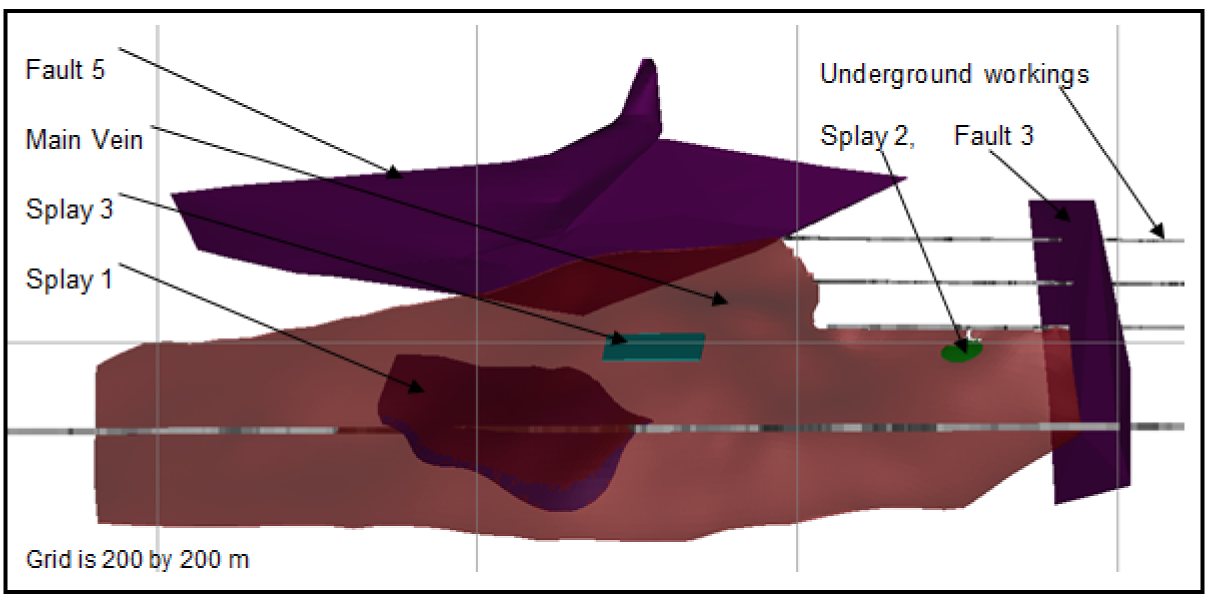


Figure 14-2: Section of Lucky Queen Wireframes Looking Northwest (SRK, 2011)

14.4.3 Solid Body Modelling for the Flame & Moth Deposit

Wireframes were constructed for two portions of the Flame vein offset along the Mill fault in the geology model for the Flame & Moth prospect. The Flame vein in the hangingwall of the Mill fault was termed the Lightning zone while the portion in the footwall of the Mill fault was termed the Christal zone (Figure 14-3).

GeoStrat reviewed and validated the wireframes and concluded that the wireframes of the Flame & Moth deposit are a fair representations of the mineralized veins. The wireframes were constructed using MineSight software. All points of construction on the Flame vein are from Alexco's core drilling. Individual points were constructed on the hangingwall and footwall of each drill hole vein/structure intercept. These points were chosen based on the fault/vein structure where in most cases, the hangingwall and footwall contacts are clear and the mineralization is contained within a well-defined structure. The Flame vein strikes between 025° and 027° and dips between 62° and 66° to the southeast.

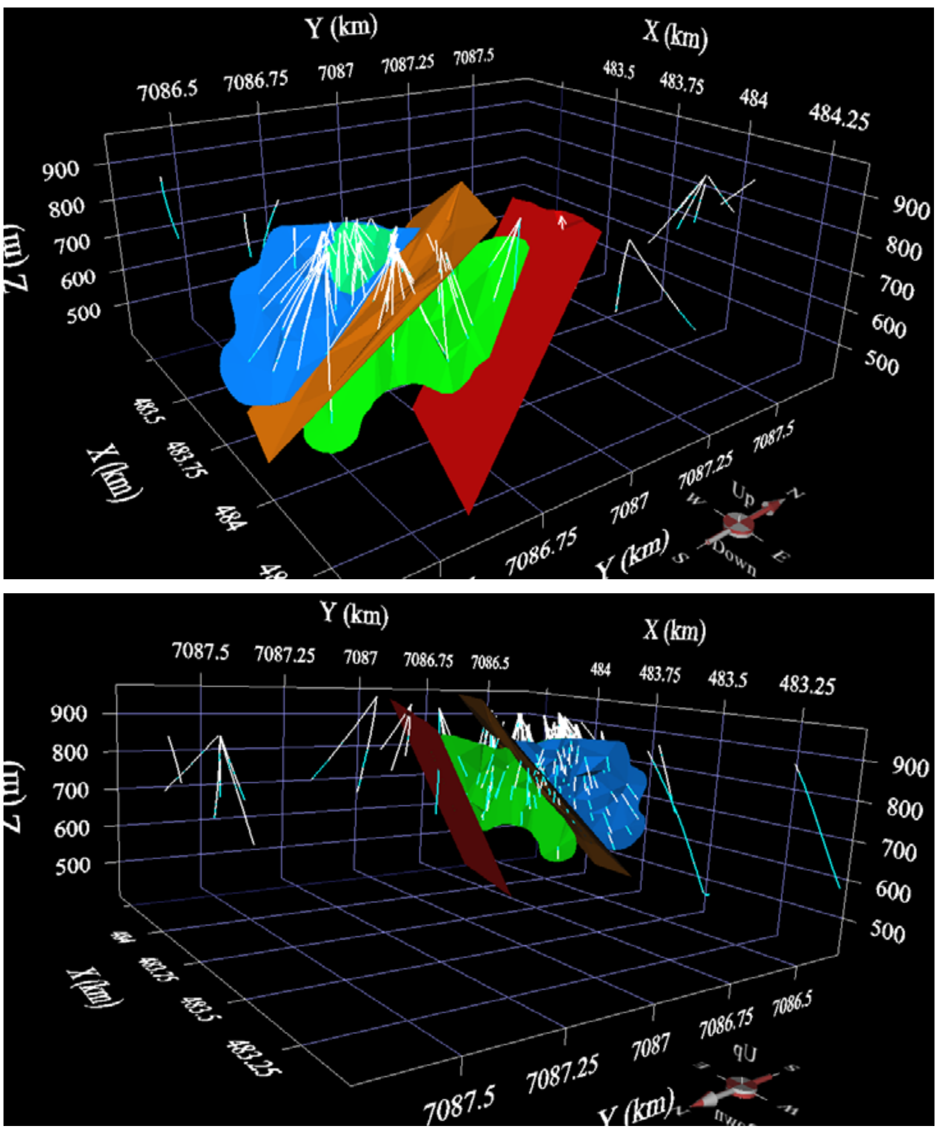


Figure 14-3: Oblique View of Flame & Moth Wireframes Looking North-Northwest (top) and Looking South-Southeast (bottom) (Alexco, 2013)

14.5 Specific Gravity Data

14.5.1 Specific Gravity for the Bellekeno Mine

The specific gravity of vein material at the Bellekeno mine is very sensitive to the lead, zinc, and iron concentrations. To accommodate for these variations, regression analyses were done using metal grades and specific gravity measured on pulp (PSG) for the Southwest and 99 zones of the Bellekeno mine. The relationships were used to calculate rock mass specific gravity. A comparison of the smelter returns, production tonnage, and metal content for January 2011 to May 2012 shows a less than a 1% variance between metal tonnes. Production tonnes are calculated from the specific gravity lead-based regression equations.

Specific gravity measured on core samples (CSG) has a limited application for estimating block specific gravity and production results. However, the in situ rock mass density can be back calculated from metal assays using the regression relationships between the measured PSG and the CSG for the Southwest and 99 zones, respectfully. The relationships are as summarized:

Southwest zone: PSG = (0.000004) x Pb (ppm) + 3.336689
CSG = 0.834456 x PSG + 0.683904

99 zone: PSG = (0.00005) x Pb (ppm) + 3.040291
CSG = 0.795686 x PSG + 0.509225

Although limited PSG and CSG data has been collected on the East zone, there is a poor regression correlation between assay results and measured CSG. An average specific gravity of 3.45 was assigned to East zone vein material based upon the average CSG measured. The poor correlation is most likely the result of poor core recovery in the vein areas. Once mining has actively commenced in the area, a new specific gravity study will begin.

Material outside of the veins was assigned a specific gravity of 2.7. This measurement is based upon the average CSG measured.

14.5.2 Specific Gravity for the Lucky Queen Mine

The specific gravity data for Lucky Queen included a total of 191 specific gravity measurements (Table 14-7) on core samples. Specific gravity was measured by Alexco using a laboratory scale and recording the mass of core pieces in air and in water. Core was not covered by wax or plastic film prior to immersion. Regression analysis of the specific gravity measurements shows a moderately strong correlation between the lead assay results and the reported specific gravity, with a correlation coefficient of 0.62 (Figure 14-4). Therefore, a linear correlation was used to assign a specific gravity value to each block based on the following relationship:

Specific Gravity = Pb (ppm) x 0.00006 + 2.617

Table 14-7: Lucky Queen Specific Gravity Measurements

Count	Specific Gravity Measured on Core			
	Minimum	Maximum	Average	Median
191	1.24	6.81	2.74	2.60

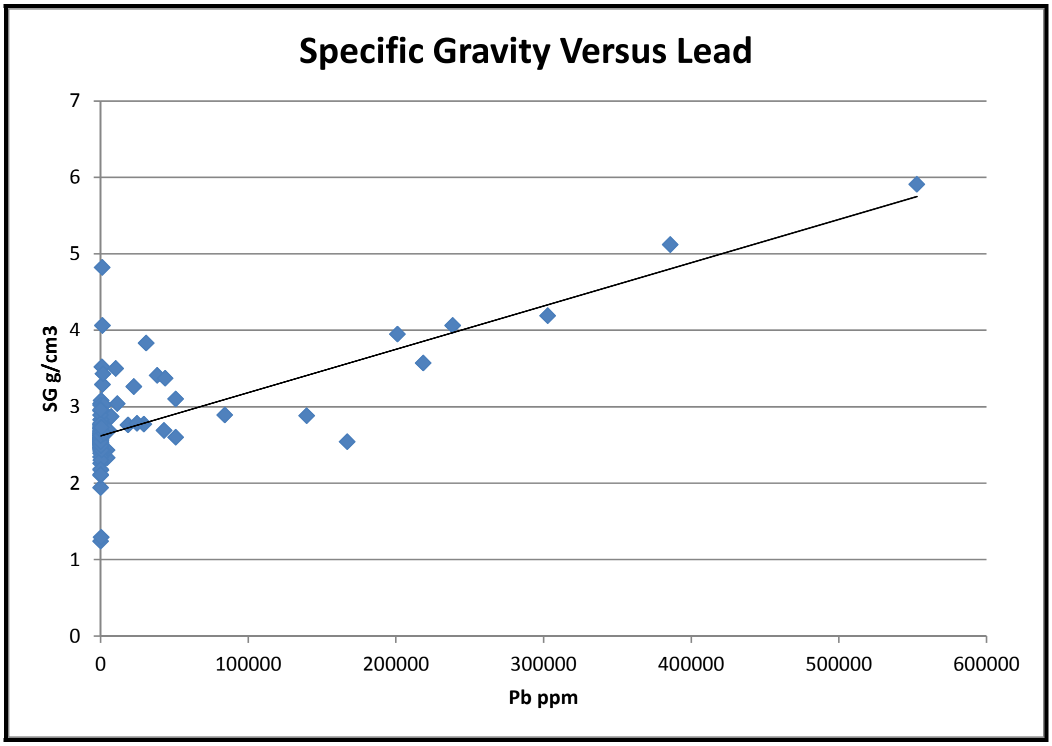


Figure 14-4: Scatter Plot of Lead Assay Results and Specific Gravity Measurements (SRK, 2011)

14.5.3 Specific Gravity for the Flame & Moth Deposit

The data supplied by Alexco for Flame & Moth included a total of 523 specific gravity measurements on core samples and 2,461 pulp specific gravity measurements, 178 and 528 of which, respectively, fall within the modelled vein solids (Table 14-8).

Table 14-8: Flame & Moth Specific Gravity Measurements

Zone	Type of material	Count	Specific Gravity			
			Minimum	Maximum	Average	Median
Christal	Pulp	120	2.53	4.93	3.7	3.66
	Core	53	2.62	4.66	3.67	3.74
Lightning V1	Pulp	337	2.65	5.71	3.53	3.45
	Core	110	2.62	5.24	3.51	3.51
Lightning V2	Pulp	71	2.84	4.6	3.47	3.39
	Core	16	2.87	4.23	3.53	3.49
Total	**Pulp**	**528**	**2.53**	**5.71**	**3.56**	**3.49**
	Core	**178**	**2.62**	**5.24**	**3.56**	**3.54**

Specific gravity was measured on core samples by Alexco using a laboratory scale and recording the mass of core pieces in air and in water. Core was not covered by wax or plastic film prior to immersion. Pulp specific gravity measurements were measured by pychnometry at ALS in North Vancouver. No strong correlation exists between specific gravity measurements and lead or zinc assay results. A linear regression between core and pulp specific gravity measurements calculated by SRK (2012) was used, where:

$$\text{Core Specific Gravity} = \text{Pulp Specific Gravity}/1.0385$$

Core specific gravity measurements were used where available for the interpolation of specific gravity into blocks. Because pulp specific gravity measurements often overestimate specific gravity, these were corrected using the above equation for those samples with no core specific gravity measurements and the corrected specific gravity measurements were used for interpolation of specific gravity into blocks.

14.6 Compositing

14.6.1 Compositing for the Bellekeno Mine

Alexco identified a total of 3,549 assay intervals as vein intercepts. These assay intervals were imported into ISATIS, and assays were then composited to 1-metre length-weighted intervals within the defined vein wireframes. A histogram of sample length for the mineralized zones can be seen in Figure 14-5.

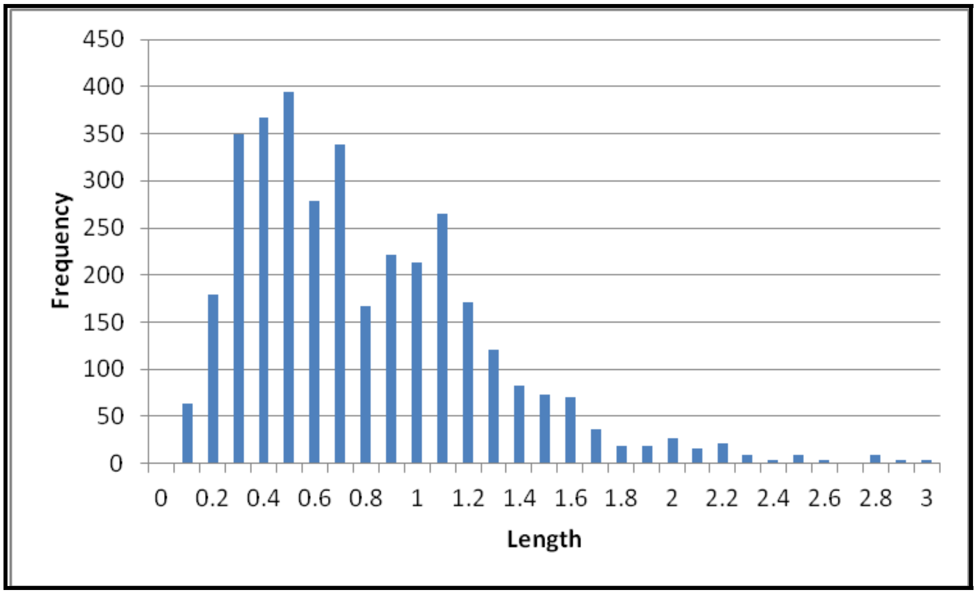


Figure 14-5: Histogram of Sample Length for the Mineralized Zones (Alexco, 2013)

14.6.2 Compositing for the Lucky Queen Mine

Alexco identified a total of 106 core drill hole assay intervals as primary vein intercepts and 26 intervals as secondary splay intercepts. These assay intervals were imported into GEMS, and assays were then composited to 1-metre length-weighted intervals within the defined vein wireframes. Terminal composites with a length of less than 50 cm were merged with the preceding composite in order to avoid a short sample bias during estimation. Missing sample intervals were assigned a nominal value of 0.001 during compositing.

14.6.3 Compositing for the Flame & Moth Deposit

Alexco identified a total of 478 core drill hole assay intervals as vein intercepts. These assay intervals were imported into ISATIS, and assays were then composited to 1-metre length-weighted intervals within the defined vein wireframes. Histograms of sample length for the Christal zone, and the Lightning zone’s Vein 1 and Vein 2 can be seen in Figure 14-6, Figure 14-7, and Figure 14-8, respectively.

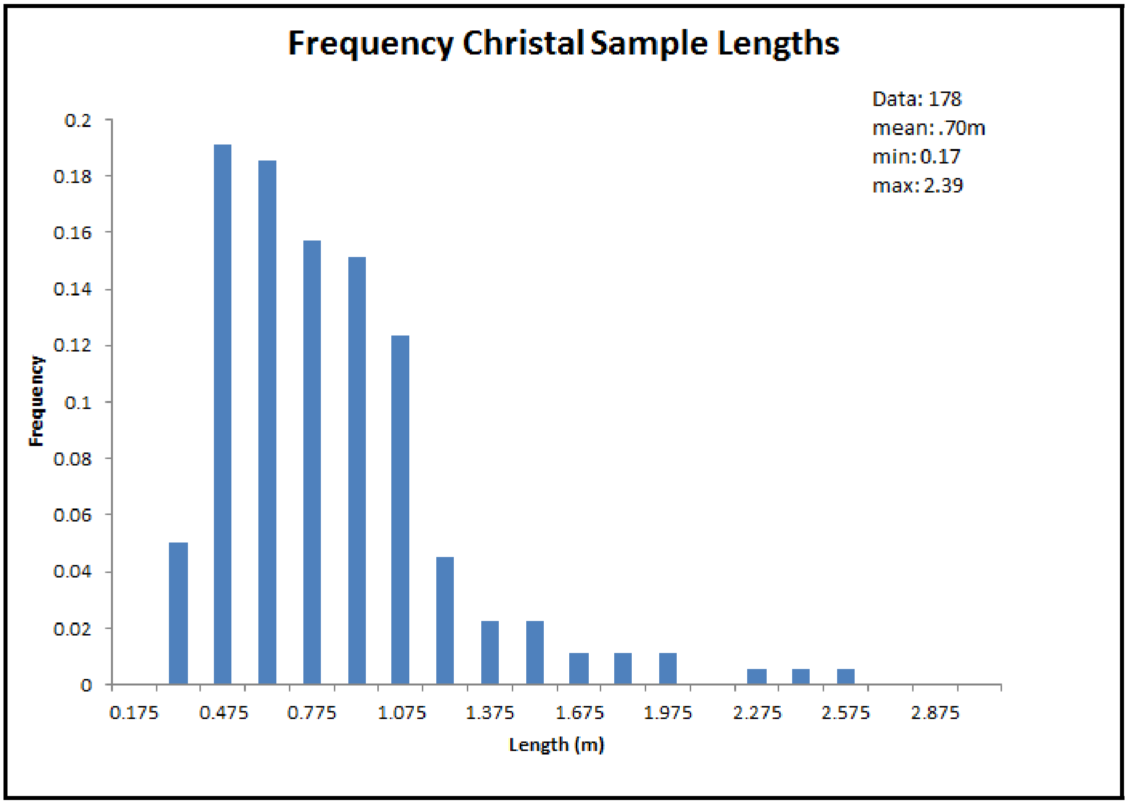


Figure 14-6: Histogram of Sample Length for the Christal Zone (Alexco, 2013)

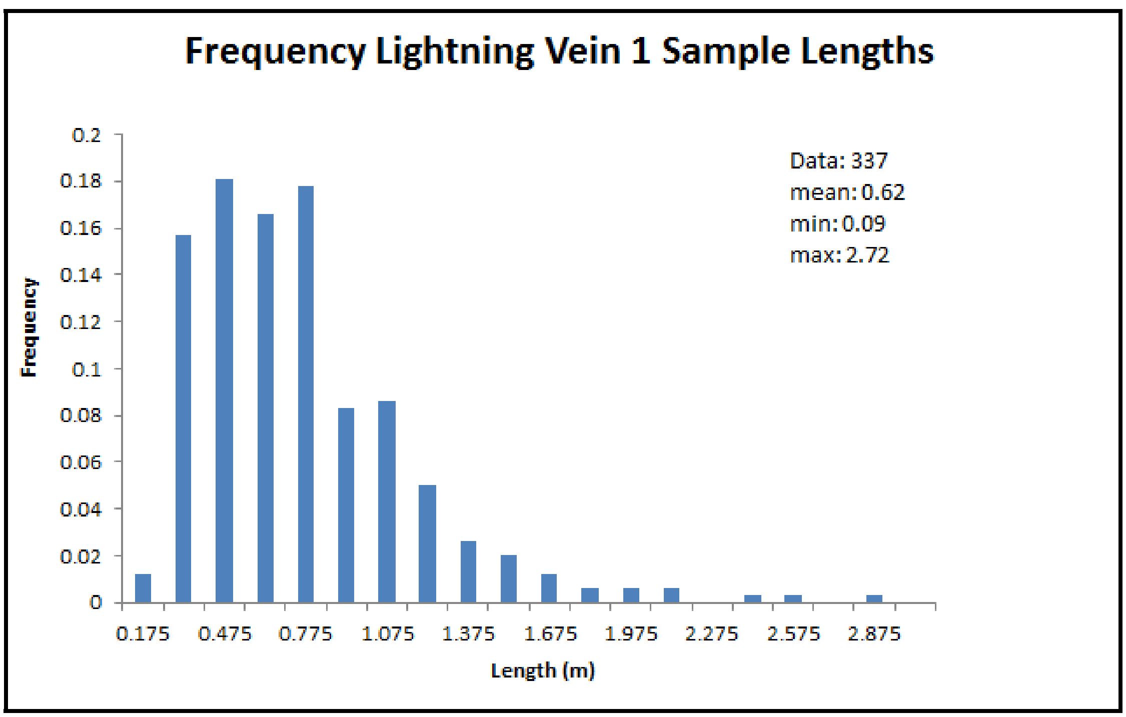


Figure 14-7: Histogram of Sample Length for the Lightning Zone Vein 1 (Alexco, 2013)

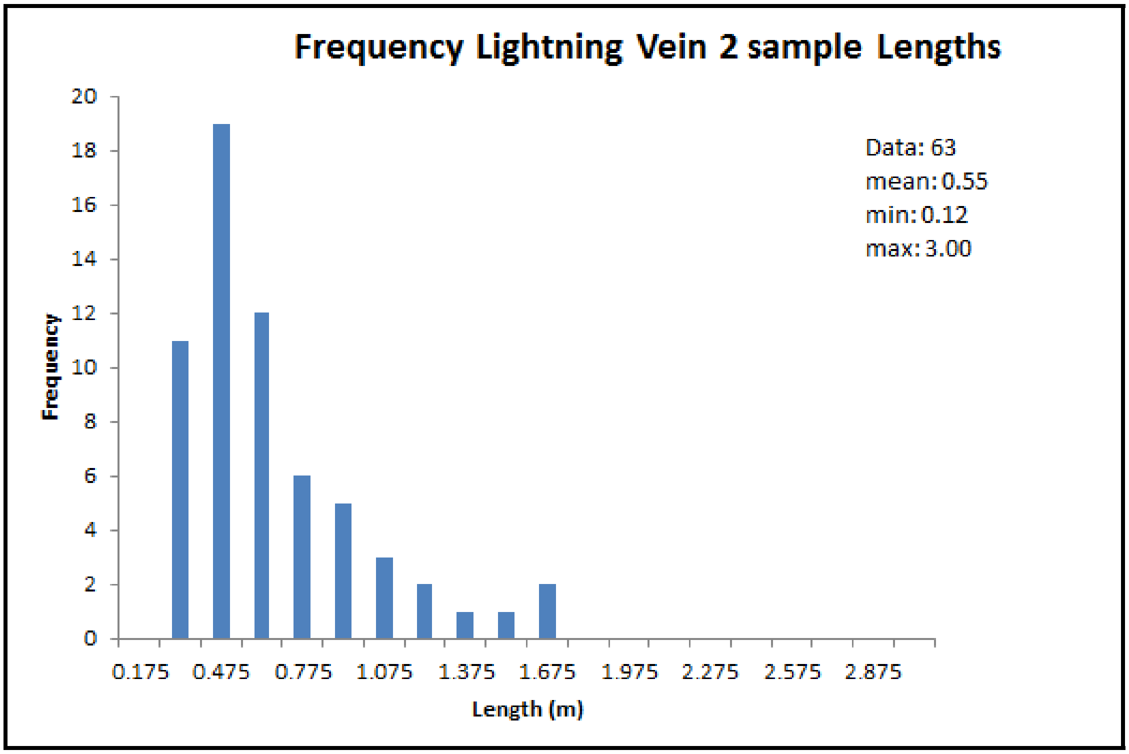


Figure 14-8: Histogram of Sample Length for the Lightning Zone Vein 2 (Alexco, 2013)

14.7 Evaluation of Outliers

14.7.1 Evaluation of Outliers for the Bellekeno Mine

Grade capping analysis was conducted on the domain-coded sample assay and composites data in order to limit the influence of extreme assay values during estimation. The assays were examined using histograms and cumulative frequency plots. After analysis, only silver composites were capped at a value of 5,000 gpt (Table 14-9). This capping threshold value was selected to minimize changes in the sample distribution. Composites were capped prior to estimation.

Table 14-9: Composite Capping Levels for the Bellekeno Mine

Element	Maximum Value	Cap Value	Mean	Mean Capped	Number Capped	Lost Metal*
Ag (gpt)	10,128	5,000	1,044	1,025	21	1.82%

* Lost metal is (Average – Averaged Capped)/Average * 100 where Average is the average grade of the assays before capping and Average Capped is the average grade of the assays after capping.

14.7.2 Evaluation of Outliers for the Lucky Queen Mine

Grade capping analysis was conducted on the domain-coded and composites data in order to limit the influence of extreme assay values during estimation. The combined composite sample population for the main Lucky Queen vein and splay was examined using histograms, probability graphs, and capping plots. Capping threshold values were selected that minimize changes in the sample distribution, and sample values were capped to these values prior to compositing and estimation (Table 14-10). For lead, the capping threshold was set to the percentile used for grade capping of silver in order to maintain the observed correlation between these two elements.

Table 14-10: Composite Capping Levels for Lucky Queen

Element	Maximum Value	Cap Value	Mean	Mean Capped	Number Capped	Lost Metal*
Ag (gpt)	13,998	6,300	960	834	2	13.1%
Au (gpt)	3.00	2.00	0.16	0.15	1	10.0%
Pb (ppm)	303,963	148,000	20,831	18,461	2	11.4%
Zn (ppm)	210,100	70,000	13,944	10,143	3	27.2%

* Lost metal is (Average – Averaged Capped)/Average * 100 where Average is the average grade of the assays before capping and Average Capped is the average grade of the assays after capping.

14.7.3 Evaluation of Outliers for the Flame & Moth Deposit

Grade capping analysis was conducted on the domain-coded sample assay and composited assay data in order to limit the influence of extreme assay values during estimation. The assays from the Christal and Lightning zones were examined using histograms and cumulative frequency plots. Capping threshold values were selected that minimize changes in the sample distribution, and composited values were capped to these values prior to estimation (Table 14-11).

Table 14-11: Sample Capping Levels for Flame & Moth

Zone	Element	Maximum Value	Cap Value	Number Capped	Mean	Mean Capped	Loss Metal
Christal	Pb ppm	170,756	150,000	1	12,567	12,373	1.54
	Ag ppm	6,774.75	3000	3	489.94	458.38	6.44
Lightning V1	Pb ppm	247,700	150,000	2	16,791	16,321	2.80
	Zn ppm	299,000	200,000	7	59,321	57,984	2.25
Lightning V2	Ag ppm	3,156.28	3,000	1	502.28	498.80	0.69

14.8 Statistical Analysis and Variography

14.8.1 Statistical Analysis and Variography for the Bellekeno Mine

The Bellekeno data was analyzed by zone and is presented in the following series of graphics - the SW zone, the 99 zone, and the East zone.

14.8.2 Southwest Zone

Figure 14-9 through Figure 14-16 present the results for the SW zone: histograms, probability plots, normal variography, and lognormal variography.

In general, it is noted that reasonable variograms are obtained in log space for silver, lead, and zinc, with an omnidirectional range of approximately 40 to 50 m in the plane of the vein.

14.8.3 The 99 Zone

Figure 14-17 through Figure 14-21 present the results for the 99 zone: histograms, probability plots, normal variography, and lognormal variography.

Range for the 99 zone is shorter than the SW zone, approximately 20 to 30 m in the plane of the vein.

14.8.4 The East Vein

Figure 14-22 through Figure 14-25 present the results for the East zone: histograms, probability plots, normal variography, and lognormal variography.

Lead and zinc did not display a spatial structure, possibly due to the relatively small data set available for analysis. The silver variogram appears to indicate a 20 to 30 m range in the plane of the vein.

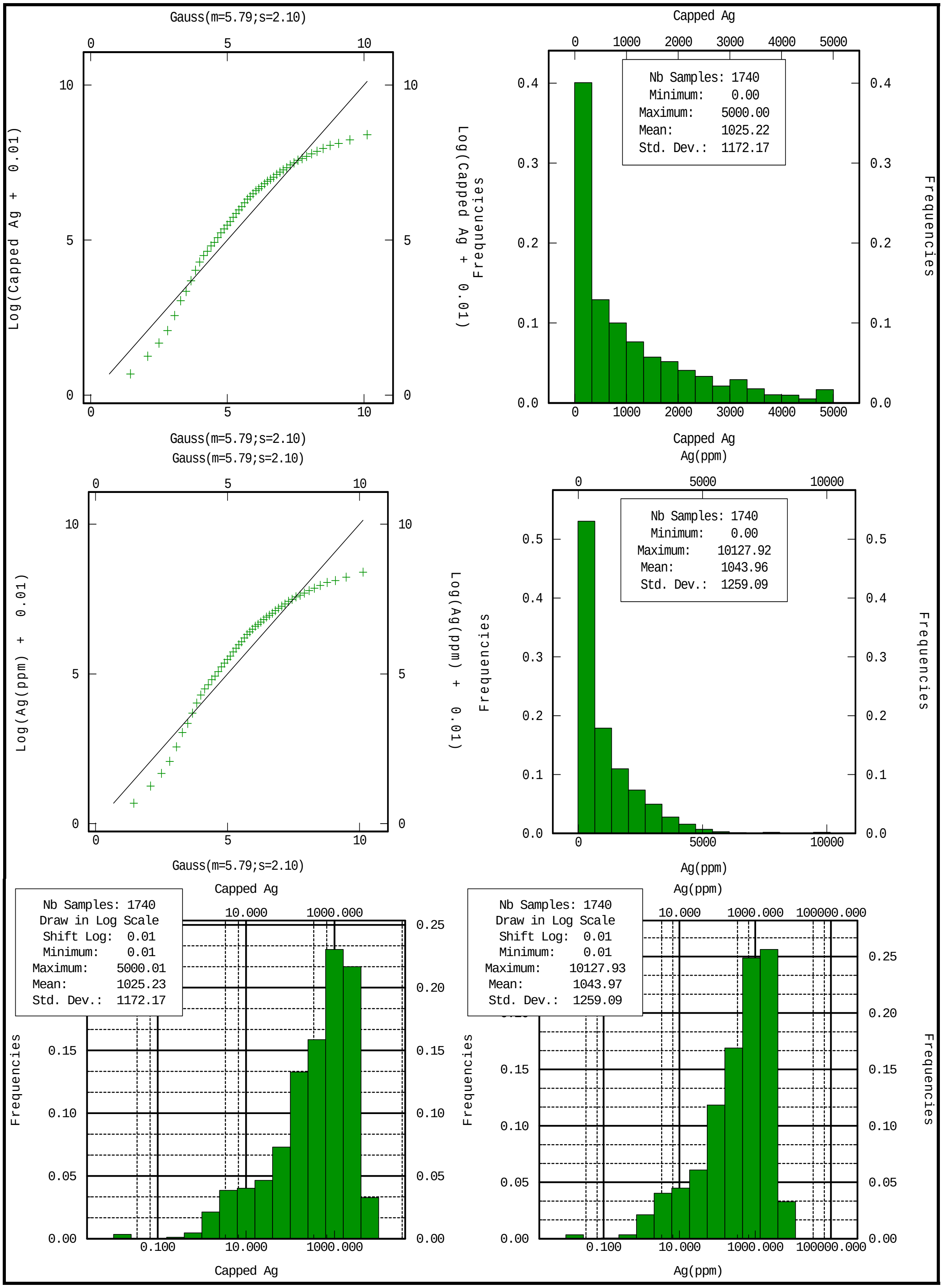


Figure 14-9: Histograms and Probability Plots for Silver, Capped and Uncapped, Southwest Zone (Alexco, 2013)

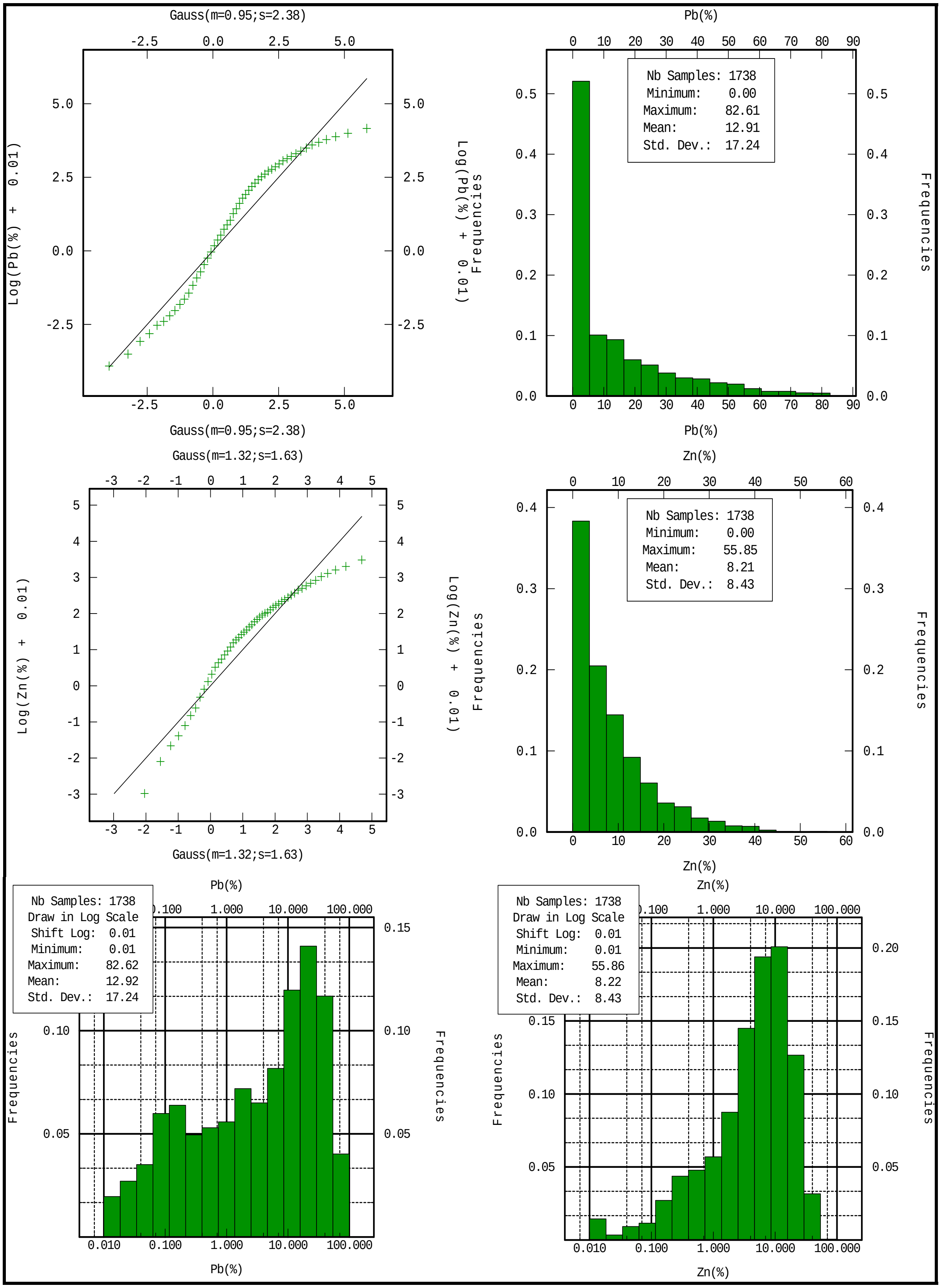


Figure 14-10: Histograms and Probability Plots for Lead and Zinc, Capped and Uncapped, Southwest Zone (Alexco, 2013)

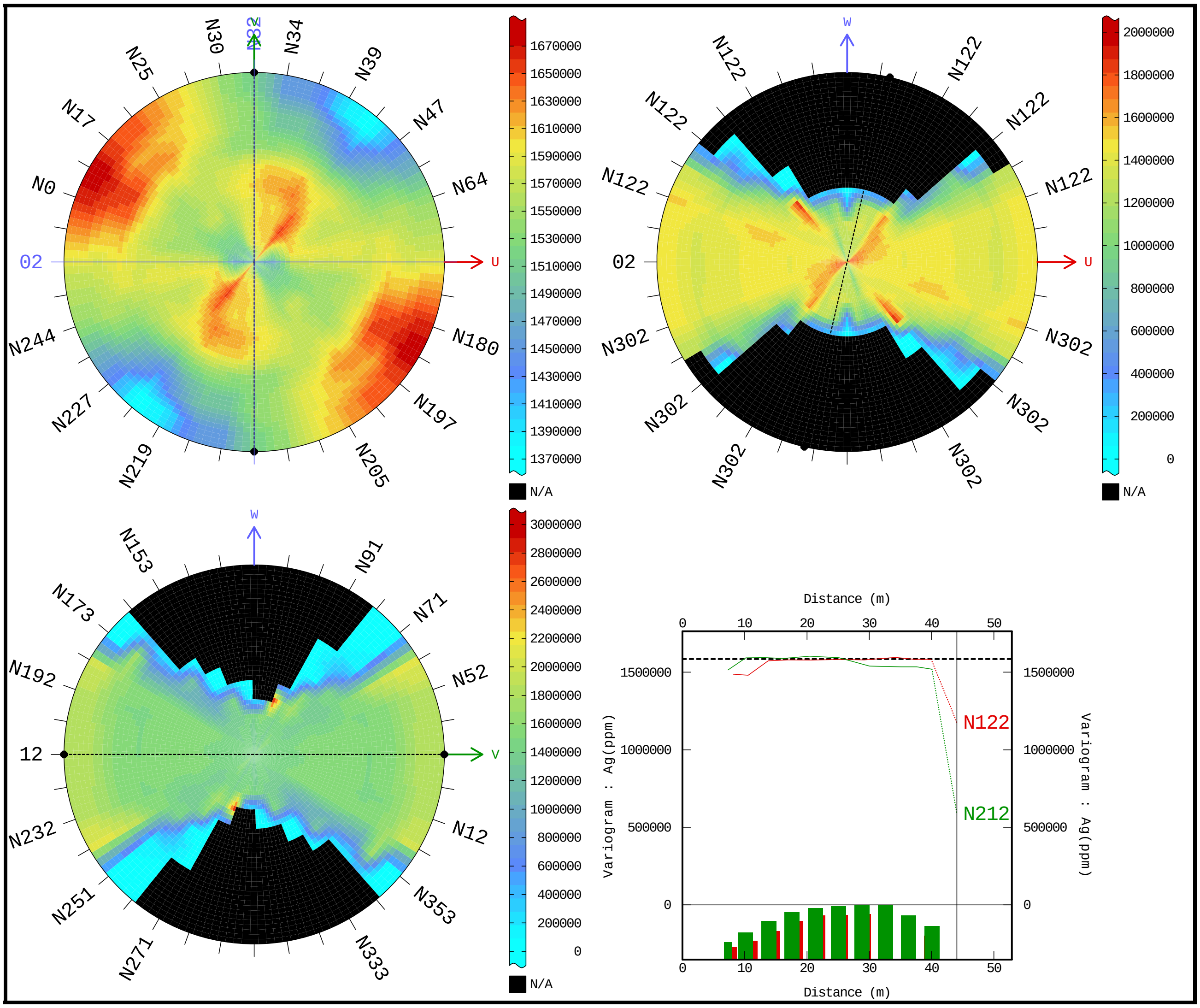


Figure 14-11: Normal Variography of Silver, Southwest Zone (Alexco, 2013)

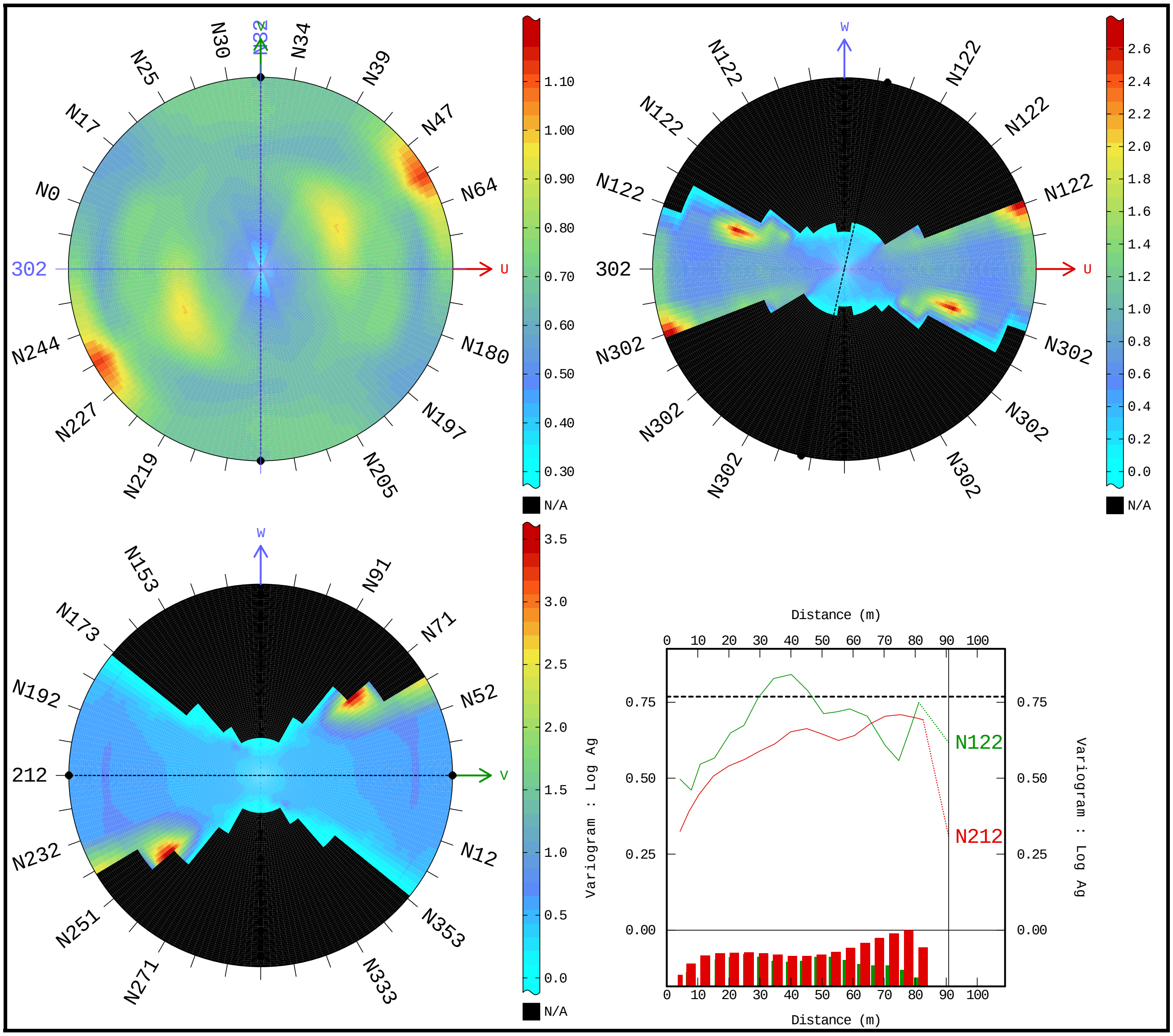


Figure 14-12: Lognormal Variography of Silver, Southwest Zone (Alexco, 2013)

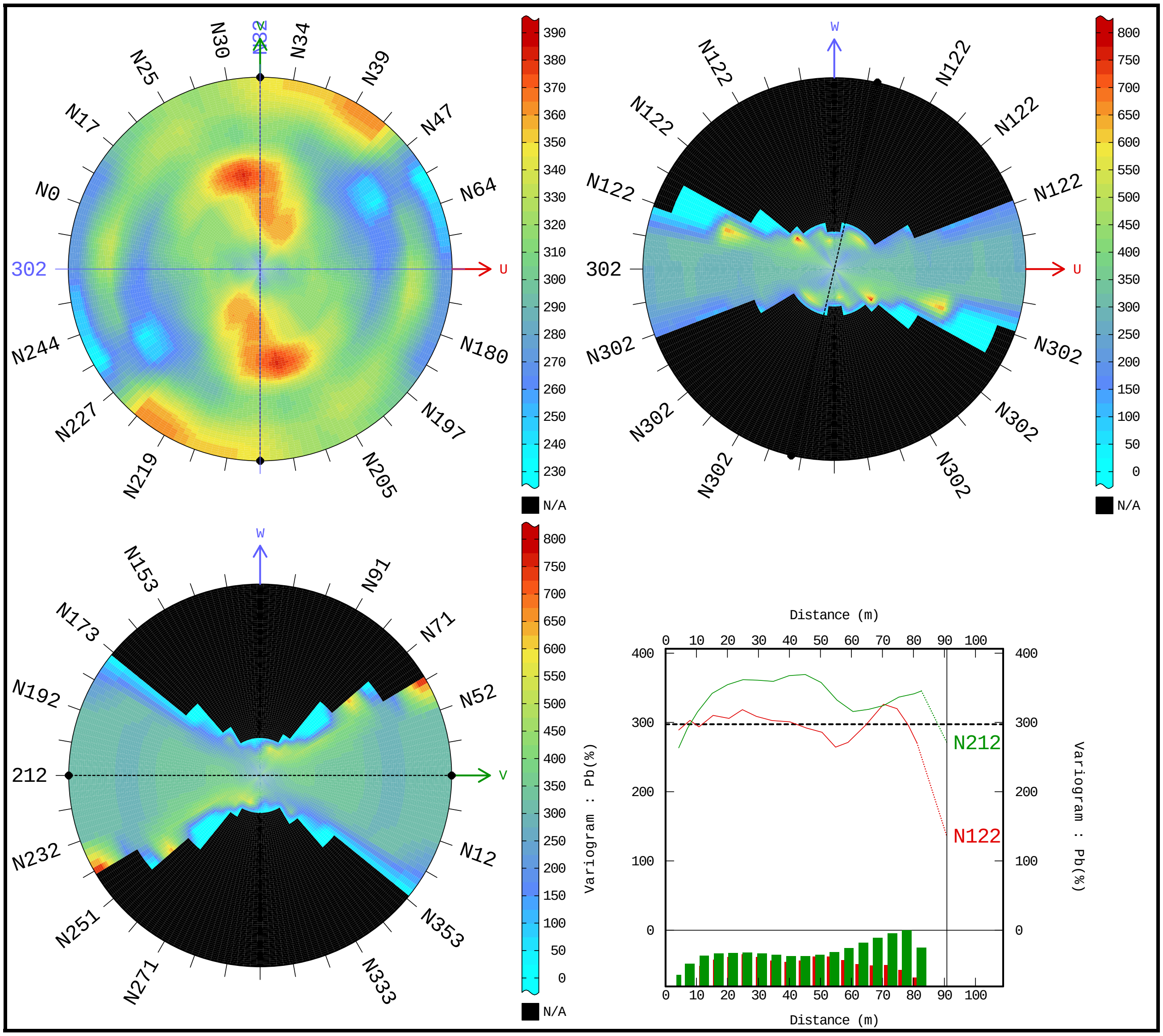


Figure 14-13: Normal Variography of Lead, Southwest Zone (Alexco, 2013)

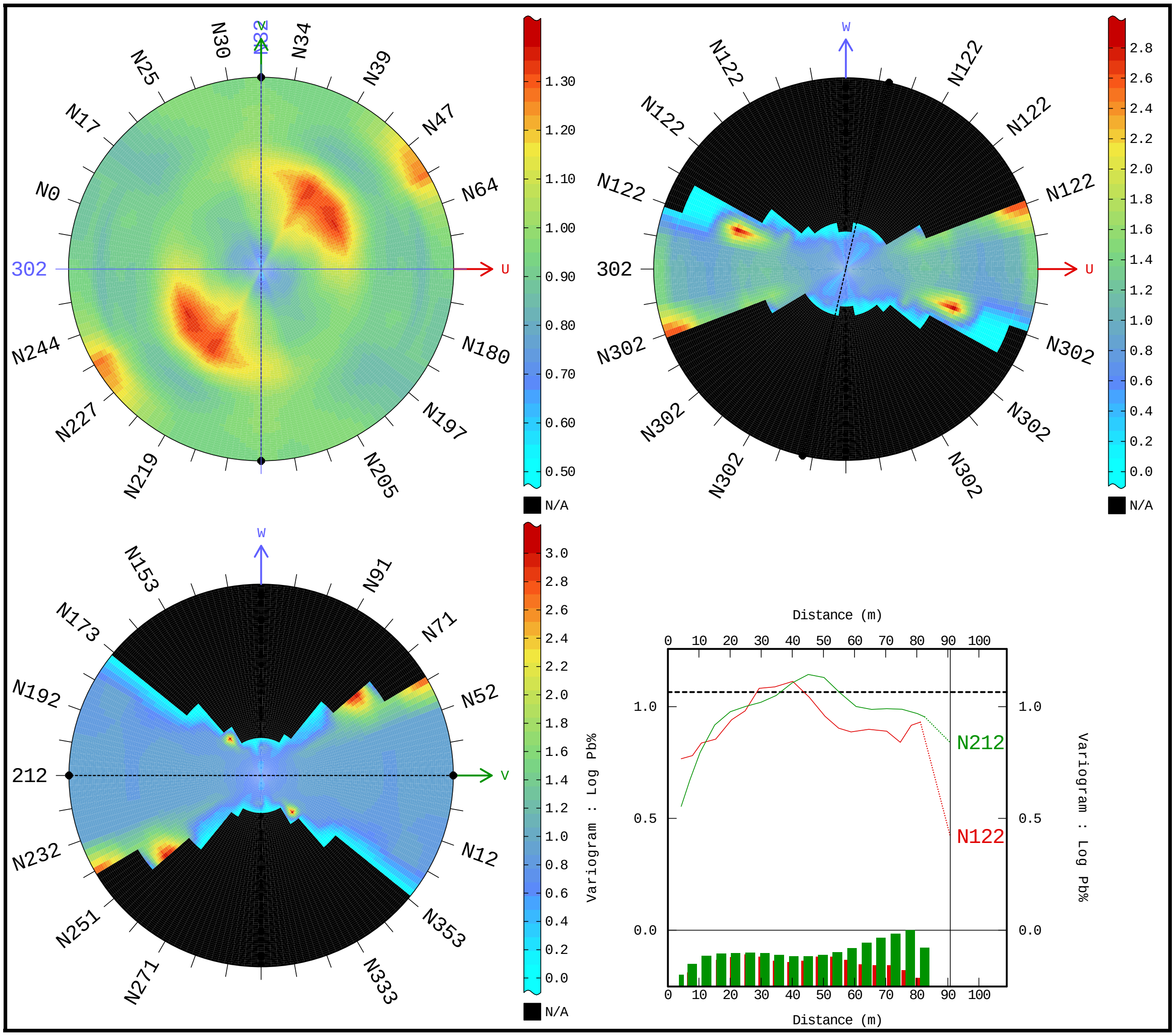


Figure 14-14: Lognormal Variography of Lead, Southwest Zone (Alexco, 2013)

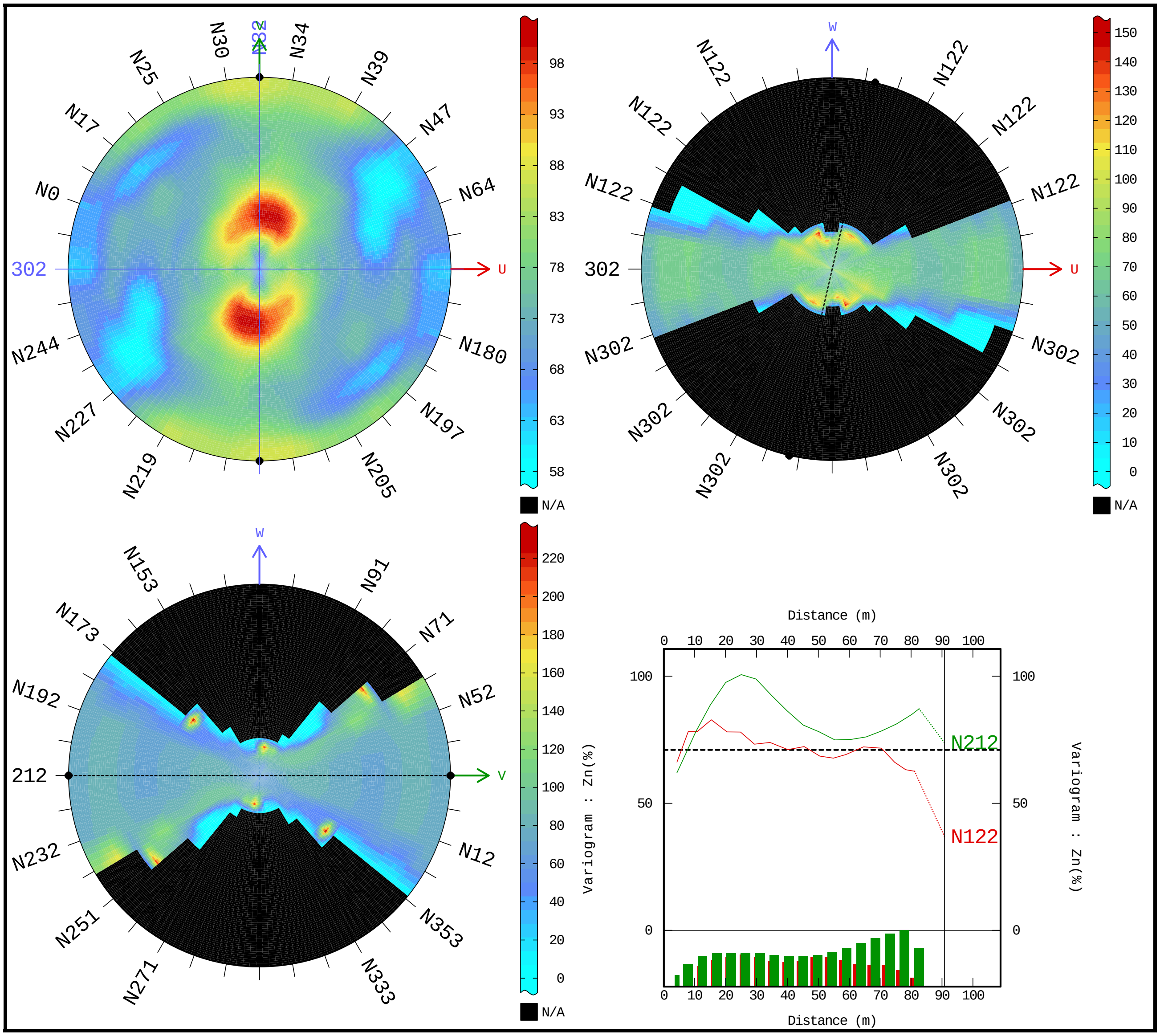


Figure 14-15: Normal Variography of Zinc, Southwest Zone (Alexco, 2013)

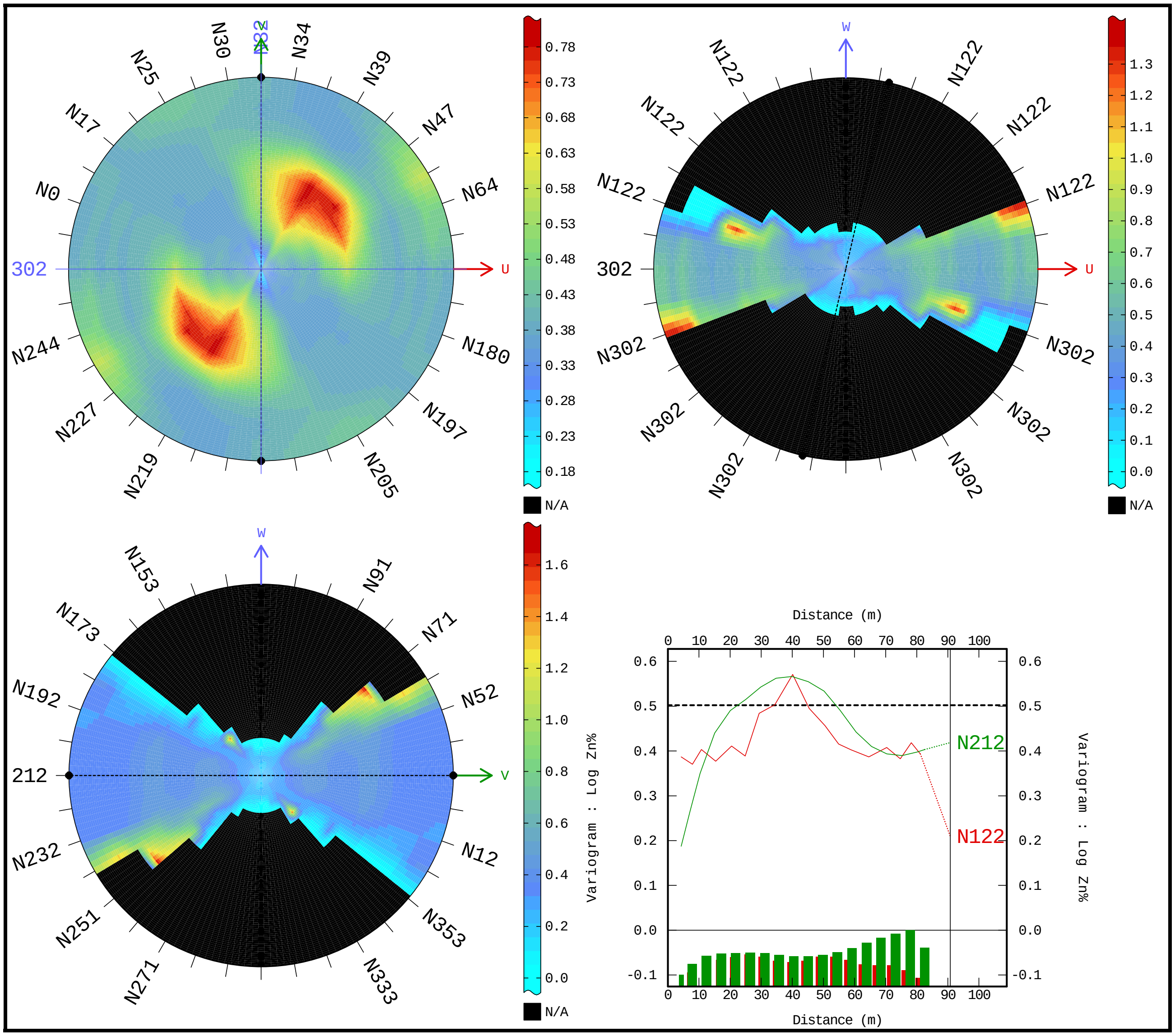
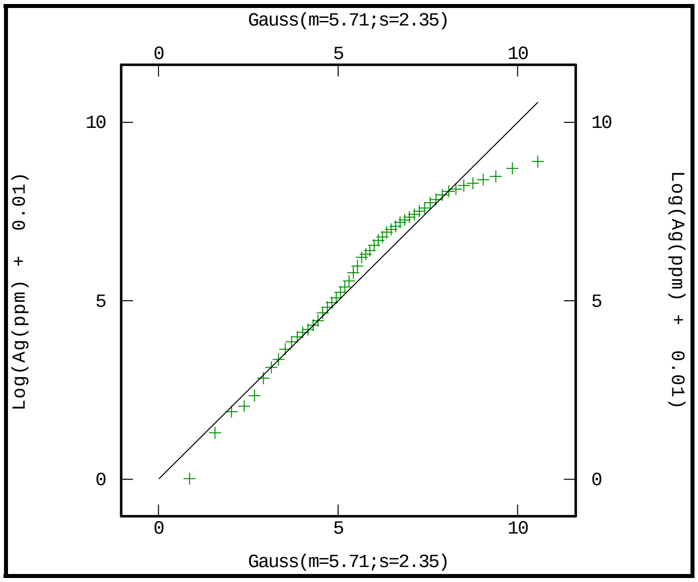


Figure 14-16: Lognormal Variography of Zinc, Southwest Zone (Alexco, 2013)



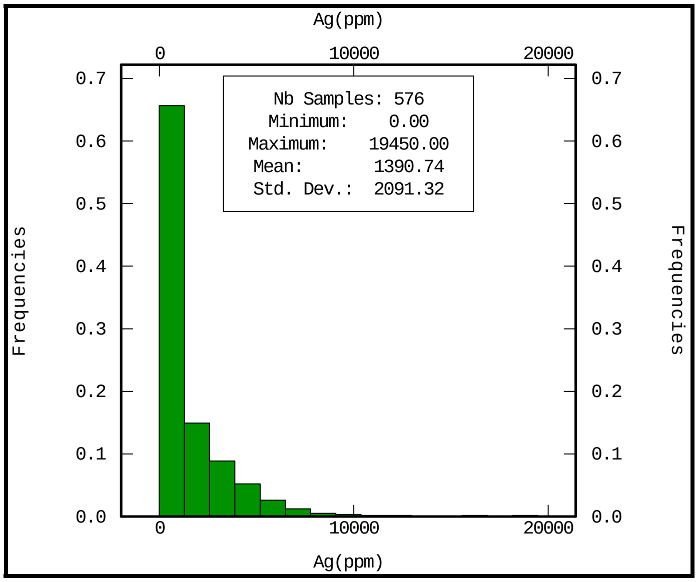
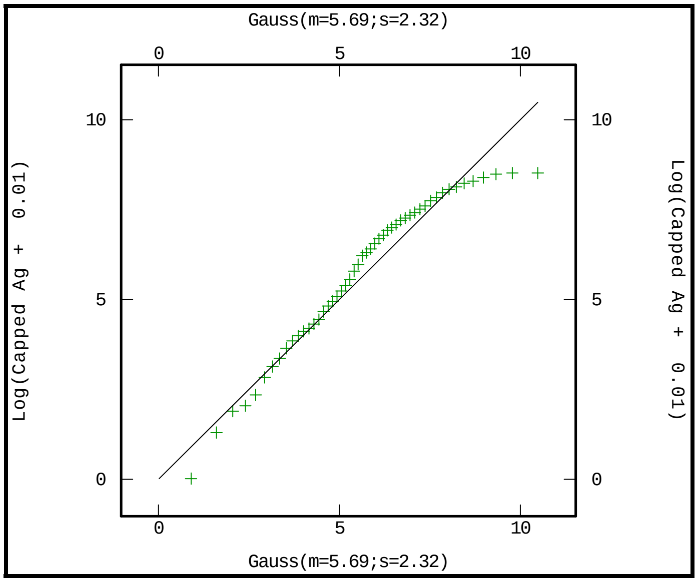


Figure 14-17: Histograms and Probability Plots for Silver, 99 Zone (Alexco, 2013)



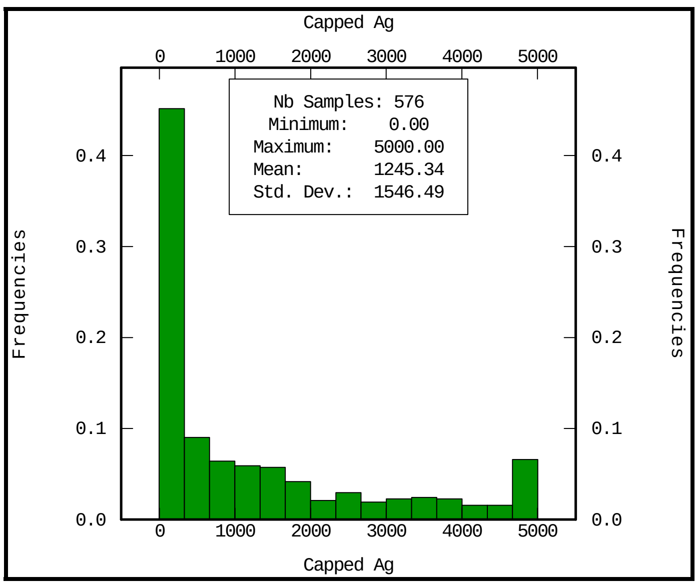


Figure 14-17 continued: Histograms and Probability Plots for Silver, 99 Zone (Alexco, 2013)

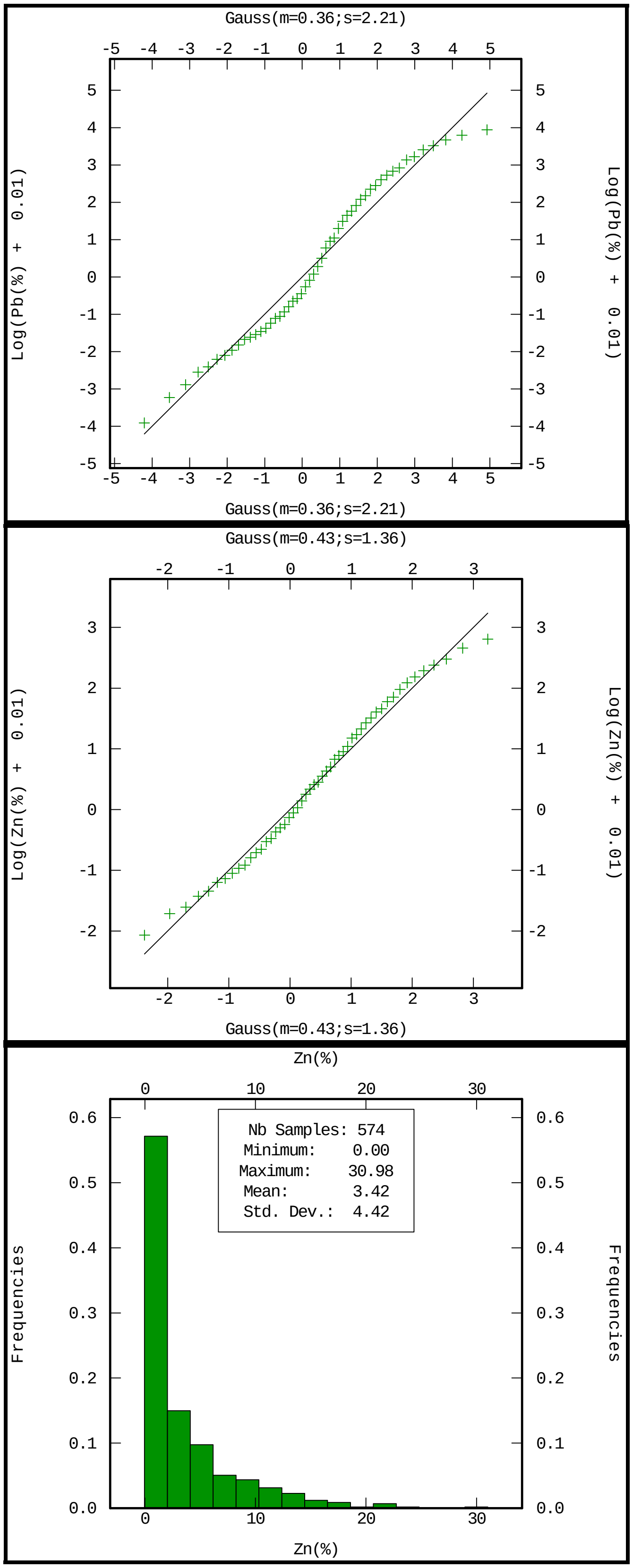


Figure 14-18: Histograms and Probability Plots for Lead and Zinc, 99 Zone (Alexco, 2013)

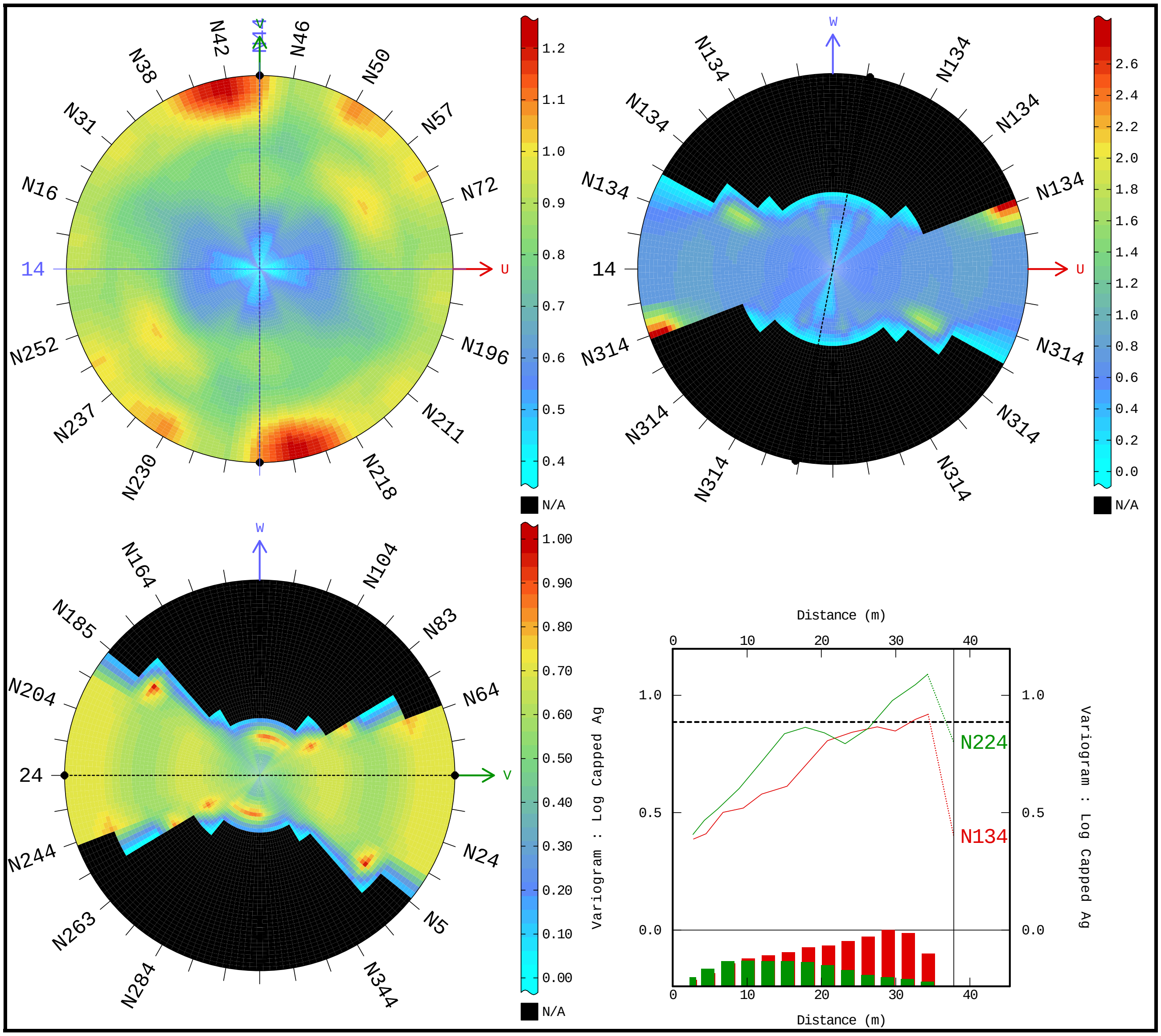


Figure 14-19: Log Space Variograms for Capped Silver, 99 Zone (Alexco, 2013)

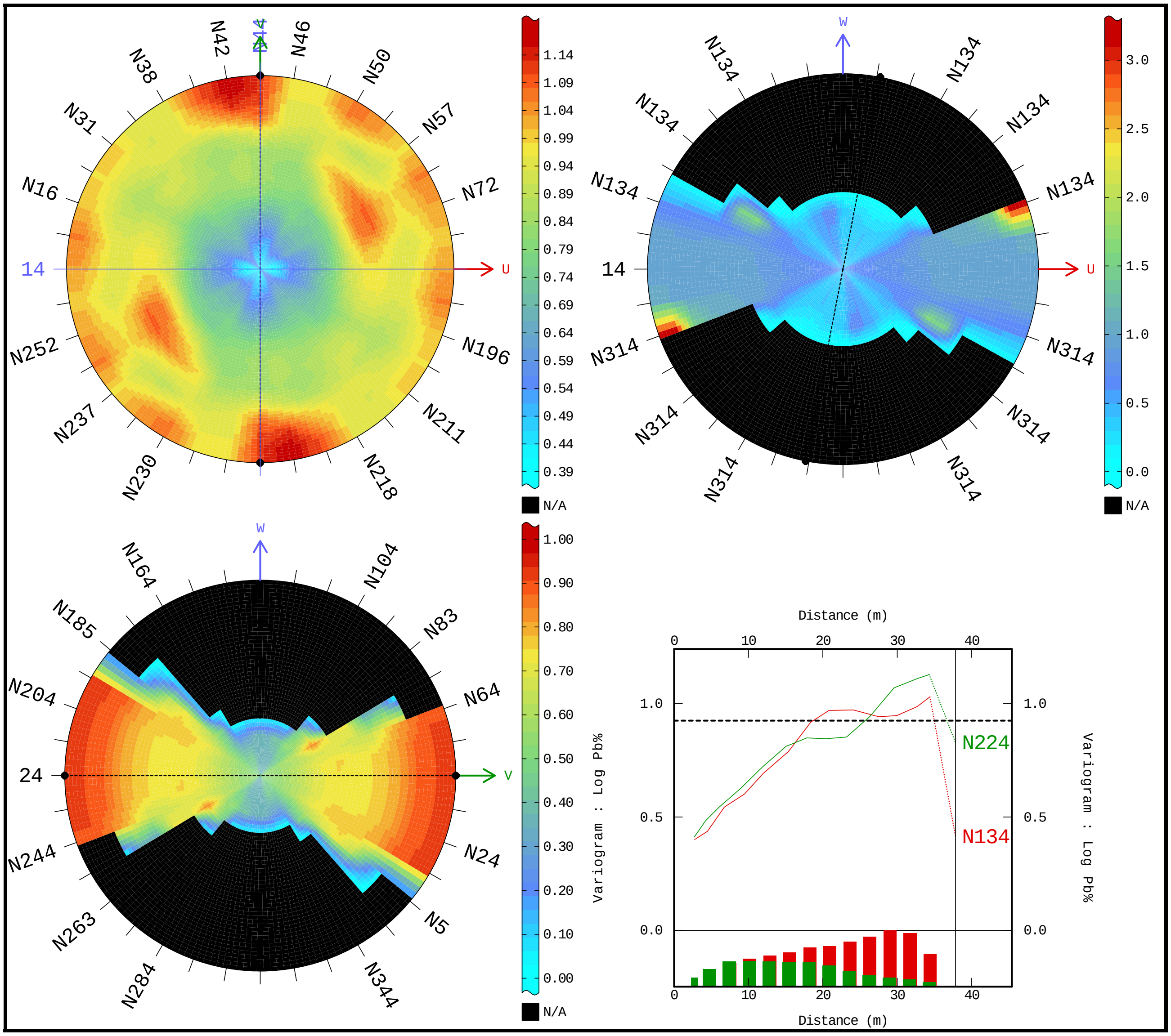


Figure 14-20: Log Space Variograms for Lead, 99 Zone (Alexco, 2013)

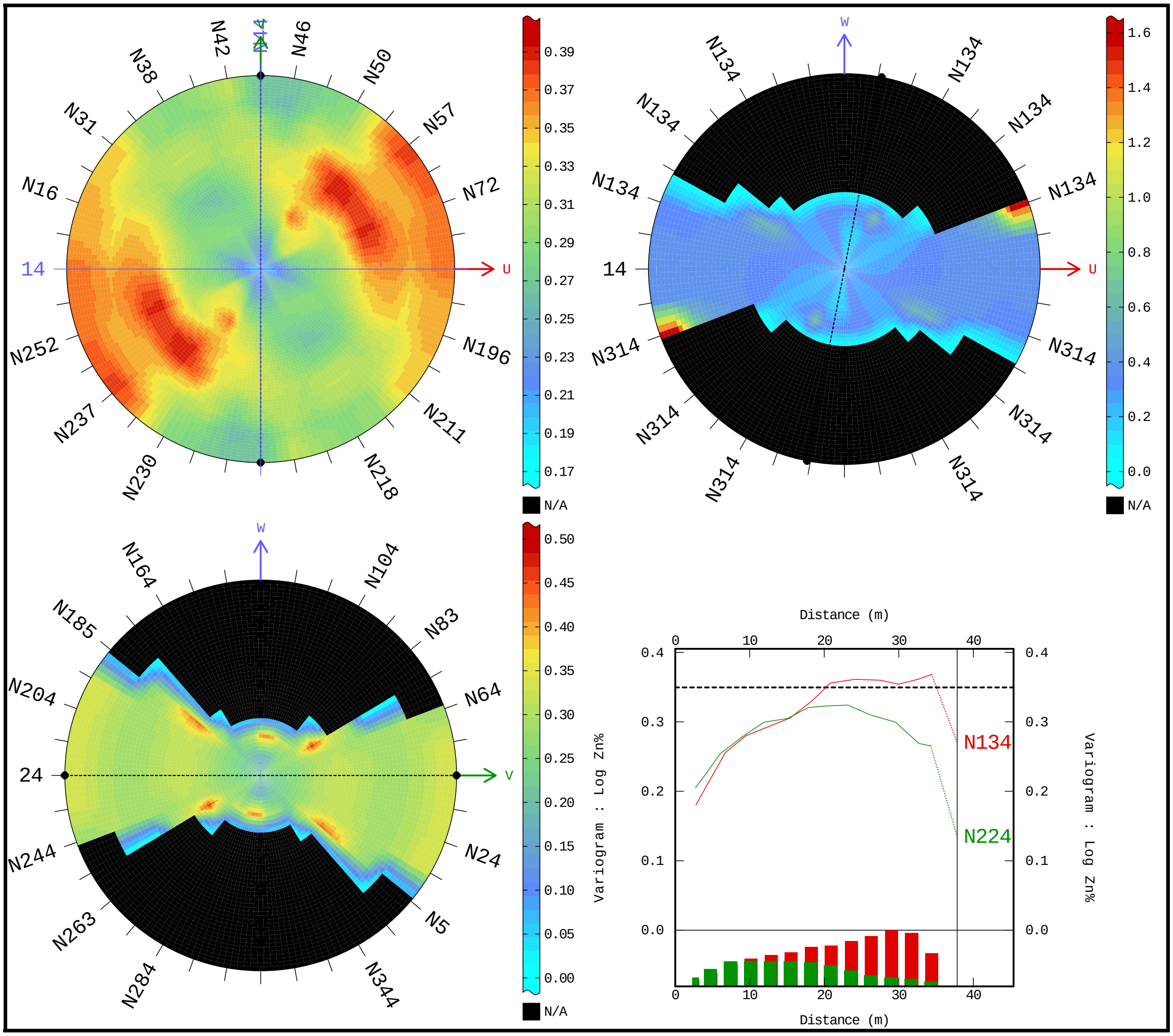


Figure 14-21: Log Space Variograms for Zinc, 99 Zone (Alexco, 2013)

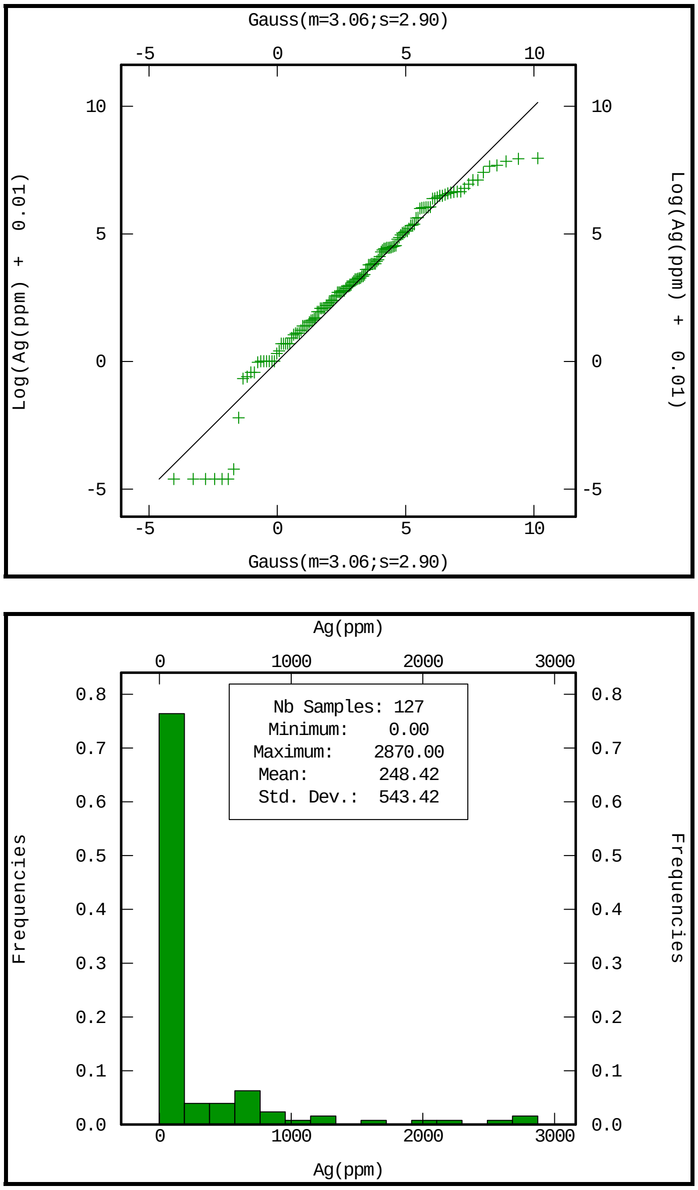
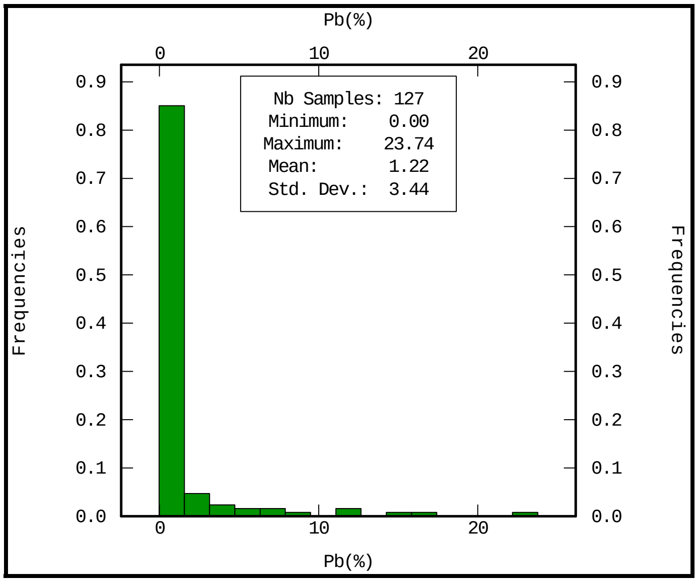


Figure 14-22: Histograms and Probability Plots for Silver, East Zone (Alexco, 2013)



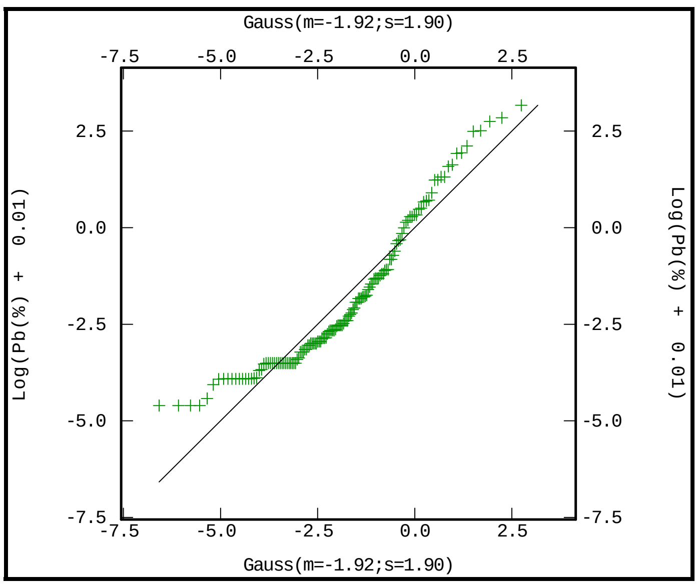


Figure 14-23: Histograms and Probability Plots for Lead, East Zone (Alexco, 2013)

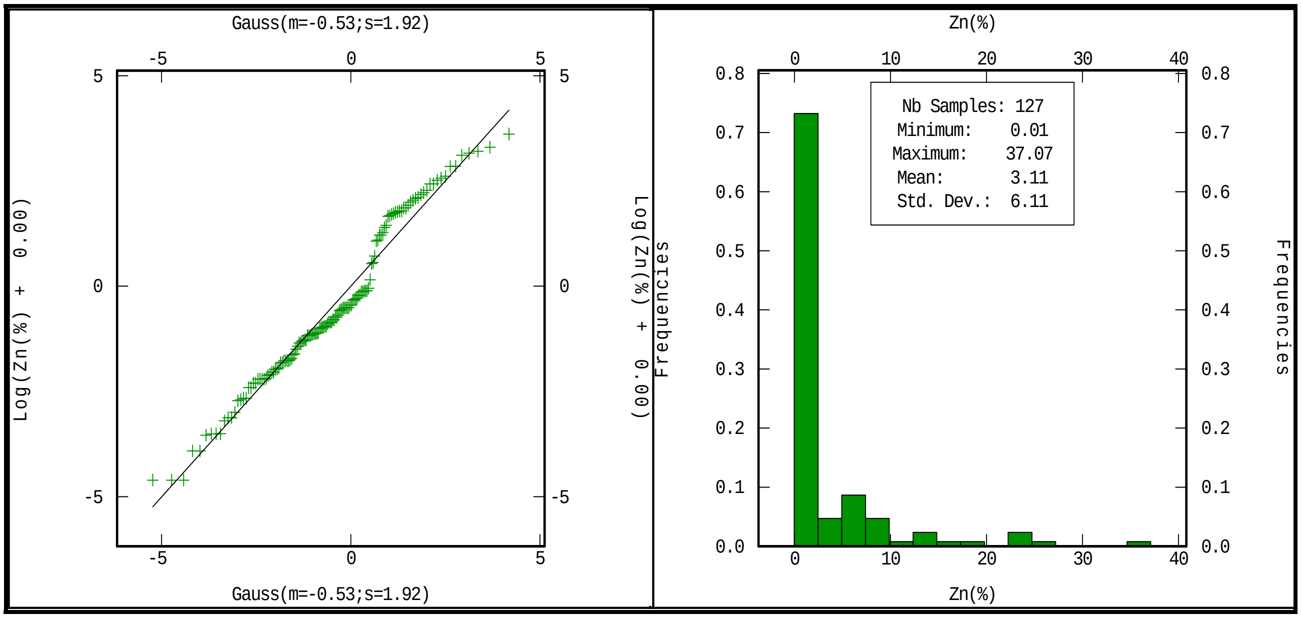


Figure 14-24: Histograms and Probability Plots for Zinc, East Zone (Alexco, 2013)

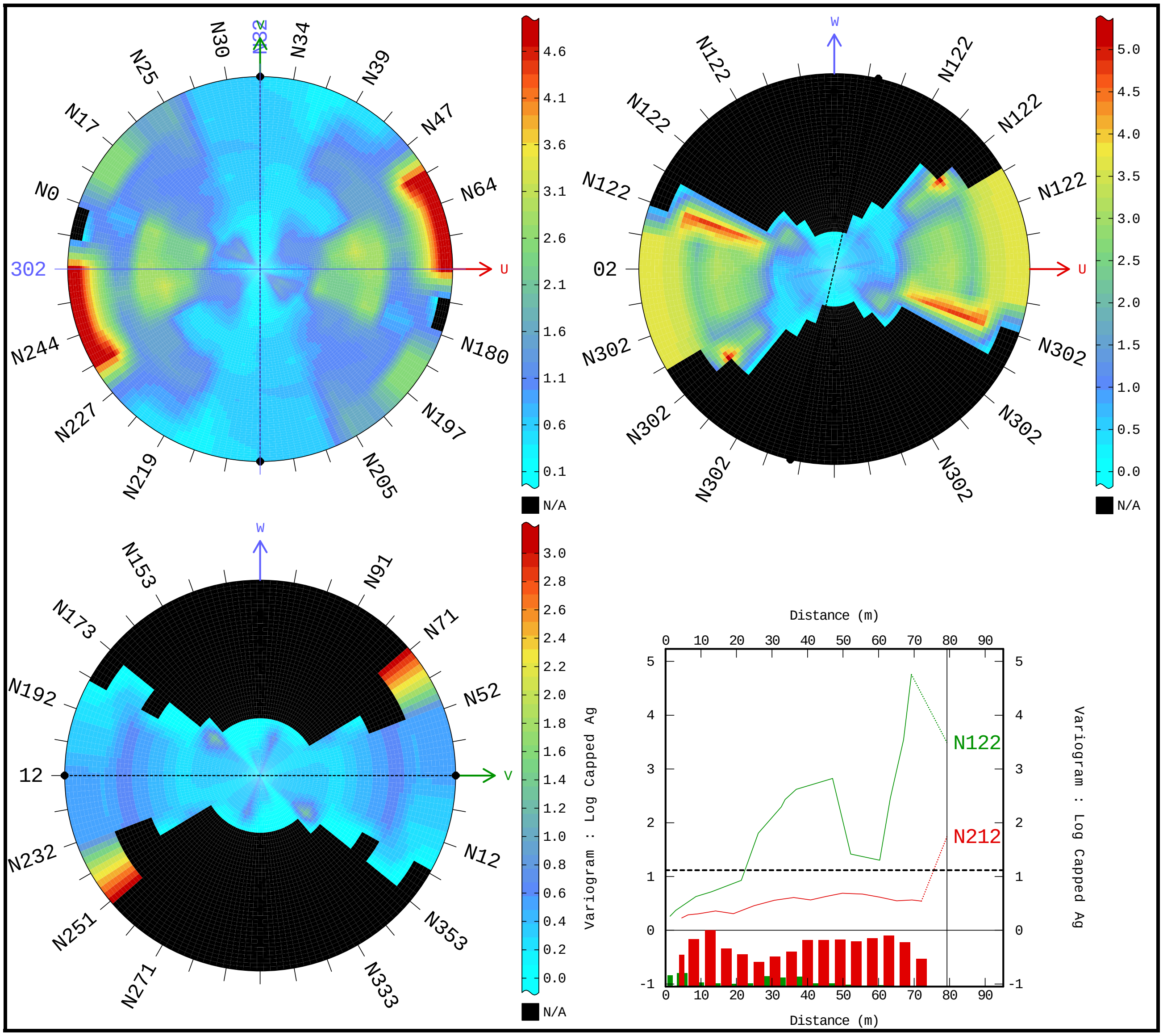


Figure 14-25: Log space Variograms for Silver, East Zone (Alexco, 2013)

14.8.5 Statistical Analysis and Variography for the Lucky Queen Mine

Examination of the distribution of drill hole and chip assay sample populations suggests that drill hole assay data differ significantly from the chip assay data (Figure 14-26). The chip sample data were, therefore, used for continuity analysis, but were not used for mineral resource estimation.

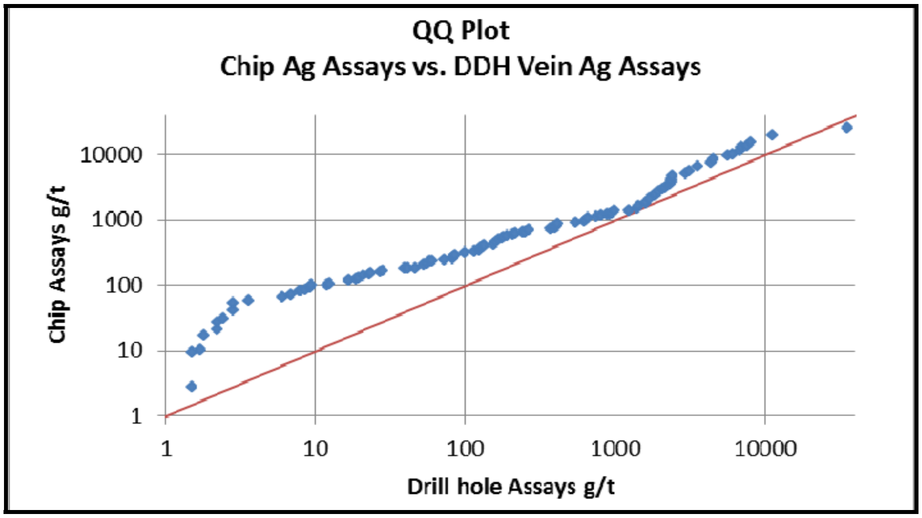


Figure 14-26: Q-Q Plot of Chip and Drill Hole Silver Assay Sample Data (SRK, 2011)

Summary statistics were compiled for the composite data, both for the defined Luck Queen vein and for a secondary splay identified by Alexco (Table 14-12). A total of 66 composites were derived for the Lucky Queen vein, and 15 composites for the secondary splay. An additional five composites averaging 1,591 gpt silver have been identified by Alexco, but were not assigned to the primary Lucky Queen vein or the secondary splay. Correlation analysis between elements indicates a strong correlation between silver and lead, with a correlation coefficient of 0.62.

Table 14-12: Composite Data Summary Statistics for the Lucky Queen Mine

Type	Statistic	Ag (gpt)	Au (gpt)	Pb (ppm)	Zn (ppm)
Total Composites	Number of Samples	81	81	81	81
	Average	814	0.14	17,909	12,080
	Minimum	0.2	0.001	2,327	44
	Maximum	13,998	3.00	303,963	210,100
	Standard Deviation	1,929	0.375	42,651	31.353
	Coefficient of Variation	2.4	2.8	2.4	2.6
Vein Composites	Number of Samples	66	66	66	66
	Average	960	0.161	20,831	13,944
	Minimum	0.6	0.001	32	44
	Maximum	13,998	3.00	303,963	210,010
	Standard Deviation	2,098	0.412	46,265	34,315
	Coefficient of Variation	2.2	2.6	2.2	2.5
Splay Composites	Number of Samples	15	15	15	15
	Average	174	0.022	5,054	3,877
	Minimum	0.2	0.001	23	116
	Maximum	2,125	0.155	60,714	27,195
	Standard Deviation	547	0.040	15,496	7,862
	Coefficient of Variation	3.2	1.8	3.1	2.0

3D continuity analysis was conducted on the composite data and underground chip sample data for the Lucky Queen vein. Down-hole and directional un-transformed and normal-scores transformed and normalized experimental semi-variograms were examined for silver, with the horizontal and across-strike directions aligned with the modelled vein orientation (Table 14-13)

Rotation was defined by the GEMS ZYZ convention within the rotated block model coordinate space. Due to the spatial distribution of the data, only a strike experimental semi-variogram could be satisfactorily modelled, and the range of the resulting normal-scores experimental semi-variogram was used to define sample selection requirements and classification criteria.

Table 14-13: Modelled Semi-Variogram for Silver

Direction	Experimental Semi-Variogram	Range
Nugget	0.2	
Sill 1	0.2	12
Sill 2	0.6	100

14.8.6 Statistical Analysis and Variography for the Flame & Moth Deposit

Summary statistics were compiled for the composite data for the Flame & Moth veins (Table 14-14). A total of 71 composites were derived for the Christal zone, and 114 composites for the Lightning zone.

Due to the limited number of samples in each of the Christal and Lightning zones, experimental semi-variograms could not be generated for silver, lead, zinc, or gold from composite grade data for these veins.

Table 14-14: Composite Data Summary Statistics for the Flame & Moth Deposit

Zone	Statistic	Ag (gpt)	Ag Capped (gpt)	Au (gpt)	Pb (ppm)	Pb Capped (ppm)	Zn (ppm)	Zn Capped (ppm)
Christal	Number of Samples	105		105	105	105	105	105
	Average	372.93		0.34	12,567.76	12,370.08	31,803.49	31,803.49
	Minimum	3.4		0	35.8	35.8	73.1	73.1
	Maximum	2,955.00		2.7	170,756.00	150,000.00	179,140.20	179,140.20
	Standard Deviation	523.3		0.5	24,000.40	22,749.60	35,658.00	35,658.00
	Coefficient of Variation	1.4		1.38	1.91	1.84	1.12	1.12
Lightning V1	Number of Samples	234	234	234	234	234	234	234
	Average	489.94	458.38	0.38	16,791.02	16,320.89	59,321.20	57,984.13
	Minimum	1	1	0	13.2	13.2	11	11
	Maximum	6,774.80	3000	3.2	247,700.00	150,000.00	299,000.00	200,000.00
	Standard Deviation	794.9	601.99	0.5	28,159.90	25,021.40	59,269.00	55,091.60
	Coefficient of Variation	1.62	1.31	1.29	1.68	1.53	1	0.95
Lightning V2	Number of Samples	45	45	45	45	45	45	45
	Average	502.28	498.8	0.27	14,997.81	14,997.81	45,801.63	45,801.63
	Minimum	0.9	0.9	0	28	28	425.1	425.1
	Maximum	3,156.30	3000	1.4	60,345.70	60,345.70	170,894.20	170,894.20
	Standard Deviation	589.8	574.41	0.3	14,312.80	14,312.80	41,991.60	41,991.60
	Coefficient of Variation	1.17	1.15	1.02	0.95	0.95	0.92	0.92

14.9 Block Model and Grade Estimation

14.9.1 Block Model and Grade Estimation for the Bellekeno Mine

A rotated block model was constructed to cover the entire extent of the mineralized veins. The block model includes separate submodels for silver, lead, zinc, and gold grade estimates, as well as specific gravity, classification criteria, validation estimates, and a calculated block value. A block percentage model was used to accurately determine volume and tonnage values based on the supplied vein wireframes by Alexco. The geometrical parameters of the block model are summarized in Table 14-15.

Table 14-15: Block Model Location and Setup (ISATIS convention)

Description	Easting (X)	Northing (Y)	Elevation (Z)
Block model origin (NAD 83 Zone 8N)	486,450	7,086,000	750
Block dimensions (metres)	2	2	2
Number of blocks	125	750	275
Rotation (degree)		32° (clockwise)	

Grades were interpolated into blocks using an inverse distance estimator (power of two) and search ellipses were set up to parallel the strike and dip of the veins. For silver, lead, zinc, and gold, a two-pass series of expanding search ellipsoids was used for sample selection and estimation.

Composite data used for the estimation was restricted to samples located in the respective veins. Individual block grades were used to calculate a NSR block model. Estimation criteria for each vein zone are summarized in Table 14-16. Blocks were classified as Indicated mineral resources if at least two drill holes and six composites were found within a 30 by 30 m search ellipse. All other interpolated blocks were classified as Inferred mineral resource.

Table 14-16: Search Ellipse Parameters for the Bellekeno Mine

Commodity	Search Pass	ISATIS Rotations			Range			Number of Composites		Max. Samples per hole
		Principal Azimuth	Principal Dip	Intermed Azimuth	X-Rot	Y-Rot	Z-Rot	Min.	Max.	
SW Vein	1	-32	77	0	50	25	20	2	10	2
Ag, Pb, Zn	2	-32	77	0	100	50	20	2	10	2
99 Vein	1	-44	79	0	30	30	30	2	10	2
Ag, Pb, Zn,	2	-44	79	0	60	60	60	2	10	2
East Vein	1	-32	78	0	30	30	30	2	10	2
Ag, Pb, Zn	2				60	60	60			

14.9.2 Block Model and Grade Estimation for the Lucky Queen Mine

A rotated block model was constructed to cover the entire extent of the mineralized veins as defined by Alexco. The block model includes separate submodels for silver, lead, zinc, and gold grade estimates, as well as estimated specific gravity, classification criteria, validation estimates, and a calculated block value. A block percentage model was used to accurately determine volume and tonnage values based on the supplied Alexco vein wireframes. The geometrical parameters of the block model are summarized in Table 14-17.

Table 14-17: Block Model Location and Setup for the Lucky Queen Mine

Description	Easting (X)	Northing (Y)	Elevation (Z)
Block model origin (NAD 83 Zone 8N)	486,900	7,091,300	1,200
Block dimensions (metres)	10	10	10
Number of blocks	70	100	50
Rotation (degree)	-50° counter-clockwise		

An inverse distance estimator (power of two) was used for the estimation of block grades. A two-pass series of expanding search ellipsoids with varying minimum sample requirements was used for sample selection and estimation, with the primary and secondary axes of the search ellipsoid defined by the silver semi-variogram range. Composite data used during estimation were restricted to samples located in their respective domain. Individual block grades were then used to calculate a block model. For the second pass, estimation results were also iteratively queried to ensure that all potential mineral resources within the defined domains were estimated. Estimation criteria are summarized in Table 14-18.

During the first pass, four to 12 composites from two or more drill holes within a search ellipsoid corresponding to 50% of the semi-variogram range were required for the estimation. All blocks estimated during the first pass were classified as Indicated (Table 14-18).

During the second pass, the search ellipse was expanded to ensure that all blocks within the defined vein and splay models were estimated. Between four to 12 composites from one or more drill holes were used for estimation. All blocks estimated during the second pass were classified as Inferred. All splay resources were also classified as Inferred due to the small number of total samples for this domain.

Table 14-18: Search Ellipse Parameters for the Lucky Queen Mine

Estimator	Search Pass	Search Type	Rotation		Search Ellipse Size			Number of Composites		Max. Samples per hole
			Z	Y	X (m)	Y (m)	Z (m)	Min.	Max.	
ID2	1	Ellipse	0°	50°	50	50	10	4	12	3
ID2	2	Ellipse	0°	50°	300	300	60	4	12	0

14.9.3 Block Model and Grade Estimation for the Flame & Moth Deposit

A rotated block model was constructed to cover the entire extent of the mineralized veins as defined by Alexco. The block model includes separate submodels for silver, lead, zinc, and gold grade estimates, as well as estimated specific gravity, classification criteria, validation estimates, and a calculated block value. A block percentage model was used to accurately determine volume and tonnage values based on the supplied Alexco vein wireframes. The geometrical parameters of the block model are summarized in Table 14-19.

Table 14-19: Block Model Location and Setup for the Flame & Moth Deposit

Description	Easting (X)	Northing (Y)	Elevation (Z)
Block Model Origin (NAD 83 Zone 8N)	483550	7086370	920
Block Dimensions (metres)	3	5	5
Number of Blocks	115	165	90
Rotation (degree)	30° clockwise		

Grades were interpolated into blocks using the ID2 method and search ellipses were set up to parallel the strike and dip of the veins. For silver, lead, zinc, and gold, a two-pass series of expanding search ellipsoids was used for sample selection and estimation.

Composite data used for the estimation was restricted to samples located in the respective veins. Individual block grades were used to calculate a block model. Estimation criteria for each vein zone are summarized in Table 14-20. Blocks were classified as Indicated mineral resources if at least two drill holes and six composites were found within a 60 by 60 m search ellipse. All other interpolated blocks were classified as Inferred mineral resource.

Table 14-20: Search Ellipse Parameters for the Flame & Moth Deposit

Commodity	Search Pass	Model Rotations			Range			Number of Composites		Max. Samples per Core Drill Hole
		Principal Azimuth	Principal Dip	Intermed. Azimuth	X-Rot	Y-Rot	Z-Rot	Min.	Max.	
Ag, Pb, Zn, Au	1	40	-35	0	60	60	20	6	12	4
	2	40	-35	0	100	100	40	6	12	4
Density	1	40	-35	0	60	60	20	4	8	3
	2	40	-35	0	100	100	40	4	8	3
	3	40	-35	0	100	100	40	2	8	1

14.10 Model Validation and Sensitivity

14.10.1 Model Validation and Sensitivity for the Bellekeno Mine

The block model was validated visually by the inspection of successive section lines in order to confirm that the block model correctly reflects the distribution of high-grade and low-grade samples. The average composite sample grades for all blocks containing composite samples (informed blocks) were compared to the ID2 estimates using scatter plots. Both Inferred and Indicated blocks were plotted for both zones. The scatter plots for silver, lead, and zinc for blocks in the SW, 99, and East zones are displayed in Figure 14-27, Figure 14-28, and Figure 14-29 shows an acceptable correlation between informed and estimated blocks.

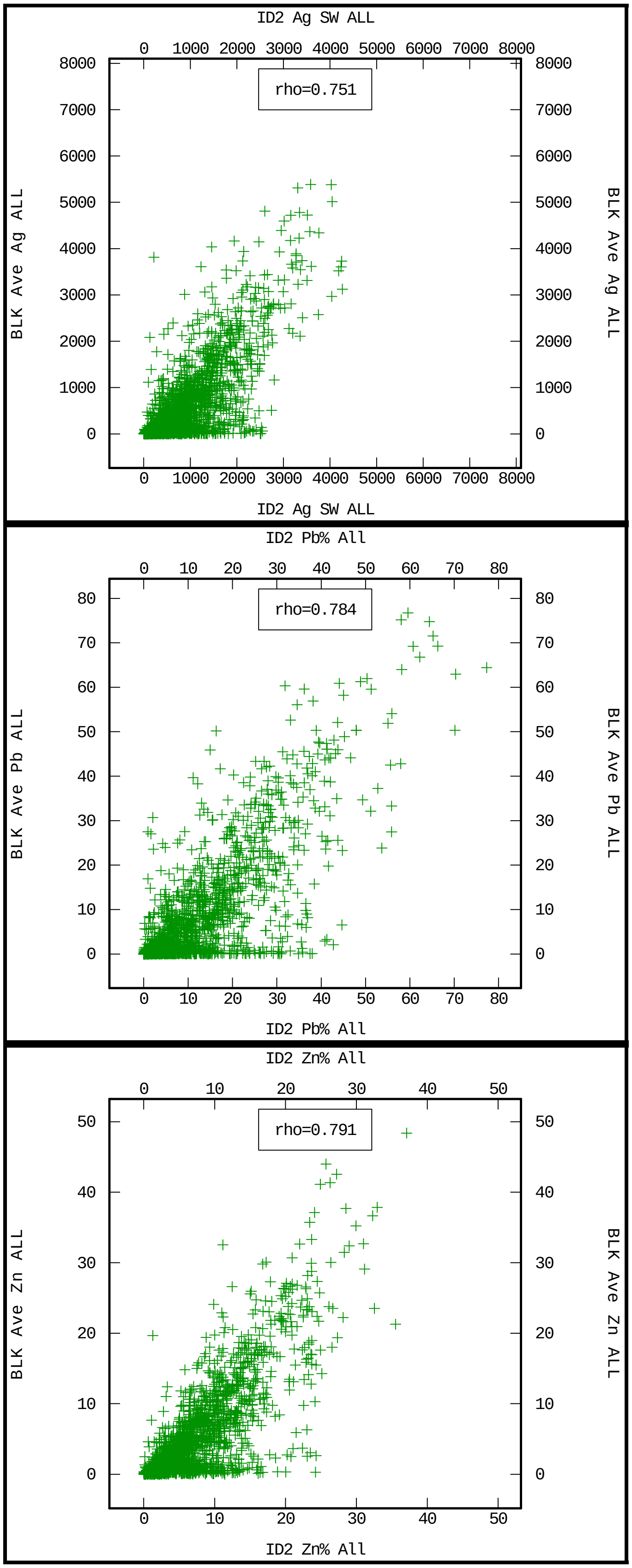


Figure 14-27: Comparison of ID2 and Average Sample Grades for Silver, Lead, and Zinc, 48 Vein Southwest Zone (Alexco, 2013)

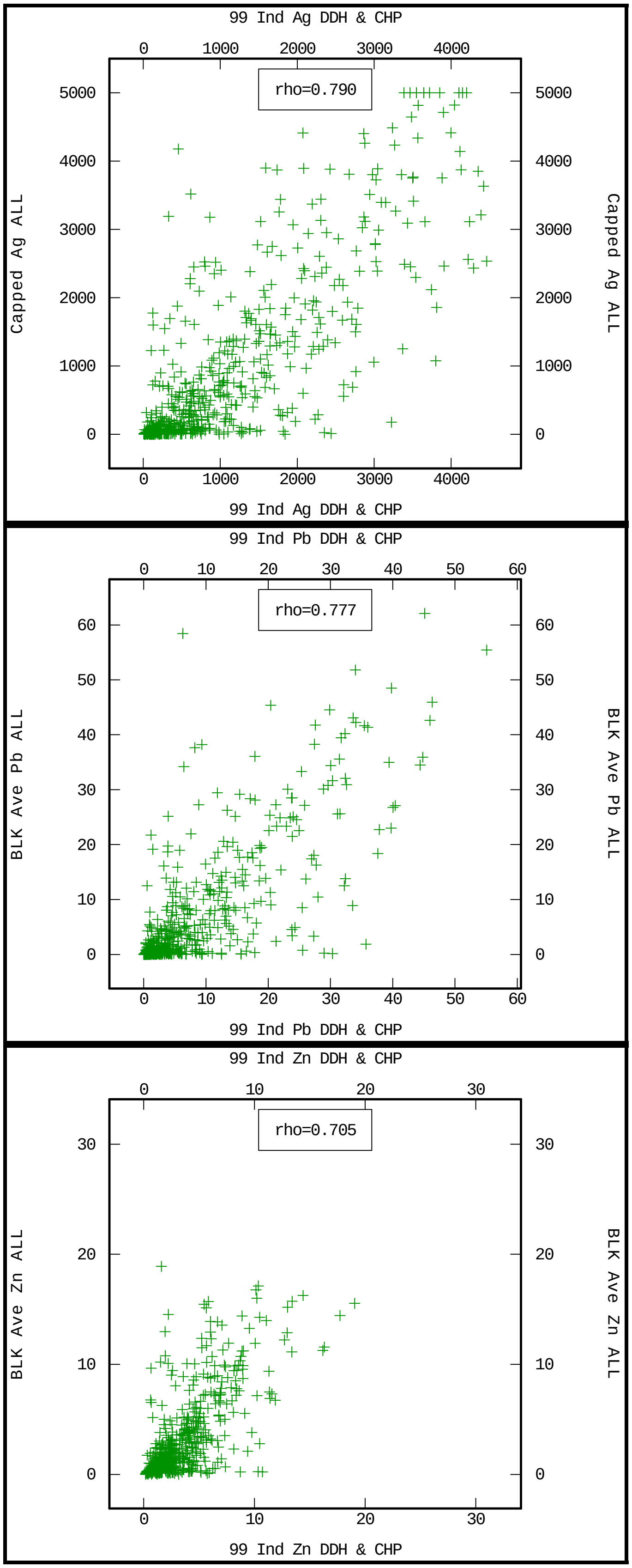


Figure 14-28: Comparison of ID2 and Average Sample Grades for Silver, Lead, and Zinc, 48 Vein, 99 Zone (Alexco, 2013)

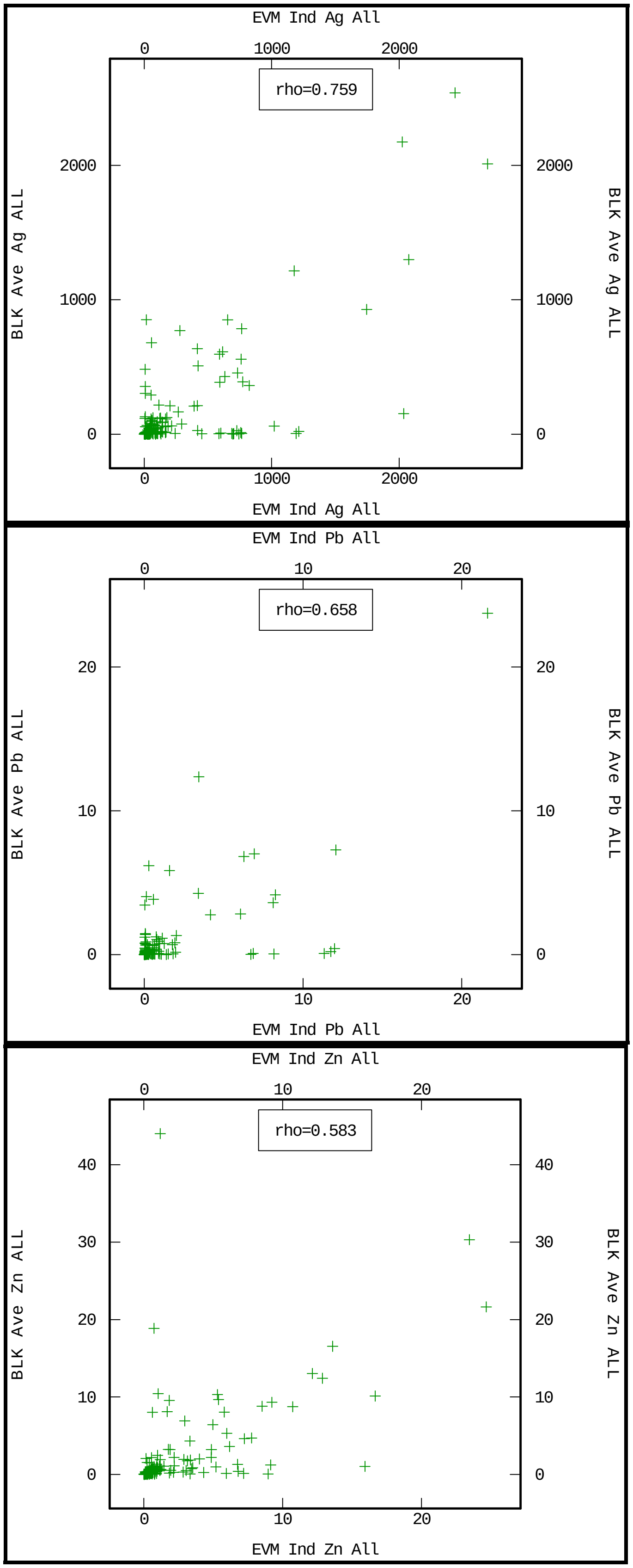


Figure 14-29: Comparison of ID2 and Average sample grades for Silver, Lead, and Zinc, 48 Vein, East Zone (Alexco, 2013)

Table 14-21 tabulates global quantities and grade estimates at different cut-off grades for the Bellekeno deposit. Figure 14-30 presents the effects of increasing cut-offs on the tonnage and grade of the deposit. The reader is cautioned that these figures should not be misconstrued as a mineral resource. The reported quantities and grades are only presented as a sensitivity of the resource model to the selection of cut-off grades.

Table 14-21: Bellekeno Inferred and Indicated Block Model Quantity and Grade Estimates* at Various Cut-Off Values**

Cut-Off	Indicated		Inferred	
(C$)	Tonnes	Ag (gpt)	Tonnes	Ag (gpt)
$200	356473	670	230903	442
$185	365037	658	242634	428
$180	367934	656	246445	423
$160	379177	640	263052	405
$140	391963	623	279851	387
$120	407438	604	296204	371
$100	426986	581	313408	355

* The reader is cautioned that the figures presented in this table should not be misconstrued as a Mineral Resource Statement. The reported quantities and grades are only presented to show the sensitivity of the resource model to the selection of a cut-off grade.

** C$ values calculated at 1C$ = 1US$

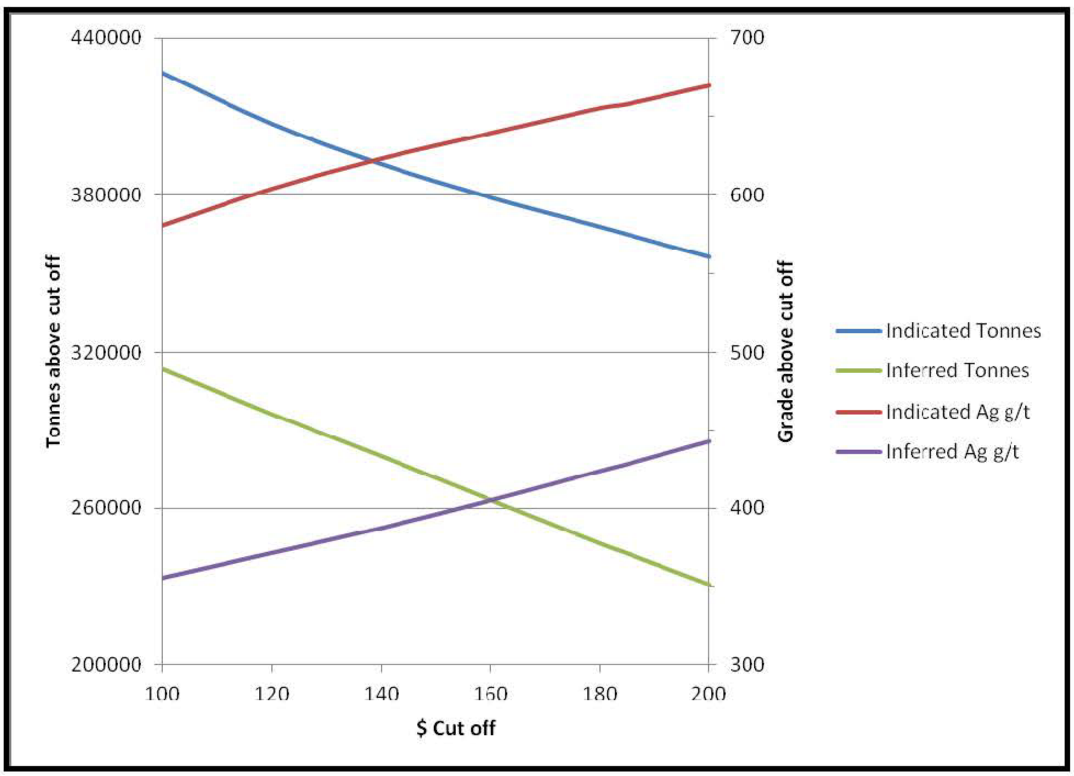


Figure 14-30: Grade Tonnage Curve for Bellekeno (Alexco, 2013)

14.10.2 Model Validation and Sensitivity for the Lucky Queen Mine

The block model was validated visually by the inspection of successive section lines in order to confirm that the block model correctly reflects the distribution of high-grade and low-grade samples. Trend analysis for the Lucky Queen mineral resource estimate demonstrates a minimal global bias and slight smoothing of the inverse distance estimates as compared to a nearest neighbor (NN) estimates, and correctly reflects grade trends along the strike of the deposit (Figure 14-31). An additional validation check was completed by comparing the undiluted inverse distance estimates to undiluted nearest neighbour estimates generated using the same search criteria and tabulated at a zero cut-off (Table 14-22). The observed difference between two models average block estimates are a function of the sharp grade drop immediately adjacent to the high-grade core of the vein.

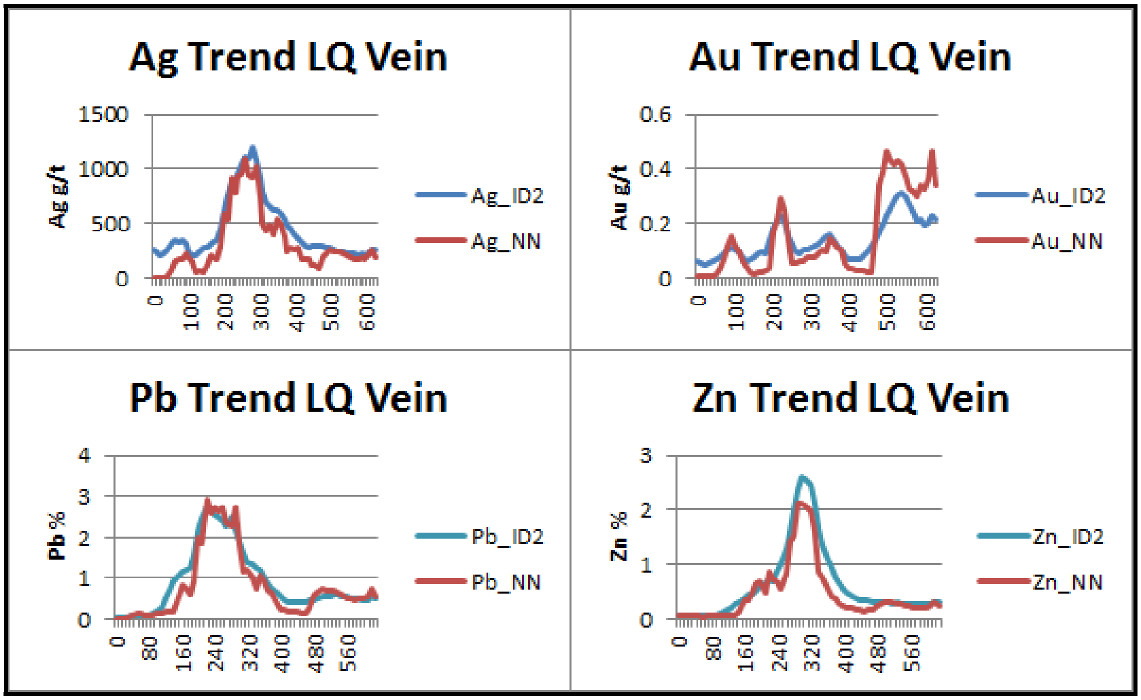


Figure 14-31: Swath Comparison of ID2 and NN Estimation (SRK, 2011)

Table 14-22: Nearest Neighbour Block Model Validation

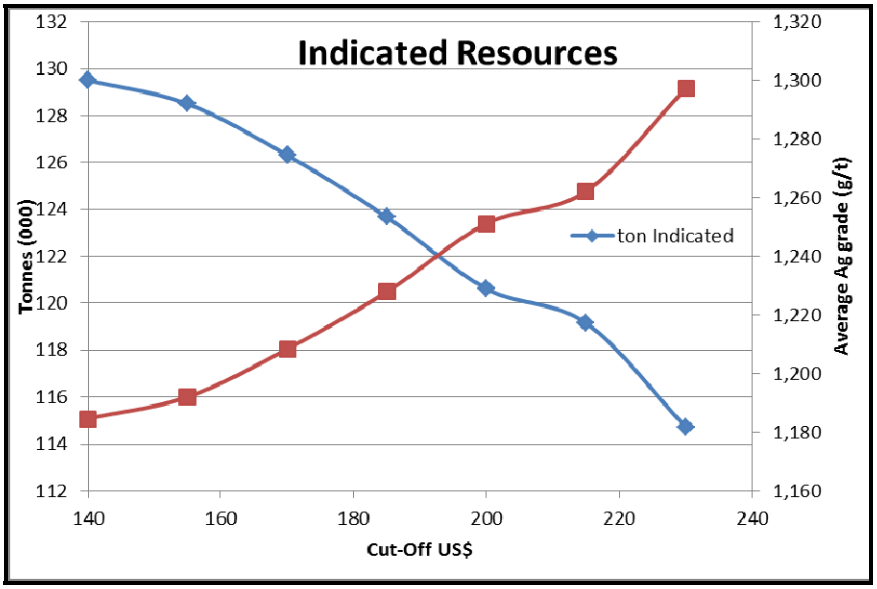
Variable	Inverse Distance Block Average	Nearest Neighbour Block Average
Ag (gpt)	545	452
Au (gpt)	0.14	0.15
Pb (%)	1.22	1.14
Zn (%)	0.82	0.70

The Lucky Queen mineral resources are not sensitive to the selection of a cut-off grade. Table 14-23 shows the global quantities and grade estimates at different cut-off grades for the Lucky Queen vein and Figure 14-32 represents the effects of increasing cut-off grades on the tonnage and grade of the Lucky Queen deposit. The reader is cautioned that these figures should not be misconstrued as a mineral resource. The reported quantities and grades are only presented as a sensitivity of the resource model to the selection of cut-off grades.

Table 14-23: Lucky Queen Mine Indicated and Inferred Block Model Quantity and Grade Estimates* at Various Cut-off Values

Cut-Off (C$)	Indicated Tonnes	Ag (gpt)	Inferred Tonnes	Ag (gpt)
$230	115,000	1,297	121,000	633
$215	119,000	1,262	133,000	607
$200	121,000	1,250	142,000	590
$185	**124,000**	**1,227**	**152,000**	**571**
$170	126,000	1,207	166,000	546
$155	128,000	1,191	186,000	516
$140	130,000	1,183	212,000	482

* The reader is cautioned that the figures presented in this table should not be misconstrued as a Mineral Resource Statement. The reported quantities and grades are only presented to show the sensitivity of the resource model to the selection of a cut-off grade.



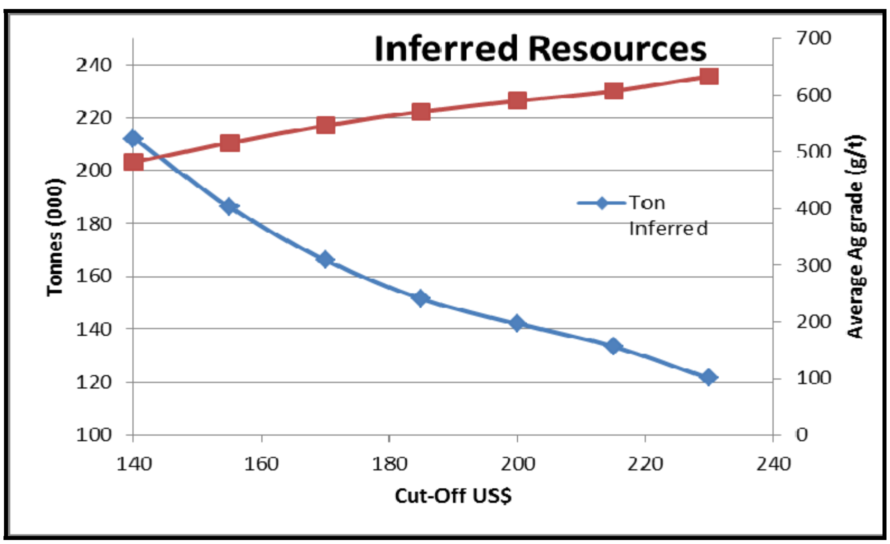


Figure 14-32: Grade Tonnage Curve for Lucky Queen (SRK, 2011)

14.10.3 Model Validation and Sensitivity for the Flame & Moth Deposit

The block model was validated visually by the inspection of successive section lines in order to confirm that the block model correctly reflects the distribution of high-grade and low-grade samples. The average composite sample grades for all blocks containing composite samples (informed blocks) were compared to the ID2 estimates using scatter plots. Due to the small number of informed blocks, both Inferred and Indicated blocks were plotted for both zones. The scatter plots for silver, lead, zinc, and gold for blocks in the Christal zones are displayed in Figure 14-33 and show an excellent correlation between informed and estimated blocks.

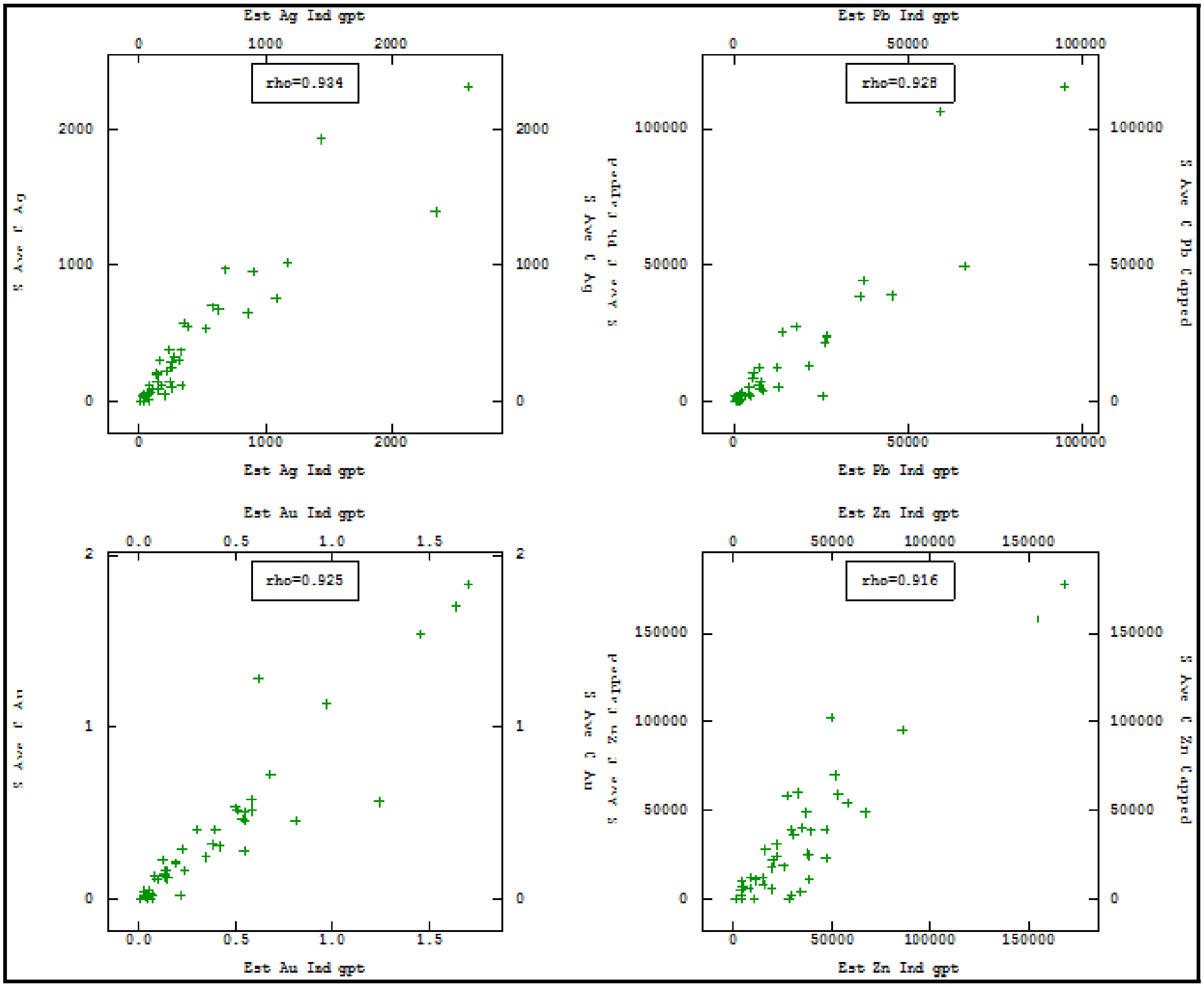


Figure 14-33: Comparison of ID2 and Average Sample Grades for Christal Zone (Alexco, 2013)

Table 14-24 tabulates global quantities and grade estimates at different cut-off values for the Flame & Moth deposit.

Table 14-24: Flame & Moth Deposit Indicated and Inferred Block Model Quantity and Grade Estimates* at Various Cut-Off Values**

Cut-Off (C$)	Indicated Tonnes	Indicated Ag (gpt)	Inferred Tonnes	Inferred Ag (gpt)
$130	1,486,000	488	168,000	250
$185	**1,378,000**	**516**	**107,000**	**313**
$230	1,278,000	543	82,000	356
$260	1,213,000	561	71,000	379
$300	1,124,000	587	57,000	414

* The reader is cautioned that the figures presented in this table should not be misconstrued as a Mineral Resource Statement. The reported quantities and grades are only presented to show the sensitivity of the resource model to the selection of a cut-off grade.

** C$ values calculated at 1C$ = 1US$

Figure 14-34 presents the effects of increasing the cut-off grade on the tonnage and grade of the deposit. The reader is cautioned that these figures should not be misconstrued as a mineral resource. The reported quantities and grades are only presented as a sensitivity of the resource model to the selection of cut-off grades.

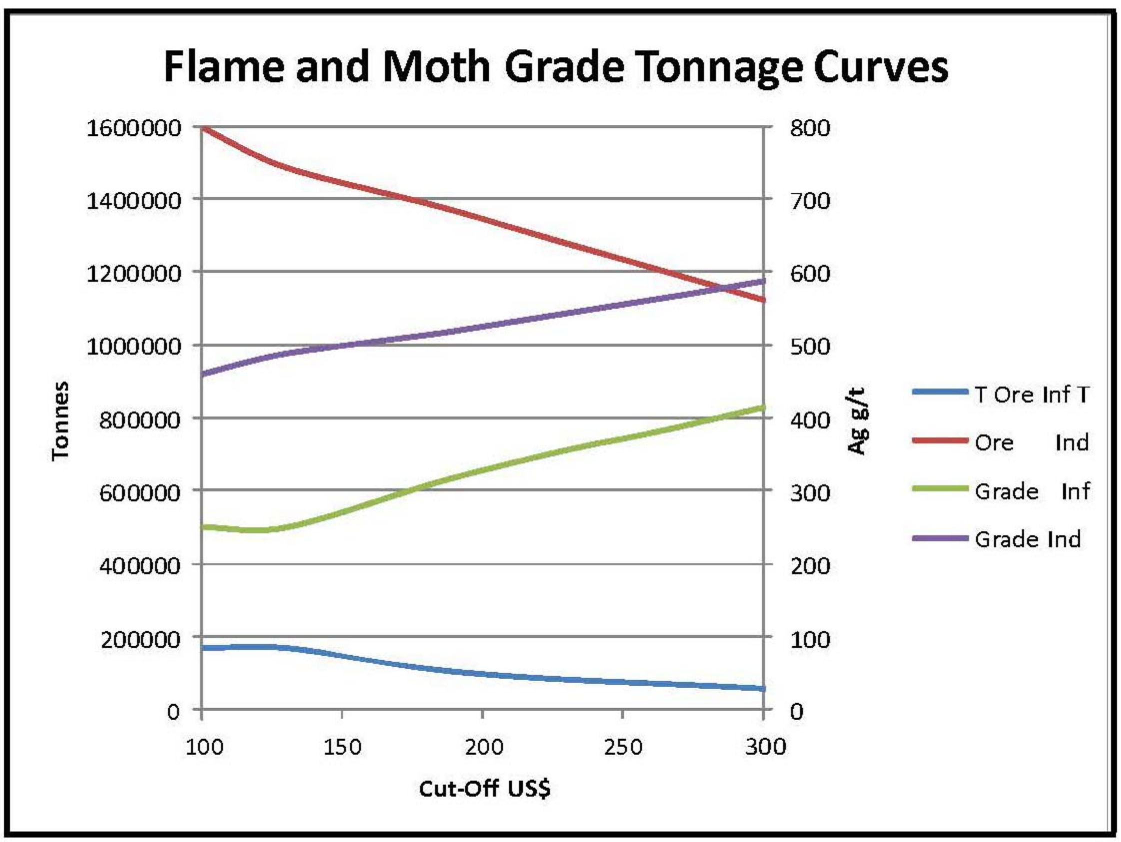


Figure 14-34: Grade Tonnage Curve for the Flame & Moth Deposit (Alexco, 2013)

14.11 Mineral Resource Classification

Mineral resource classification is typically a subjective concept. Industry best practices suggest that resource classification should consider both the confidence in the geological continuity of the mineralized structures, the quality and quantity of exploration data supporting the estimates, and the geostatistical confidence in the tonnage and grade estimates. Appropriate classification criteria should aim at integrating these concepts to delineate regular areas at similar resource classification.

SRK is satisfied that the geological modelling honours the current geological information and knowledge. The location of the samples and the assay data are sufficiently reliable to support resource evaluation.

Generally, for mineralization exhibiting good geological continuity investigated at an adequate spacing with reliable sampling information accurately located, SRK considers that blocks estimated during the first estimation run considering full variogram ranges can be classified in the Indicated category within the meaning of the CIM *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2010). For those blocks, SRK considers that the level of confidence is sufficient to allow appropriate application of technical and economic parameters to support mine planning and to allow evaluation of the economic viability of the deposit.

Conversely, blocks estimated during the second pass considering search neighbourhoods set at twice the variogram ranges should be appropriately classified in the Inferred category because the confidence in the estimate is insufficient to allow for the meaningful application of technical and economic parameters or to enable an evaluation of economic viability.

All mineral resource estimates presented in this PEA technical report have been classified within the meaning of the CIM *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2010) by independent QPs as defined by National Instrument 43-101.

The mineral resources were estimated in conformity with the generally accepted CIM *Estimation of Mineral Resources and Mineral Reserves Best Practices Guidelines* (CIM, 2003). Mineral resources may be affected by further infill and exploration drilling that may result in increases or decreases in subsequent resource estimates. Mineral resources may also be affected by subsequent assessments of mining, environmental, processing, permitting, taxation, socio-economic, and other factors.

14.11.1 Mineral Resource Classification for the Bellekeno Mine

Block model quantity estimates, grade estimates, and resource classification for the Bellekeno deposit were prepared by David Farrow, PGeo, of GeoStrat Consulting Services Inc., an independent QP.

GeoStrat considers that the quality of the exploration and production data (confidence in the location and reliability of the assaying results) acquired by Alexco is good and is not a factor that would impact resource classification. The confidence in the underlying data sets support classification of Indicated and Inferred mineral resources. However, there is insufficient information to confirm both the geological and grade continuity with the current level of sampling to support a Measured mineral resource classification.

All blocks estimated in the first estimation run using drill sampling data were classified as Indicated mineral resources and all blocks estimated using the subsequent runs were classified as Inferred. Dr. Gilles Arseneau, PGeo, of SRK reviewed the process.

14.11.2 Mineral Resource Classification for the Lucky Queen Mine

Block model quantity estimates, grade estimates, and resource classification for the Lucky Queen deposit were prepared by F. H. Brown, CPG, PrSciNat, under the supervision of Dr. Gilles Arseneau, PGeo, both independent QPs.

SRK considers that the quality of the exploration data (confidence in the location and reliability of assaying results) acquired by Alexco is good and, therefore, is not a factor that would impact resource classification. The confidence in the underlying data sets support classification of Indicated and Inferred mineral resources. However, there is insufficient information to confirm both the geological and grade continuity with the current level of sampling to support a Measured mineral resource classification.

All blocks estimated in the first estimation run were classified as Indicated mineral resources and all blocks estimated using the second estimation run were classified as Inferred.

14.11.3 Mineral Resource Classification for the Flame & Moth Deposit

Block model quantity estimates, grade estimates, and resource classification for the Flame & Moth deposit were prepared by David Farrow, PGeo, of GeoStat who is an independent QP.

GeoStrat considers that the quality of the exploration data (the confidence in the location and the reliability of the assay results) acquired by Alexco is good and, therefore, is not a factor that would impact resource classification. The confidence in the underlying data sets support classification of Indicated and Inferred mineral resources. However, there is insufficient information to confirm both the geological and grade continuity with the current level of sampling to support a Measured mineral resource classification.

Blocks were classified as Indicated mineral resources if at least two drill holes and six composites were found within a 60 by 60 m search ellipse. All other interpolated blocks were classified as Inferred mineral resource.

14.12 Mineral Resource Statements

CIM *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2010) defines a mineral resource as:

"[A] concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, coal, and industrial minerals in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge."

The "reasonable prospects for economic extraction" requirement generally implies that the quantity and grade estimates meet certain economic thresholds and that the mineral resources are reported at an appropriate cut-off grade that takes into account extraction scenarios and processing recoveries.

The block model quantities and grade estimates were assessed to identify the portions of the Bellekeno, Lucky Queen and Flame & Moth deposits having "reasonable prospects for economic extraction" considering underground mining, based on parameters summarized in Table 14-25, Table 14-26, and Table 14-27.

Table 14-25: Assumptions Considered for Preparing the Bellekeno Mineral Resource Statement (Alexco, 2012)

Parameter	Value	Unit
Silver price	$24.00	US$ per ounce
Gold price	$1,400	US$ per ounce
Lead price	$0.90	US$ per pound
Zinc price	$1.00	US$ per pound
Exchange rate	$0.96	US$/C$
Cut-off value	$185	US$ per tonne mined
Process recovery silver	96%	percent
Process recovery gold	72%	percent
Process recovery lead	97%	percent
Process recovery zinc	88%	percent

Table 14-26: Assumptions Considered for Preparing the Lucky Queen Mineral Resource Statement (SRK, 2011)

Parameter	Value	Unit
Silver price	$18.50	US$ per ounce
Gold price	$1,100	US$ per ounce
Lead price	$0.90	US$ per pound
Zinc price	$0.95	US$ per pound
Exchange rate	$1.00	US$/C$
Cut-off value	$185	US$ per tonne mined
Process recovery silver	96%	percent
Process recovery gold	72%	percent
Process recovery lead	97%	percent
Process recovery zinc	88%	percent

Table 14-27: Assumptions Considered for Preparing the Flame & Moth Mineral Resource Statement (Alexco, 2013)

Parameter	Value	Unit
Silver price	$24.00	US$ per ounce
Gold price	$1,400	US$ per ounce
Lead price	$0.85	US$ per pound
Zinc price	$0.95	US$ per pound
Exchange rate	$1.00	US$/C$
Cut-off value	$185	US$ per tonne mined
Process recovery silver	96%	percent
Process recovery gold	72%	percent
Process recovery lead	97%	percent
Process recovery zinc	88%	percent

14.12.1 Mineral Resource Statement for the Bellekeno Mine

The Bellekeno silver mine was in operation to the end of August 2013 and as such has demonstrated its amenability to underground extraction.

Commodity prices were provided to GeoStrat by Alexco as representative of its long-term strategic forecast. Metallurgical recoveries were from a previous PEA for the Bellekeno project at the Keno Hill silver district (Wardrop, 2009). Refer to Table 14-28. These metal prices and metallurgical recoveries were used to estimate values (C$ per tonne [/t]) for blocks in the resource block model. Mineral resources for the Bellekeno deposit are tabulated in Table 14-29 and have been reported relative to a cut-off value of C$185.00/t.

Table 14-28: Metal Prices and Metallurgical Recoveries

Commodity	Price	Recovery
Silver	US$ 22.50/oz	96%
Lead	US$0.85/lb	97%
Zinc	US$0.95/lb	88%

Table 14-29: Mineral Resource Statement*, Bellekeno Deposit, GeoStrat Consulting Services Inc. September 30, 2012

Vein	Class	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Ag Oz
SW	Indicated	195,000	602	6.7%	5.7%	3,773,000
	Inferred	136,000	427	4.5%	3.5%	1,871,000
99	Indicated	95,000	760	4.0%	3.5%	2,320,000
	Inferred	20,000	715	4.1%	2.9%	455,000
East	Indicated	75,000	675	3.3%	6.9%	1,635,000
	Inferred	87,000	364	3.4%	8.1%	1,013,000
Total	Indicated	365,000	658	5.3%	5.3%	7,728,000
	Inferred	243,000	428	4.1%	5.1%	3,338,000

* Reported at a cut-off value of C$185.00/t considering metal prices of US$22.50/oz for Ag, US$ 0.85/lb for Pb, and US$ 0.95/lb for Zn; and recovery of 96% for Ag, 97% for Pb, and 88% for Zn. All numbers have been rounded to reflect the relative accuracy of the estimates. Mineral resources are not mineral reserves and have not demonstrated economic viability. Confidence in the estimate of Inferred mineral resources is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure.

The Bellekeno mineral resource estimate has an effective date of May 31, 2012, based on a mine survey documenting mining progress up to that date.

SRK notes that since the date of the Bellekeno deposit mineral resource statement, Alexco reports actual tonnes processed from the Bellekeno mine of 124,000 tonnes at average grades of 701 gpt silver, 8.3% lead, and 4.3% zinc (from June 1, 2012 to the temporary shutdown on September 1, 2013).

14.12.2 Mineral Resource Statement for the Lucky Queen Mine

SRK considers that the mineralization evaluated in the Lucky Queen deposit is amenable to underground extraction. Approximately 20% of the Lucky Queen vein as modelled by Alexco has a horizontal width of less than 1.20 m. In order to determine the quantities of material offering reasonable prospects for economic extraction from an underground mining operation, grades for blocks with a horizontal width of less than 1.20 m were adjusted (diluted) to a minimum thickness of 1.20 m assuming zero grade internal dilution.

Commodity prices were provided to SRK by Alexco as representative of its long-term strategic forecast. Metallurgical recoveries were from a previous PEA for the Bellekeno project at the Keno Hill silver district (Wardrop, 2009). Refer to Table 14-30.

Table 14-30: Metal Prices and Metallurgical Recoveries

Commodity	Price	Recovery
Silver	US$ 18.50/oz	96%
Lead	US$0.90/lb	97%
Zinc	US$0.95/lb	88%
Gold	US$1,100.00/oz	72%

These metal prices and metallurgical recoveries were used to estimate values (C$/t) for blocks in the resource block model.

Mineral resources for the Lucky Queen deposit are shown in Table 14-31 and have been reported relative to a cut-off value of C$185.00/t.

Table 14-31: Mineral Resource Statement*, Lucky Queen Deposit, SRK Consulting (Canada) Inc., July 27, 2011

Vein	Class	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Au (gpt)
Main Lucky Queen	Indicated	124,000	1,227	2.57	1.72	0.17
Vein	Inferred	133,000	564	1.33	0.89	0.18
Splay	Inferred	17,000	626	1.68	1.21	0.05
Total	**Indicated**	**124,000**	**1,227**	**2.57**	**1.72**	**0.17**
	Inferred	**150,000**	**571**	**1.37**	**0.92**	**0.16**

* Reported at a cut-off value of C$185.00/t considering metal prices of US$18.50/oz for Ag, US$ 0.90/lb for Pb, US$ 0.95/lb for Zn, and US$ 1,100/oz for Au; and recovery of 96% for Ag, 97% for Pb, 887% for Zn and 72% for Au. All numbers have been rounded to reflect the relative accuracy of the estimates. Mineral resources are not mineral reserves and have not demonstrated economic viability. Confidence in the estimate of Inferred mineral resources is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure.

14.12.3 Mineral Resource Statement for the Flame & Moth Deposit

Commodity prices were provided to GeoStrat by Alexco as representative of a consensus long-term strategic forecast. Metallurgical recoveries were from a previous PEA for the Bellekeno project at the Keno Hill silver district (Wardrop, 2009). Refer to Table 14-32.

Table 14-32: Metal Prices and Metallurgical Recoveries

Commodity	Price	Recovery
Silver	US$ 24.00/oz	96%
Lead	US$0.85/lb	97%
Zinc	US$0.95/lb	88%
Gold	US$1,400.00/oz	72%

These metal prices and metallurgical recoveries were used to estimate values (C$/t) for blocks in the resource block model.

Mineral resources for the Flame & Moth deposit are shown in Table 14-33 and have been reported relative to a cut-off value of C$185.00/t.

Table 14-33: Mineral Resource Statement*, Flame & Moth Deposit, GeoStrat Consulting Services Inc., January 30, 2013

Zone	Class	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Au (gpt)
Christal	Indicated	450,000	545	1.74%	3.64%	0.48
	Inferred	57,000	320	1.08%	2.38%	0.28
Lightning	Indicated	829,000	496	1.73%	7.02%	0.40
	Inferred	50,000	302	0.61%	6.27%	0.26
Lightning V2	Indicated	99,000	548	1.61%	3.97%	0.27
	Inferred	1,000	614	1.73%	4.54%	0.12
Total	**Indicated**	**1,378,000**	**516**	**1.72%**	**5.70%**	**0.42**
	Inferred	**107,000**	**313**	**0.86%**	**4.21%**	**0.27**

* Reported at a cut-off value of C$185.00/t US$24.00/oz for Ag, US$ 0.85/lb for Pb, US$ 0.95/lb for Zn, and US$ 1,400/oz for Au; and recovery of 96% for Ag, 97% for Pb, 88% for Zn and 72% for Au. All numbers have been rounded to reflect the relative accuracy of the estimates. Mineral resources are not mineral reserves and have not demonstrated economic viability. Confidence in the estimate of Inferred mineral resources is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure.

14.13 Previous Mineral Resource Estimates

14.13.1 Bellekeno Previous Resource Estimates

In its initial exploration efforts on the Keno Hill silver district, Alexco targeted the historical resources documented at the Bellekeno deposit by validating and confirming the existence of the polymetallic silver mineralization. SRK, in conjunction with Alexco, produced an initial Mineral Resource Statement for the Bellekeno deposit on November 10, 2007, which was subsequently updated on January 28, 2008. During 2008, Alexco constructed a new 633-metre decline designed to access the historical Bellekeno workings. This allowed for tight-spaced underground core drilling and updated geologic mapping within all three Bellekeno resource zones (Southwest, 99, and East) during 2009, which was incorporated into a Mineral Resource Statement dated November 9, 2009 (Wardrop, 2009) and is summarized in Table 14-34.

Table 14-34: Consolidated Mineral Resource Statement* for the Bellekeno Deposit, Wardrop Engineering November 9, 2009

Category	Zone	Tonnes	Ag (gpt)	Pb (%)	Zn (%)	Au (gpt)
Indicated	Southwest†	215,800	997	12.6	7.2	0.662
Indicated	99†	91,700	995	7.5	4.2	0.293
Indicated	East‡	93,500	672	3.9	6.9	0.330
Total Indicated		**401,000**	**921**	**9.4**	**6.5**	**0.500**
Inferred	East‡	111,100	320	3.1	17.9	0.340
Total Inferred		**111,100**	**320**	**3.1**	**17.9**	**0.340**

* Mineral resources are not mineral reserves and have not demonstrated economic viability. All figures have been rounded to reflect the relative accuracy of the estimates.

† Reported at a cut-off of C$185/t using metal prices of US$15.25/oz Ag, US$0.675/lb Pb, and US$0.80/lb Zn. Ag and Zn composites not capped. Pb composites capped at 450,000 ppm.

The following metallurgical recoveries were applied: lead 96.9%, zinc 88.4%, gold 71.6% and silver 93.8%.

‡ Reported at a cut-off of C$185/t using metal prices of US$14.50/oz Ag, US$0.60/lb Pb, and US$0.90/lb Zn. Ag and Zn composites not capped. Pb composites capped at 450,000 ppm.

The following metallurgical recoveries were applied: lead 96.9%, zinc 88.4%, gold 71.6% and silver 93.8%.

14.13.2 Flame & Moth Previous Resource Estimates

A previous Mineral Resource Statement was produced by SRK in 2012. The results were detailed in the previous technical report (SRK, 2012) and are summarized in Table 14-35.

Table 14-35: Mineral Resource Statement for the Flame & Moth Deposit, SRK Consulting (Canada) Inc., June 27, 2012

Class	Tonnes	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)
Indicated	759,000	453	0.39	1.73	6.97
Inferred	387,000	312	0.26	1.18	4.06

14.14 Recommendations for Conversion of Mineral Resources into Mineral Reserves

No mineral reserve estimates will be disclosed in this technical report.

15 Mineral Reserve Estimates

No mineral reserve estimates will be disclosed in this technical report.

16 Mining Methods

16.1 Overview

The Keno Hill silver district has long been recognized as a polymetallic silver-lead-zinc vein mining district with characteristics possibly similar to other well-known mining districts in the world. Examples of this type of mineralization include the Kokanee Range (Slocan), British Columbia; Coeur d'Alene, Idaho; and Fresnillo, Mexico.

The Keno Hill silver district is historically known for locally challenging ground conditions encountered in the area that limit the applicable mining methods to fully supported methods with limited spans, such as cut and fill or very small scale longhole, as has been practiced at the Bellekeno mine by Alexco. Shrinkage stoping and square set stoping methods have also been used historically but are not considered viable from safety and human resources perspectives.

16.2 Previous Mining (pre-2006)

The Keno Hill - Galena Hill - Sourdough Hill area has a production history dating to 1913 following the initial discovery of silver in about 1901 at Galena Creek near the present day Silver King mine. Since then, more than 65 deposits and prospects have been identified within the area. Twenty-one of these deposits have had documented silver production in excess of 3,110 kilograms (100,000 ounces) (United Keno Hill Mines Ltd., 1996).

Historically, miners followed veins with small, timbered, tracked drifts. The square set mining method was employed between levels and visually followed the vein one set at a time. Thick sections of vein at times permitted the stopes to be multi-sets wide.

Historic reserves were never substantial and long range production planning was, as a result, restricted by exploration programs and their results. Exploration itself relied heavily on blind drifting and raising on vein structures because of the perceived ineffectiveness of underground core drilling and the difficulty in obtaining good core recovery from vein material and areas of broken ground.

Timber support was used extensively throughout all workings, particularly on vein, where substantial support was required to hold up the incompetent material. There were only a few recorded open longwall stopes where wood stulls provided sufficient support. Shrinkage stoping was used on occasion but no records of performance or stope competence exist.

The maintenance and upkeep of the extensive timber support in the underground workings which was necessary to permit uninterrupted development and production mining, was a major burden on resources and contributed to the cause of the closure in January 1989.

Initial attempts at introducing trackless mining methods in the lower levels of the Bellekeno mine had mixed success due in part to over mucking in bad, wet ground and a failure to achieve the early placement of adequate ground control.

16.2.1 Bellekeno Mine

Historically, underground mining at Bellekeno was completed by drifting on vein, shrinkage stoping, and square set stoping using tracked equipment. All development was supported with square set timbers and timber pole lagging. Few areas were impassable using this method and where instability on the vein was an issue, the heading was abandoned and a bypass was commenced in more competent footwall rocks.

The Bellekeno mine level naming convention is based on the historic imperial level names with 100 level being nominally 100 feet underground. Levels are a nominal 100 feet apart and the larger the number, the deeper the level. The historic mine included levels from 100 to 800 with the deepest current workings at the 960 level.

The most recent mining in the 1980s was completed using an overhand cut and fill method utilizing rubber tired equipment. Support for drifting on the vein (for exploration purposes) was completed using friction anchors and weld-wire mesh, with varying degrees of success in the variable vein conditions. The use of shotcrete was implemented in the final stages before mine closure to successfully mine through the poor ground conditions encountered on vein on the 800 level.

Prior to December 31, 1988, Bellekeno produced 36,545 tonnes of vein material (UKHM, 1996) with average grades of:

- 1,462 gpt silver;
- 9.86% lead;
- 2.26% zinc.

The mine and Keno Hill silver district was placed into care and maintenance in 1989 and remained on care and maintenance apart from some exploration work conducted in the mid-1990's until Alexco acquired the holdings of UKHM in 2006.

16.2.2 Lucky Queen

The Lucky Queen deposit was mined from 1927 to 1932 when mineral inventory was exhausted, producing vein material from two mineralized shoots. Access was originally through an inclined shaft to the 300 level and underground mining was completed by drifting on vein and shrinkage stoping using tracked equipment. All development was supported with square set timbers and timber pole lagging.

The Lucky Queen vein and strike extensions were explored intermittently by surface overburden drilling, trenching, and soil sampling throughout the 1950s, 1960s, 1970s and early 1980s. An exploration drift at the 500 level elevation was collared near the Black Cap prospect by UKHM in 1985-1987. A total of approximately 1,800 m was developed. The drift was designed to come in underneath the historical Lucky Queen workings and included a plan to raise up into the No 2 inclined shaft.

Poor ground conditions around the shaft, combined with difficulty in locating the vein and an urgent need for miners elsewhere in the Keno Hill silver district caused the adit to be abandoned in 1987.

Prior to December 31, 1988, Lucky Queen produced 112,065 tonnes of vein material (UKHM, 1996) with average grades of:

- 3,041 gpt silver;
- 6.95% lead;
- 2.69% zinc.

16.3 Structural Geology

16.3.1 Bellekeno

During the execution of the previous PEA (Wardrop, 2009), a structural investigation and interpretation was completed for the Bellekeno mine area by structural geologist Bruce R. Otto. The following paragraphs (in italics) are excerpts from the report authored by Bruce R. Otto (October 8, 2009) entitled "Structural and stratigraphic relationships at the Bellekeno mine; their control on mineralization grade and thickness and their implications for exploration."

Mr. Otto's initial scope of work was to investigate available data sources and compile a revised structural interpretation for the incorporation with geotechnical findings; provide detail on the structural and geological controls of the uncontrolled caving initiated during mining on the 800 level; and comment on the existence of similar conditions susceptible to caving elsewhere in the Bellekeno mining areas.

Structural Results – 99 Zone

The 48-vein fault forms a 3-dimensionally curviplanar surface that ranges planimetrically in strike from 025° to over 065°, averaging 038° through the extent of mine workings. It moved sinistrally a distance of approximating 35 metres along a 080°/-65° vector. Initial movement of the fault where its strike was north of 38° azimuth formed dilational zones while segments with strikes east of 038° resulted in less dilation, and perhaps transpression.

The mine section occupies the top third of the central quartzite and consists of massive quartzite with interlayers of variably carbonaceous schist and laminated to thin-bedded quartzite. A thick greenstone sill occupies a stratigraphic interval above the east zone and below the 99 zone. The sill occurs near the boundary of a fundamental vertical change in the ratio of quartzite to schist. The section below the sill consists primarily of massive quartzite with only one 12-metre-thick graphitic schist interval. The section above includes multiple intervals of schist that separate massive quartzite units. The 99 zone includes parts of four quartzite intervals separated by three of schist, and that hosting the southwest zone includes a diversity of massive quartzite beds separated by abundant intervals of interbedded schist and thick units of intricately interlayered thin-bedded quartzite and schist.

Bypass Schist

The bypass schist separates the two quartzite members of the East zone. Contact relationships are unclear because it has not yet been mapped at its only exposure, in the 600 footwall bypass drift and formerly mapped exposures in the main 600 drift have been compromised by faulting. Drill logs show that it consists of 12 metres of laminated carbonaceous schist with thinly interlayered and thin-bedded to laminated quartzite. Its base forms the relatively sharp stratigraphic top of the East zone mineralized vein shoot.

KOD Schist

The KOD (Kiss of Death) schist, named for associated severe caving on the 800 level is the first significant unit of schist above the bypass schist in the East zone. It consists of a 4-metre-thick section of strongly graphitic schist with very little interleaved quartzite. The KOD schist lies in sharp contact with the underlying 600 quartzite and grades upward into thin-bedded quartzite-bearing schist and thence gradationally into the overlying 650 quartzite. Where exposed in the 750 decline it is highly foliated and displays a superimposed steeper dipping cleavage that lies at a 20° angle to the primary foliation. It is distinctly more carbonaceous than the other schist intervals, and forms an aquaclude; quartzitic strata directly above generally carry abundant water, generally causing a rain storm wherever workings pass through it.

Vent Raise Schist

The vent raise schist, named for exposures near the vent raise in the 750 decline, is an 8-metre-thick unit consisting of basal graphitic schist grading upward to a section of thin-bedded to laminated fine quartzite with graphitic partings and thence upward to thicker quartzite beds with schistose partings. The basal graphitic schist lies in sharp contact above the thick-bedded sands of the 650 quartzite and its top grades upward into the thicker quartzite beds of the 700 quartzite. The ventilation raise schist passes through the 800 level in the 48 vein hangingwall, where it is associated with unstable backs and caving.

700 Schist

The 700 schist, named for exposures near the 700 level in the 750 decline, is a 5-metre-thick unit consisting of basal graphitic schist with minor laminations and thin beds of quartzite that lies in sharp contact with the underlying 700 quartzite, and grades upward to interlayered thin-bedded quartzite with 1 - 20 cm graphitic schist interlayers, thence gradationally up to medium- to thick-bedded quartzite of the Bankers quartzite. The middle of the 700 schist contains one anomalous thick-bedded interlayer of quartzite.

Previous Instability – 800 Level Self Mining

Ground instability on the 800 level occurred during mining in the late 1980s. Monthly and weekly reports of development document three attempts to access the vein, resulting in "severe overbreak…and extensive cave-in" of the footwall to the 48 vein. Mining during the late 1990s once again entered the vein on the 800 level, applying shotcrete immediately after mucking to support the excavation. An attempt to mine through the self-mined zone from the 700 level resulted in further instability and abandonment of the heading.

> *Severe caving on the 800 level occurs in a lithologically diverse part of the section where a number of structural and stratigraphic geometries coalesce. It is difficult to ascertain the specific cause without the ability to observe the caved area first-hand. Caving occurred primarily in schistose strata, and that is clearly one of the most important factors. Caving occurs along the fault at the northeast edge of the 99 zone where it curves almost imperceptibly to a more easterly strike as it enters the 600 quartzite. Curvature to this geometry would form a region of strike-parallel, or perhaps transpressional displacement. The combination of schistose strata deformed by transpressional displacement may have caused intense fracturing that when mined through could not hold a back. The vertically extensive geometry of caving suggests that schistose strata may have been dragged into the fault zone. The most reasonable explanation for the 800 level caving would therefore involve transpressional faulting of a strongly schistose section, perhaps where broken schist forms the primary proto-lithology of the fault gouge.*
>
> *The propensity to cave in vertically continuous zones therefore appears to require three spatially overlapping factors: the intersection of abundant schistose strata with the 48 vein fault surface, segments of the fault where these strata were draped during early transtensional faulting, and later transpressional displacement.*

The current geological interpretation indicates three schist packages intersecting the 48 vein in the vicinity of the 99 zone. Due to the proximity to transpressional zones, these packages are expected to have similar ground conditions along strike as those intersected during previous mining in the 99 zone.

Figure 16-1 shows the modelled schist packages.

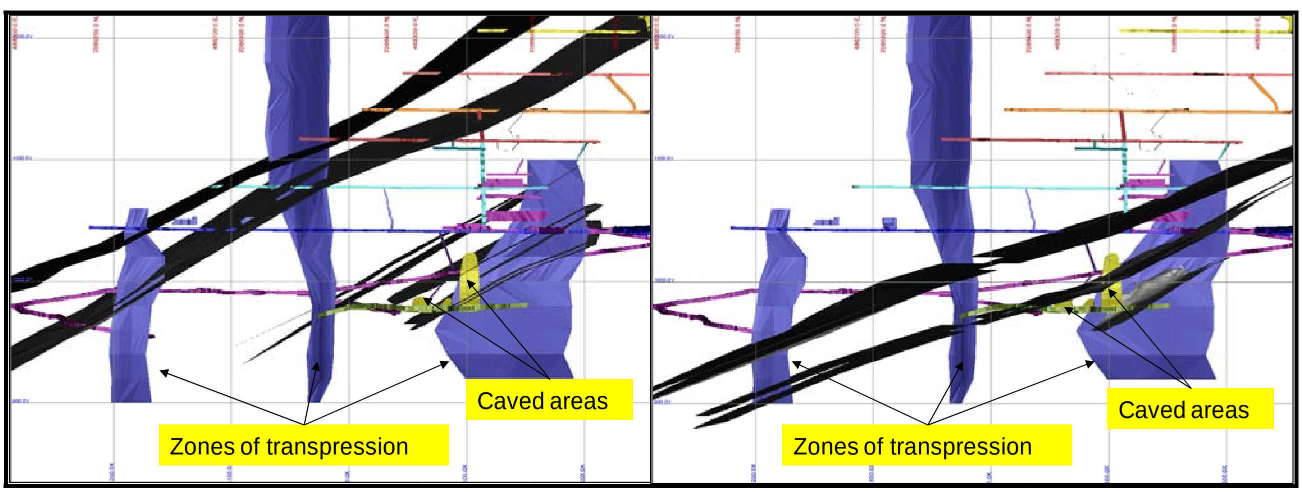


Figure 16-1: Bellekeno 99 Zone: Zones of Transpression and Interpreted Schist Packages - Footwall left; Hangingwall right (Otto, 2009)

Discussion

Based on the results of the structural investigation, schist packages are the primary source of historic ground instabilities at Bellekeno. The fact that most instabilities (including zones of overbreak) have occurred in the schist should be viewed in relation to the limited suite of mining and ground support methods available during the previous mining undertakings. The conditions resulting in the self-mining from the 800 level are specific to the 99 zone. This is the only area where interpreted footwall and hangingwall schist packages exist at similar elevations across the 48 vein fault system, within a zone of transpression. Additional geotechnical factors that may have assisted in the initiation of self-mining are:

- Lack of geological understanding of the Bellekeno area (specifically the 99 zone);
- Untimely installation of ground support;
- Lack of preparedness to handle these types of ground conditions;
- Limited availability of ground support methods/techniques;
- Hydrogeological conditions.

The Bellekeno mine has now been in production again for close to three years. In that time, a great deal of effort has been put into learning how the ground behaves in the 99 and Southwest (SW) zones and the best means of controlling the ground. The operation has been successful in controlling the ground to date and has begun to implement very small scale longhole stopes with a reasonable amount of success.

16.3.2 Lucky Queen and Flame & Moth

No additional structural studies have been conducted at this time for these properties. The lessons learned from Bellekeno mine will be applied to these properties.

16.4 Geotechnical Evaluation

Preliminary geotechnical evaluations have been completed for the Bellekeno mine (including mining the SW and 99 zones) and for the Lucky Queen and Flame & Moth deposits. The evaluations considered the mineralized veins, hangingwall and footwall zones adjacent to planned mining, and general areas for proposed infrastructure development. Based on these assessments, recommendations for mining methods, stope design, and support requirements have been provided.

Information available for the evaluations included drill hole databases, core photographs, Gemcom models, and information collected by SRK during various site visits. All geotechnical descriptions have been interpreted from drill hole intersections of the mining horizons and, where available, underground observations. The Bellekeno evaluation is considered to be an update to geotechnical studies completed by SRK in 2009 (SRK, 2009) in support of the mine operation. The evaluations for Lucky Queen and Flame & Moth are based on data provided by Alexco.

16.4.1 Geotechnical Description – All Areas

The deposits are all hosted within district-scale metasedimentary rock units of the Keno Hill Basal Quartzite Member. While the quartzite is considered to be of fair to good rock mass quality, larger schist packages are often the locus of minor or moderate fault movement often producing gouge and poor rock mass conditions. Graphitic schist in the immediate vein hangingwall/footwall zone is considered to be of very poor to poor rock mass quality and tends to be more problematic especially where water is present. Areas of historic over-break are observed in excavations through schist units.

On vein conditions are considered to be fairly similar across the various deposits. Underground exposures and drill hole core intercepts of the vein exhibit extremely high variability both along strike and dip (on a scale of less than 5 m). The mineralized and gangue components of the vein pinch and swell across the vein width, and the veining is generally considered to be of poor to very poor rock mass quality. Extensive support is utilized to control the ground while developing along the vein. However, excavation exposures tend to be better than those expected from drill hole core review.

16.4.2 Structural Description

Structure – Bellekeno (Southwest, 99, and East Zones)

The structure in the Bellekeno area has been documented previously by Otto (2009) who identified approximately 100 m of hangingwall movement along the vein system. The large displacement combined with large schistose bands has produced adverse ground conditions in two identified locations. Zones of disturbed ground have been modelled through the proposed SW and 99 mining areas in addition to several schist packages. Poor ground conditions should be anticipated in these areas. Refer to Figure 16-2.

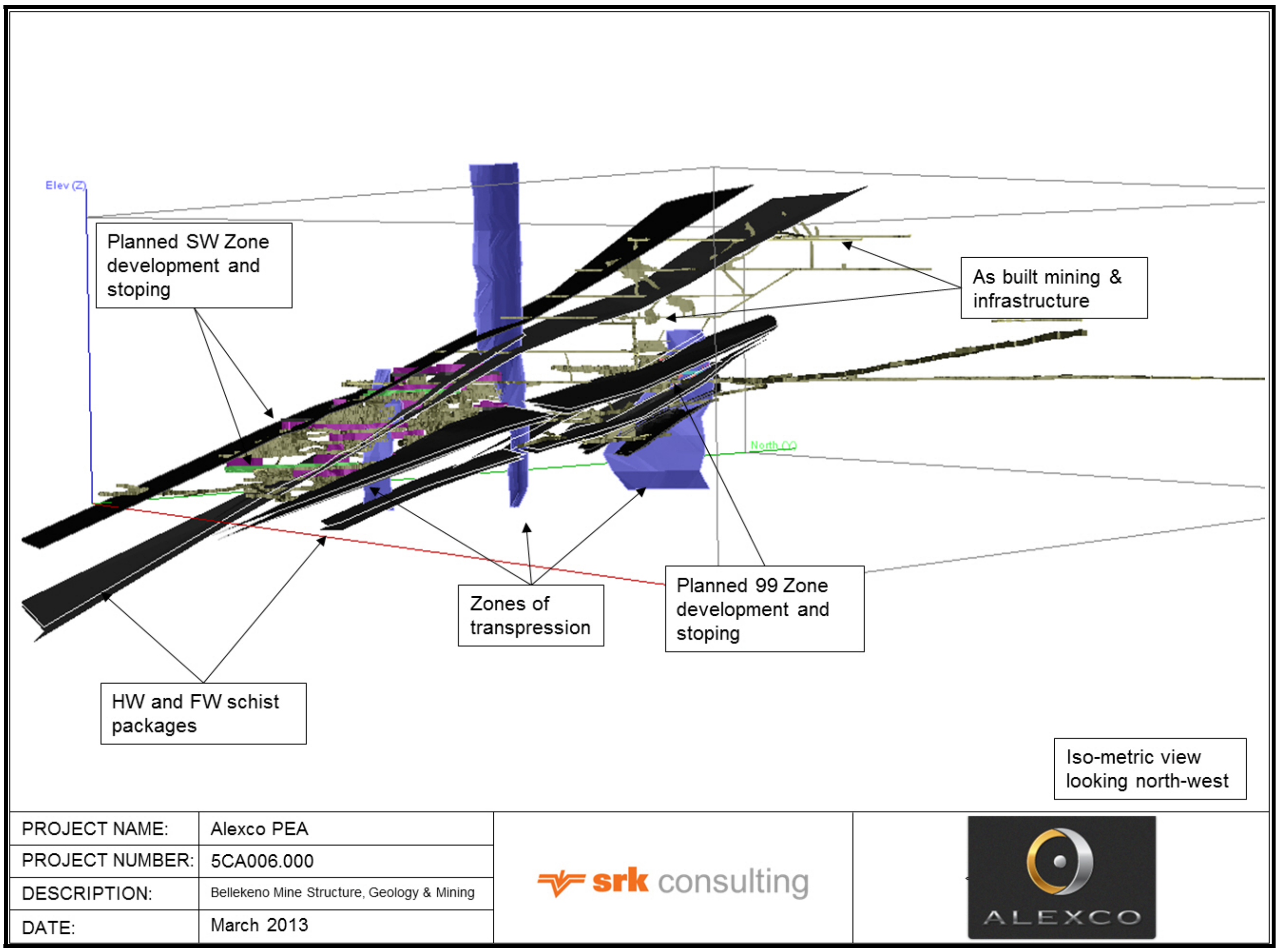


Figure 16-2: Interpreted Structure and Geology for Bellekeno SW, 99, and East Zones (SRK, 2013)

Structure – Lucky Queen

At Lucky Queen, the overall orientation of the faulting rakes very shallowly to the southwest with the thickest fault intercepts coinciding with a schist unit (Figure 16-3). The hangingwall fault intercepts are well constrained along strike by fractured rock intervals sitting further into the hangingwall, while outside faulted zones competent wall rock is generally found right up to the vein structure above and below the faulted section. The fractured/broken rock intercepts are typically quartzite that look shattered, have brittle fracturing, or have partings along siderite or quartz veining associated with mineralization.

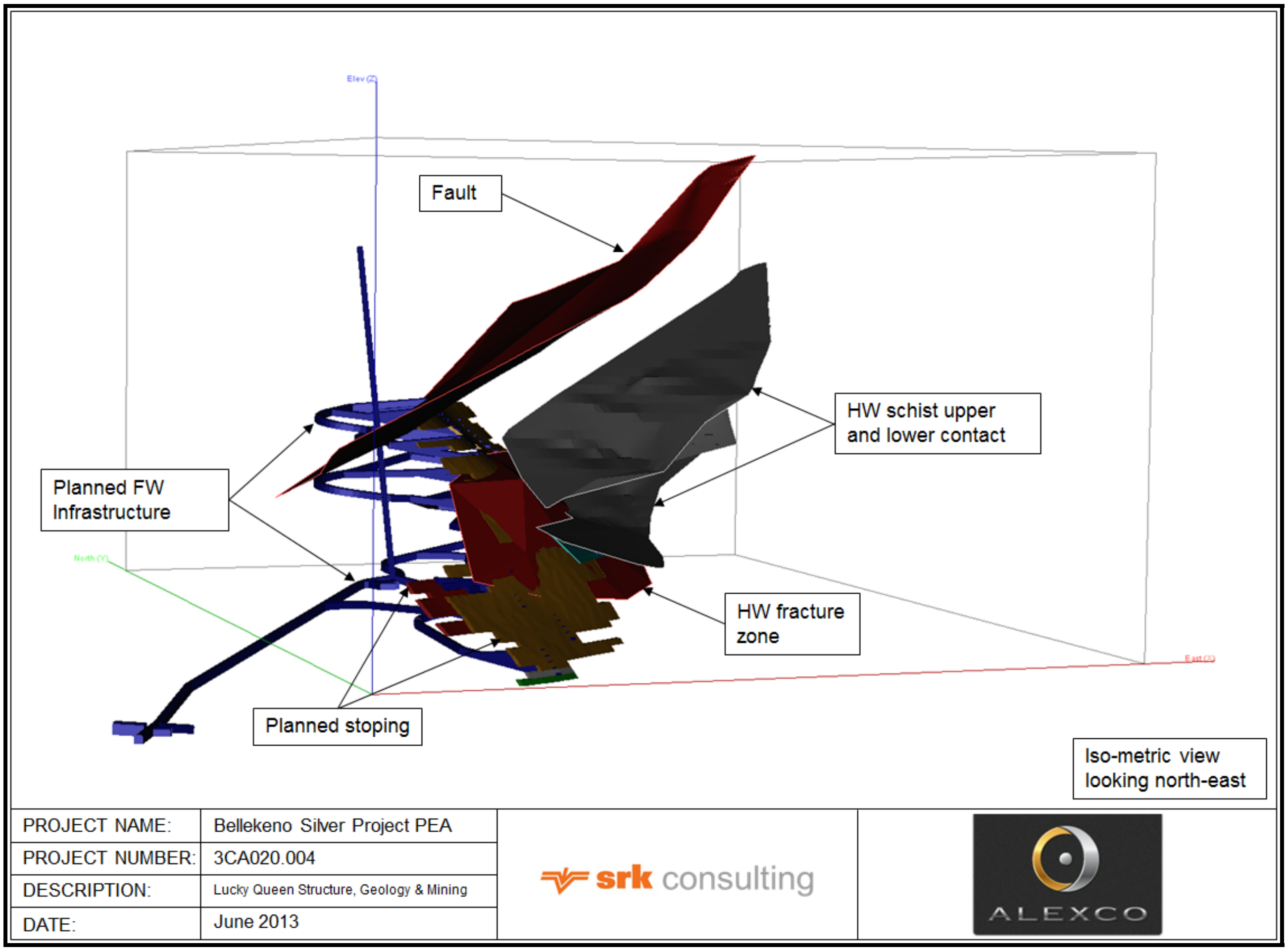


Figure 16-3: Interpreted Structure and Geology for Lucky Queen (SRK, 2013)

Structure – Flame & Moth

The Flame vein is divided into the Lightning and Christal mining areas, separated by the Mill fault. The fault offsets the Christal area in a southeast direction by approximately 120 m (Figure 16-4 and Figure 16-5) and is primarily composed of very poor quality rock, with gouge and breccia materials. The fault thickness varies along strike, but near the proposed development locations the fault is approximately 2 to 4 m wide. Rock in the immediate hangingwall and footwall to the fault is considered to be of poor quality and exhibits conditions similar to those within the fault.

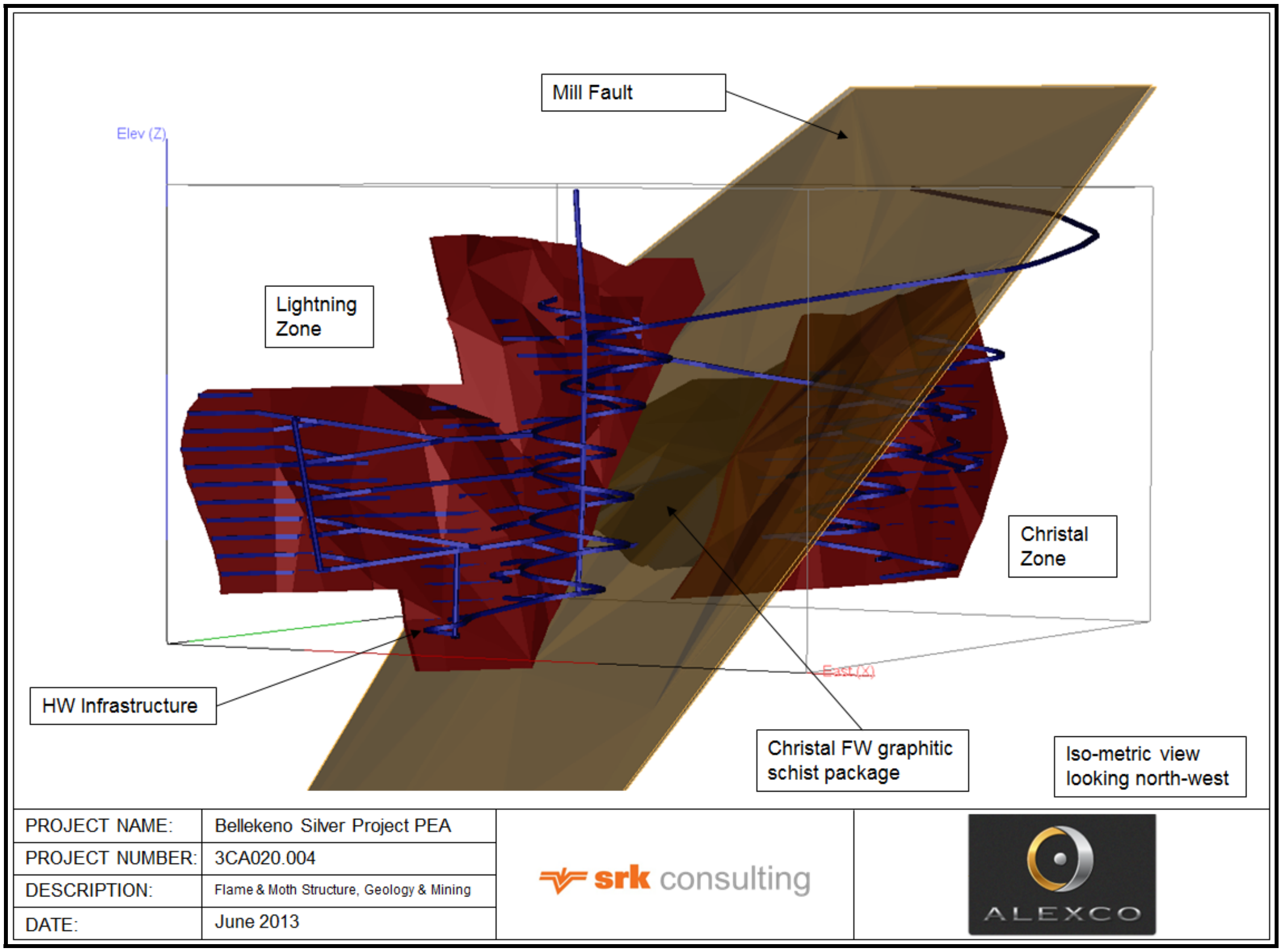


Figure 16-4: Interpreted Structure and Geology for Flame & Moth (SRK, 2013)

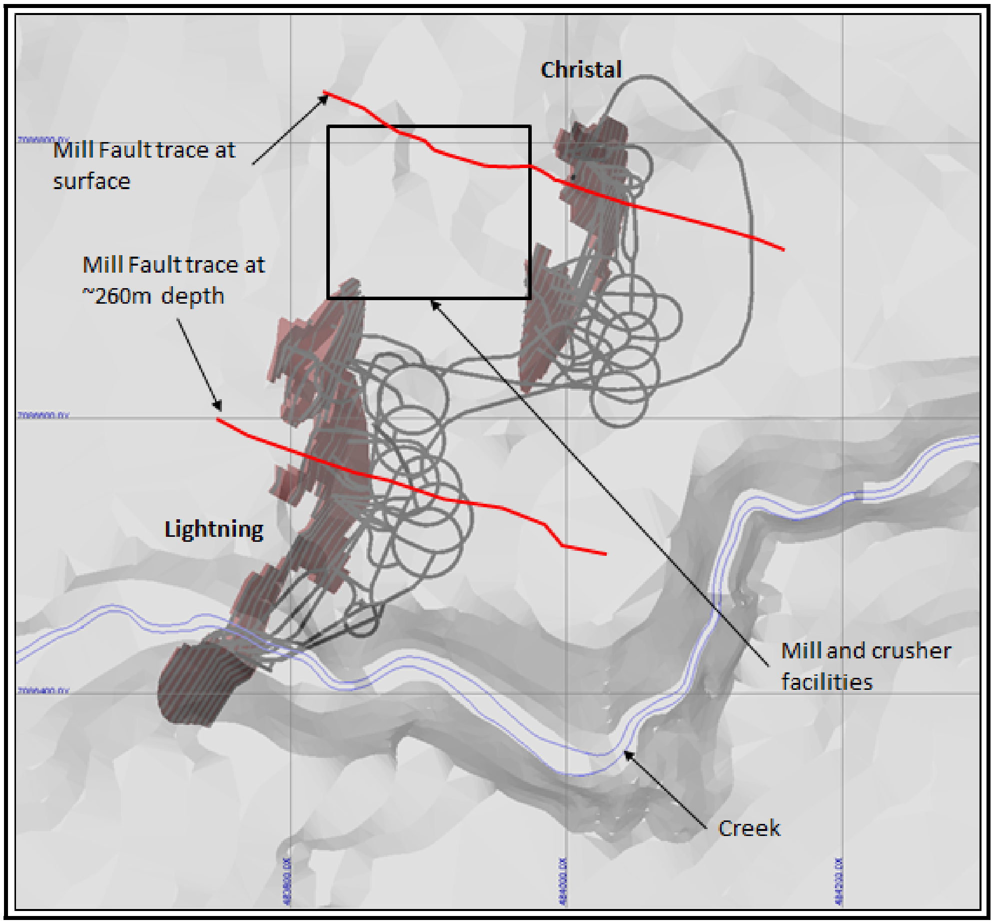
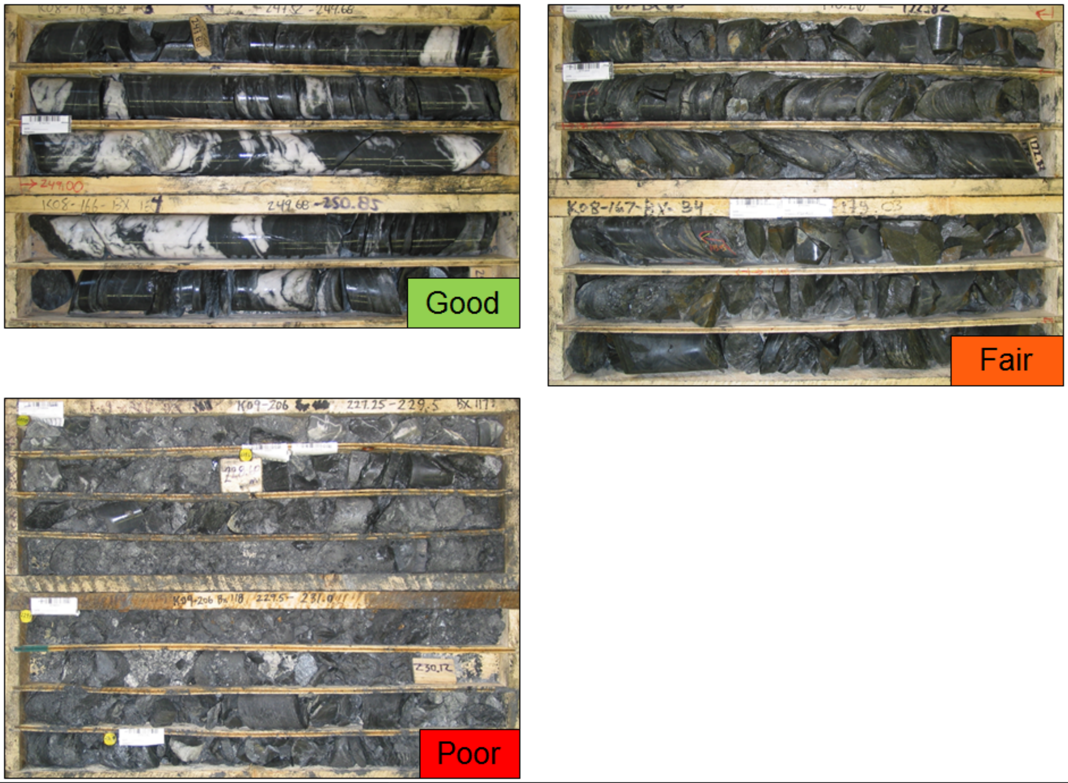


Figure 16-5: Plan View of the Flame & Moth Deposit with Key Features Highlighted (SRK, 2013)

16.4.3 Geotechnical Assessment

The geotechnical assessment utilized drill hole core photo reviews, re-logging of core photos, and detailed reviews of mining intersections to assist in understanding the distribution of likely ground conditions. Simplistic geotechnical domains were developed that reflect the quality of the rock mass relative to the mining methods proposed. Representative ground classes were developed that broadly correlate with the Poor, Fair, and Good domains. Figure 16-6 shows example rock mass conditions at the mining areas.



PROJECT NAME:	Bellekeno Silver Project PEA
PROJECT NUMBER:	3CA020.004
DESCRIPTION:	Representative Rock Mass Conditions
DATE:	June 2013

srk consulting

ALEXCO

Figure 16-6: Representative Rock Mass Conditions Used for Core Re-Logging and Development of Geotechnical Domains (SRK, 2013)

The results of the geotechnical domain review for each mining area are presented in Figure 16-7 through Figure 16-10. The rock mass was separated into hangingwall, mineralized zone, and footwall zones, and then domained in terms of poor, fair, or good rock mass conditions. Planned mining areas without drill hole coverage were assigned fair conditions. Bellekeno is separated into the three separate mining areas: SW zone, 99 zone, and the East zone. The East zone however, is not included in the PEA mine plan.

Main infrastructure is more favourably located in the footwall for the Lucky Queen and Bellekeno deposits. At Flame & Moth, ground conditions within the footwall are less favourable based on well-developed weak schist packages, requiring the location of the infrastructure within the hangingwall of the veins.

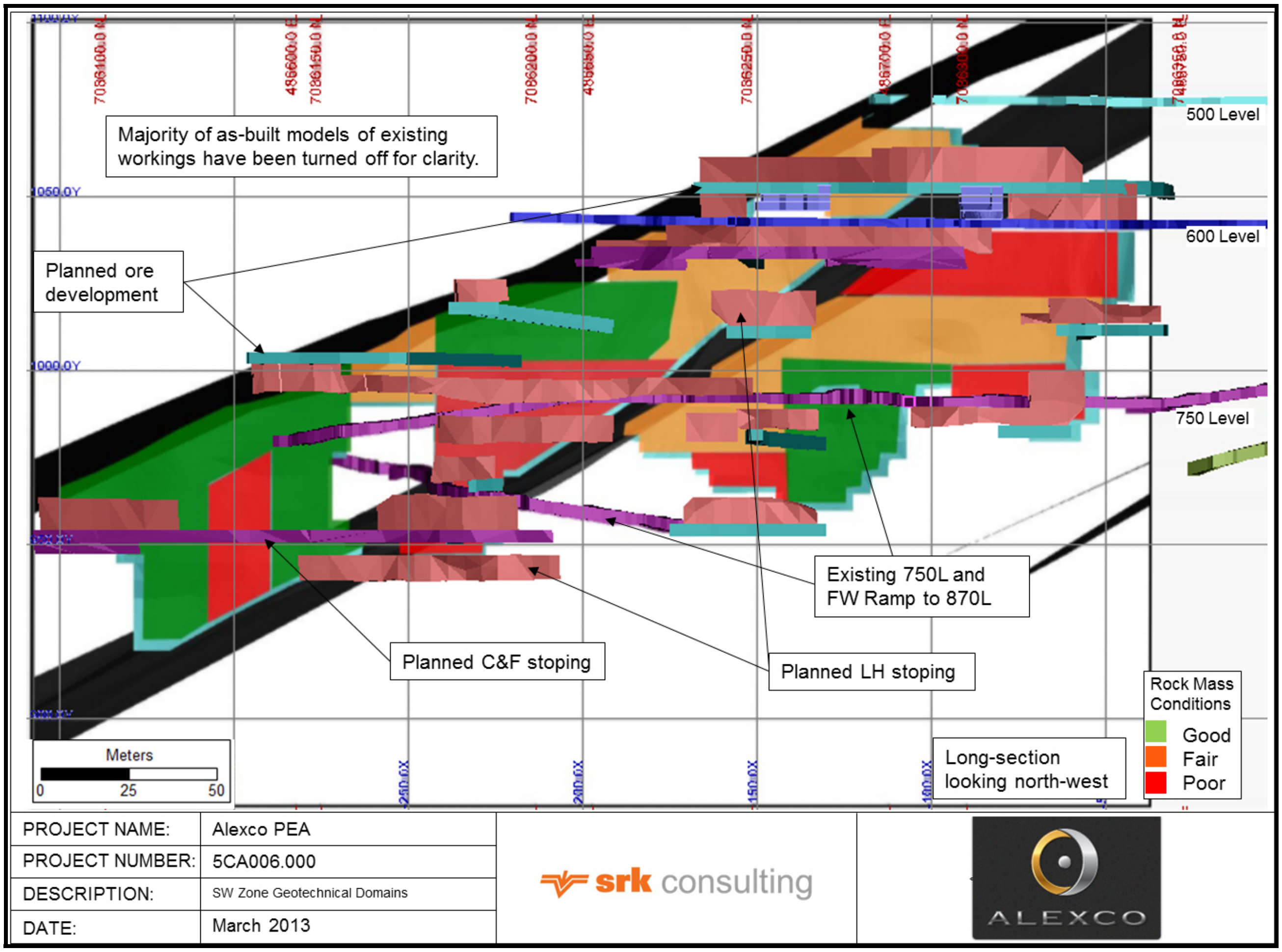
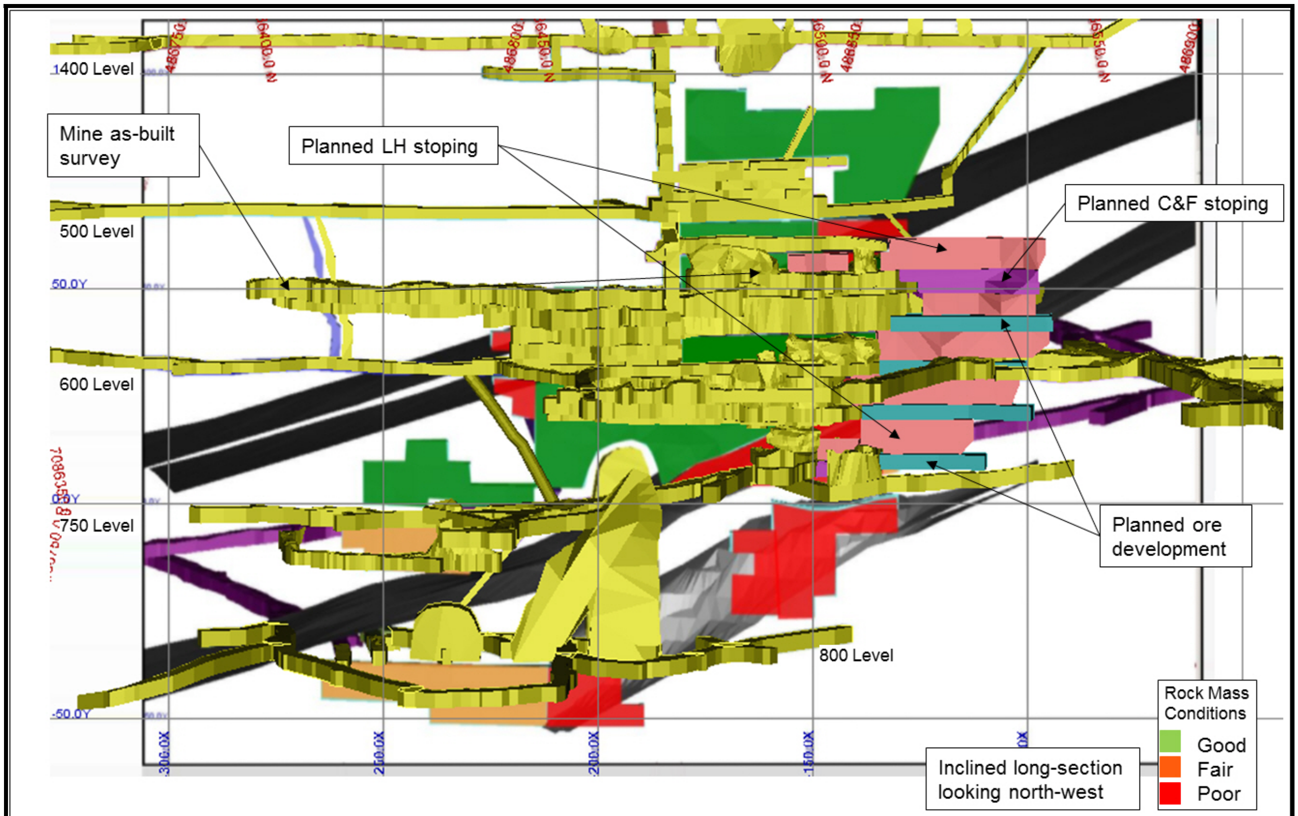


Figure 16-7: Previously Established Bellekeno SW Zone HW Geotechnical Domains Shown Behind Planned Mining Zones - purple (SRK, 2013)



PROJECT NAME:	Alexco PEA	srk consulting	ALEXCO
PROJECT NUMBER:	5CA006.000		
DESCRIPTION:			
DATE:	March 2013		

Figure 16-8: Previously Established Bellekeno 99 Zone Geotechnical Domains Shown Behind Planned Mining Zones - pink (SRK, 2013)

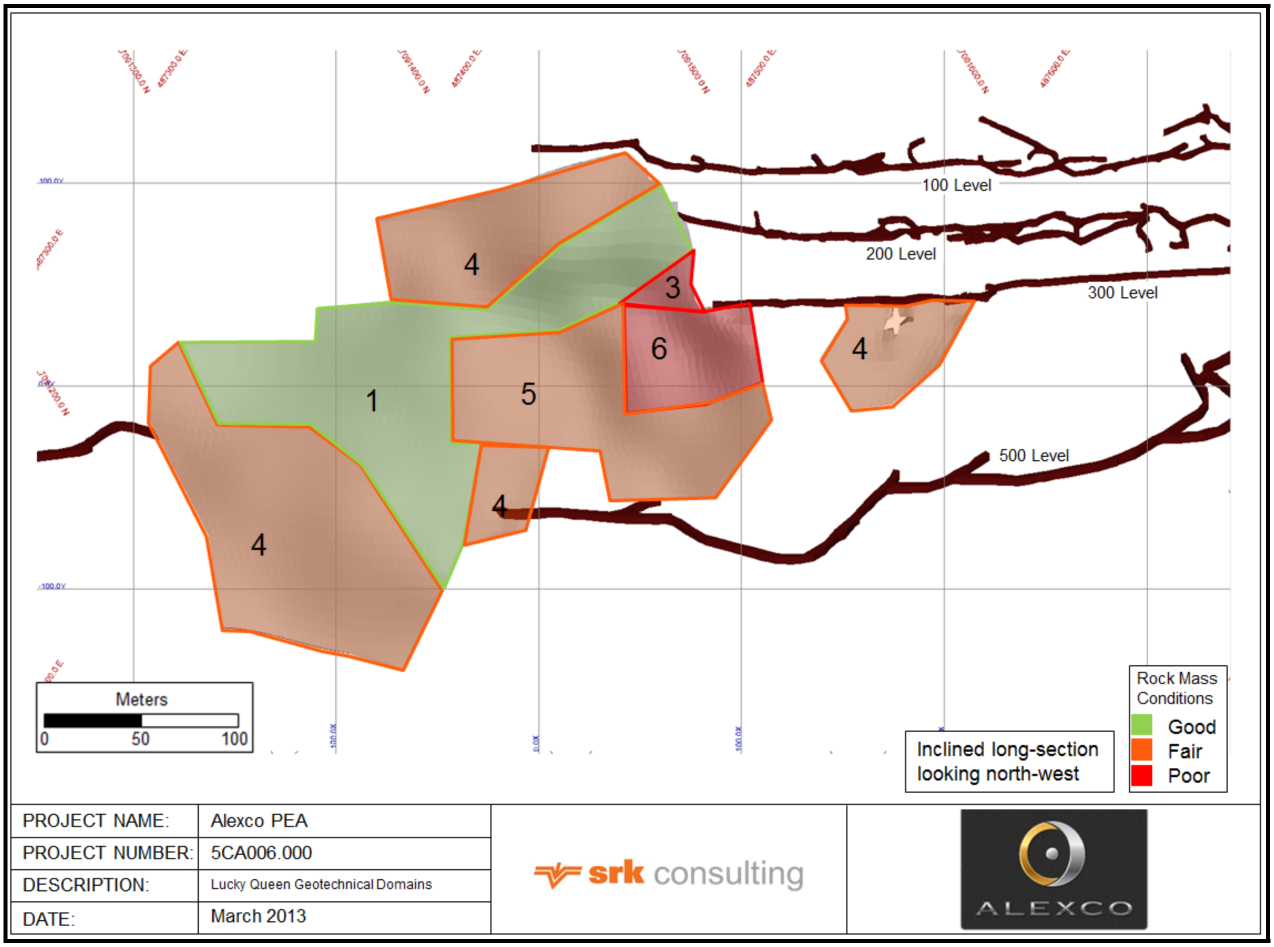


Figure 16-9: Geotechnical Domains Determined for Lucky Queen (SRK, 2013)

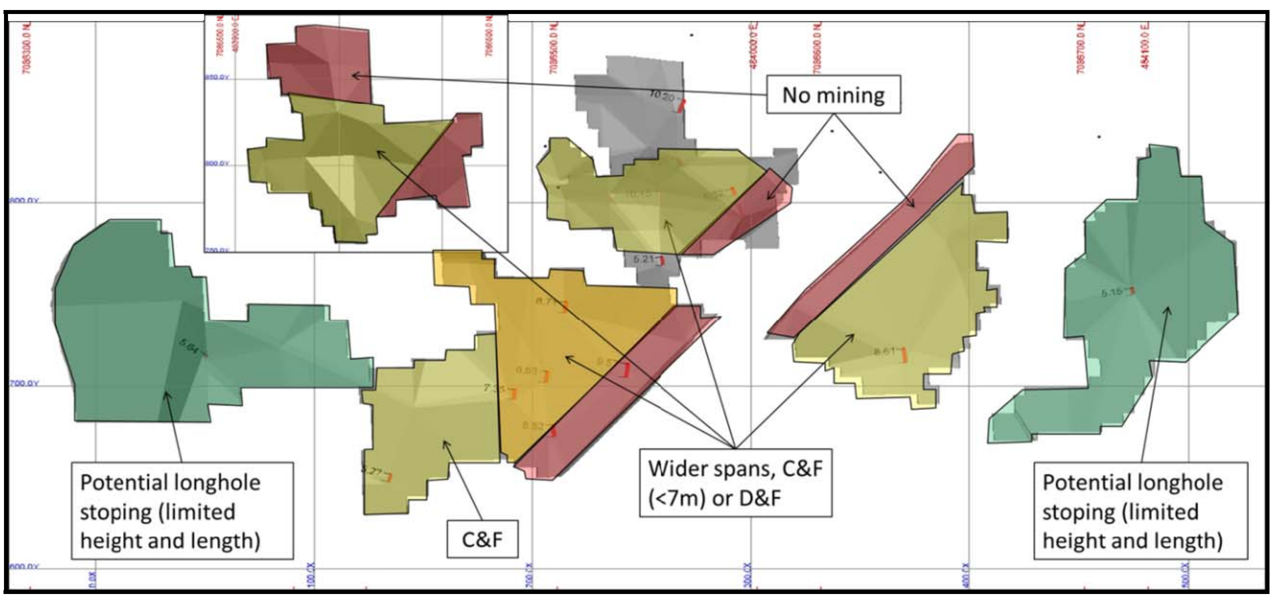


Figure 16-10: Mining Method Domains for the Flame & Moth Lightning (left) and Christal Zones (SRK, 2013)

16.4.4 Mining Method Discussion

Due to the generally poor rock mass conditions observed in drill holes, and the need to minimize the risk of losing control of the ground (fall of ground, or potential caving), the dominant recommended mining method is cut and fill (or drift and fill in wider areas). Therefore, longhole stoping has only been recommended in the areas interpreted to have intact hangingwall and footwall intersections based on the drill hole core assessment.

Previous rock mass assessments for the Bellekeno mine also identified poor ground conditions considered suitable only for cut and fill mining. Alexco's experience in mining at Bellekeno has proven that some areas are amenable to longhole stoping with limited dimensions and early backfilling. The ground support and tactical mining approach have been adjusted by Alexco to suit the higher risk longhole mining method in this geotechnical environment.

Based on Alexco's experience in the Bellekeno mine, the most common source of dilution is side wall vein material entering the stope. In most instances where dilution is introduced, the vein is not stable over the short strike lengths currently being opened (~10 m). This limits the ability to open longhole stopes over wide spans due to the risk of a slope-stability-type side wall failure from the exposed vein. As such, drift and fill has been recommended where wide spans prevent the vein being mined in a single pass.

Bellekeno

Some of the proposed longhole stoping areas at Bellekeno were found to intersect areas previously identified as having poor rock mass conditions and were recommended to be mined with cut and fill. Increased levels of support and tactical mining approaches can be used, however, if ground conditions are adverse based on development of the drilling and mucking levels, it is recommended that a cut and fill approach be adopted to safely mine these areas.

Mining near the historic cave-in areas in the 99 zone are not currently planned within the current PEA LoM plan for the Bellekeno mine. Should the potentially economic material in and around these cave-in areas be contemplated in the future, tactical methods to handle the potentially adverse conditions should be planned prior to accessing these areas. These should include probe drilling to confirm cave extents, and backfilling to create a stable environment for development headings planned for these areas.

As the level of extraction increases within the SW zone, it is likely that some stress induced failures will be encountered. Optimization of extraction sequencing and excavation performance assessments will need to be regularly undertaken. Monitoring program costs and schedule impacts should be considered in the latter stages of extraction.

Lucky Queen

Due to the shallow dipping orebody geometry at Lucky Queen, all mining has been planned using a cut and fill method.

Flame & Moth

The mining methods considered suitable for the Flame & Moth deposit are cut and fill (drift and fill in wider vein areas) and limited dimension longhole stoping with backfill. The Mill fault and overburden materials are both considered to transmit water.

16.4.5 Hydrogeological Conditions

The Bellekeno and Lucky Queen proposed mining zones are located above the valley floor, which tends to limit the occurrence and impact of adverse hydrogeological conditions. In contrast, the Flame & Moth deposit is situated below the valley floor and there is a possibility of significant water inflow to the planned underground workings. Hydrogeologic studies and mine histories indicate that groundwater within the Keno Hill silver district originates from infiltration of meteoric water, and migrates within unconsolidated glacial deposits and through fractures in metamorphic rocks. Groundwater inflows to historical and operating mines tend to be structurally controlled, with increased flows from veins and faults that have been intersected by drill holes and underground workings. Mine histories also indicate that enhanced groundwater inflows can occur when cross-faults are intersected by mine workings.

At the Flame & Moth site, three structures have been identified that could provide enhanced inflows to the proposed underground mine: Lightning zone (Flame vein), Christal zone (Flame vein), and the Mill fault that separates the two zones. During August and September of 2013, Alexco drilled three vertical test boreholes using the air-rotary method to investigate the water bearing characteristics of these zones and the overlying rock:

- KAR-1: Total depth of 183.5 m; penetration through Christal zone;
- KAR-2: Total depth of 232.3 m; penetration through the Lightning zone;
- KAR-16: Total depth 195.7 m; penetration through the Mill fault.

All three boreholes penetrated the target structures at depths similar to those of the planned mine workings. The boreholes were completed as monitoring wells and will be sampled in the future to assess bedrock water quality.

During air rotary drilling, water discharge rates were closely monitored as each borehole was advanced. The boreholes made progressively higher flow rates as they were drilled deeper. The maximum airlift flow rates ranged from about 2.5 to 5.0 litres per second (L/s) (40 to 80 gpm). Experience suggests that if a proper dewatering well is installed, its yield might be about two times the air-lift flow rate observed during drilling. Therefore, a dewatering well may discharge 5 to 10 L/s (80 to 160 gpm), in the absence of hydraulic interference from other wells.

In contrast to other areas of the Keno Hill silver district, these drilling/flow observations provided evidence that groundwater flow in the Flame & Moth area is not strongly controlled by structures. There were no situations where a borehole was making very little water and then the flow increased dramatically upon intersecting a known vein or fault. Rather, the airlift flow rates tended to increase systematically as the boreholes were deepened suggesting that the rock mass is somewhat uniform with regard to hydraulic properties.

During the drilling of KAR-16 a prominent drawdown response was observed in KAR-2, which is located 86 meters away. This response occurred rapidly (tens of minutes) and was analyzable using radial flow solutions, again suggesting that groundwater flow is not structurally controlled. The rock mass in bulk appeared to behave more as an equivalent porous medium that is relatively homogeneous and can be depressurized over large distances by pumping from wells or underground adits. Analysis of the data gave the following bedrock properties:

- Transmissivity: $T = 3.2$ to $3.6\ m^2/day$;
- Storativity: $S = 3.3 \times 10^{-5}$;

- Permeable thickness: 30.5 m;
- Hydraulic conductivity: 6.8×10^{-5} to 1.2×10^{-4} cm/sec;
- Specific storage: 1.1×10^{-6} 1/m.

Because the drilling/test conditions were uncontrolled, these values should be considered preliminary and subject to revision. Alexco is planning a formal multi-day pumping test to be performed during November 2013 to better assess the bedrock properties, hydrologic effects of Lightning Creek, and potential groundwater impacts in the Keno City area. This test will involve continuous pumping of KAR-1 for up to three days while monitoring water levels in accessible bedrock monitoring wells in the Flame & Moth area, Mill area, and Keno City area.

Given the information collected to date, it can be speculated that the mine dewatering flow rate will be in the range of 9 to 22 L/s (140 to 350 gpm), and the long-term flow rate may decline over time. This estimate should be considered preliminary and subject to revision pending completion of the planned multi-day pumping test.

Current information suggests that the mine can be dewatered using either underground sumping or external dewatering wells. A decision on the dewatering method will likely be dictated by water quality issues. It is assumed that water pumped from future active underground mine operations will require some degree of treatment prior to discharge. However, it is uncertain if water pumped from dewatering wells would require treatment. If well water does not require treatment, the more cost effective method will likely be external dewatering wells, which will minimize the amount of water in underground workings (requiring treatment) and lead to more efficient mining operations. If well water does require treatment, the most cost effective approach will likely be removal of mine water using underground sumps and treatment of all water prior to discharge. Alexco will further assess this operational issue after chemical analyses are completed on water samples taken from the three new Flame & Moth monitoring wells (KAR-1, KAR-2, and KAR-16).

The hydrogeological context and potential water ingress from faulting, overburden materials, and surface water features represent a potential risk to the Flame & Moth mine plan. A system of geotechnical/hydrological barrier pillars along the Mill fault and below the overburden areas has been included in the Flame & Moth mine design. The PEA production plan assumes that a 50% recovery of these pillars (Figure 16-29) will be possible near the end of the mine life.

The PEA mine plan allows time for drainage prior to mining once the veins are intersected by underground development. Following dewatering, rock mass and mining conditions will need to be reassessed and a conservative mining approach adopted. There is a risk of higher ground support costs and reduced advance rates due to water inflow issues.

16.4.6 Mine Design Recommendations

Mine design recommendations have been developed using information gained from Alexco's operations experience at Bellekeno mine, in addition to the reviews completed for each mining area. The general design recommendations are summarized as follows:

- Man entry spans have been reviewed based on the critical span curve of Ouchi et al. (2004):
  - Waste development headings: 5.0 m span;
  - Excavation spans can be increased for the main ramps, intersections, and permanent infrastructure areas of the mine, but must be supported accordingly;
  - Spans for production headings on vein: RMR>35 is 4.0 m. RMR<25 is 3.0 m.

- Non man-entry stope design was completed using the modified Matthews stability curve (after Stewart and Forsyth, 1995) and the failure iso-probability curves developed by Mawdesley and Trueman (2003) based on intact rock strengths and joint orientations collected at the Bellekeno mine:
  - Stope spans of 3 to 7 m;
  - Vertical heights and lengths of 8 to 15 m;
  - The vertical end and back surfaces plot near the extremities in both graphs. In these areas limited case studies are available to support the failure divisions and some level of uncertainty will need to be accepted;
  - The location of each surface on the stability graph is considered to be consistent with Alexco's experience of longhole stoping at the Bellekeno mine.

- At Flame & Moth a 20 m stand-off from the Mill fault has been recommended until studies are completed to confirm the hydrogeological conditions within the fault and vein areas, and a 30 m vertical crown pillar is to be maintained at the northern end of Lightning area (beneath unconsolidated overburden) (Figure 16-10).

These general design recommendations should be updated to reflect localized conditions at the Lucky Queen deposit.

16.4.7 Dilution

A volumetric reconciliation of the longhole stoping completed to date at Alexco's Bellekeno mine was undertaken to understand the impacts of dilution. On average, a volume difference of 25% was recorded. However, due to the variable nature of the mineralized vein contacts and splays, the dilution most often results in additional grade being recovered from the stope. At this stage, it is still prudent to assume that where the full vein width is planned to be blasted, a 20% unplanned dilution is likely and this could be unmineralized.

16.4.8 Ground Support Recommendations

Waste development and production support requirements have been based on the ground classes, empirical design (Palstrom & Broch, 2006; Laubscher, 1990), and have been adjusted with Alexco's experience in the Bellekeno mine (Table 16-1, Table 16-2, and Table 16-3) to provide the recommended ground support for development and production headings, and large span support in the production areas.

The levels of ground support specified in these tables are based on the experience gained by Alexco in the Bellekeno mine. These support recommendations are, therefore, considered preliminary for the Lucky Queen and Flame & Moth deposits, and re-evaluation will be required during ongoing evaluation programs.

Shotcrete has been recommended as an option in all production areas to account for the need to tie the rock mass together in friable sugar-cube like areas.

Table 16-1: Ground Support Requirements for Waste Development Headings in All Deposits (Based on Bellekeno mine experience)

Area	Ground Class	Support Class	Support Requirements
Waste Development Headings	DG-1	DS-1	1.8 m friction anchors on 1.2 x 1.2 m core drill hole spacing across back and shoulders #6 welded wire mesh and/or straps across back and shoulders Additional spot bolting down ribs as required
		DS-1A	1.8 m friction anchors on 1.2 x 1.2 m core drill hole spacing across back and shoulders 2.4 m resin grouted rebar on 1.2 x 2.4 m spacing across back #6 welded wire mesh and/or straps across back and shoulders Additional spot bolting down ribs as required
	DG-2	DS-3	2.4 m coated Swellex on 1.2 x 1.2 m core drill hole spacing down to 1.4 m above floor #6 welded wire mesh down to 1.2 m above sill Additional spot bolting as required Mesh straps as required
	DG-3	DS-4	25 mm flash-coat shotcrete in back and ribs 2.4 m coated Swellex on 1.0 x 1.0 m core drill hole spacing down to 1.2 m above floor #6 welded wire mesh down to 1.2 m above sill Mesh straps as required 50-75 mm additional shotcrete in back and ribs If required: spiling at 30 cm centres with 4.5 m grouted bar spiles

Table 16-2: Ground Support for Large Production Spans 4.0 to 7.0 Metres

Area	Span	Support Requirements
Production Headings	4.0-5.5m	3.5" steel reinforced shotcrete across back and 2.5" on walls to floor level Bolt through fibrecrete with 10' Swellex anchors in back and 8' in walls on a 1.3 x 1.3 m pattern down to floor level Maximum advance is 2.0 m
	5.5-7.0m	4.5" steel reinforced shotcrete across back and 3.0" on walls to floor level Bolt through fibrecrete with 12' Swellex anchors in back and 10' in walls on a 1.3 x 1.3 m pattern down to floor level Maximum advance is 2.0 m

Table 16-3: Ground Support Requirements for Production Headings with Maximum Span 4.0 Metres (Based on Bellekeno mine experience)

<table>
<tr><th>Area</th><th>Ground Class</th><th>Support Class</th><th>Support Requirements</th></tr>
<tr><td rowspan="6">Production Headings (incl. crosscuts)</td><td rowspan="2">PG-1</td><td>PS-1</td><td>1.8 m friction anchors across back on 1.2 x 1.2 m spacing; rib bolting as required
If required: #6 welded wire mesh across back and shoulders
If required: 25 mm flash-coat shotcrete in back; rib coverage as required</td></tr>
<tr><td>PS-1A</td><td>Install 8' Swellex in back & hangingwall on a 1.0 x 1.0 m pattern
1.8 m friction anchors across back on 1.2 x 1.2 m spacing
Install #6 weldmesh on back and shoulders
#0 screen straps and 1.8 m friction anchors every 2.0 m on ribs
6' split sets and straps 1.0 x 1.0 m on footwall
Shotcrete as required
Install 1 split set pull test collar each round</td></tr>
<tr><td rowspan="2">PG-2</td><td>Modified PS-3</td><td>Install 8" Swellex in back on 1.0 x 1.0 m pattern
Install #6 weldmesh on back & shoulders
8' Swellex and straps 1.0x1.0 m on footwall and hangingwall
Shotcrete as required
Spile as required
Maximum drift width 4.0 m
Install 1 split set pull test collar each round</td></tr>
<tr><td>Modified PS-3A</td><td>Install 10' Swellex in back & hangingwall on 1.0 x 1.0 m pattern
Install #6 weldmesh on back & hangingwall
6' split sets and straps 1.0 x 1.0 m on footwall
Shotcrete as required
Maximum drift width 3.5 m
Install 1 split set pull test collar each round</td></tr>
<tr><td>PG-3</td><td>PS-4</td><td>25 mm flash-coat shotcrete on back and ribs
3.0 m Swellex on a 1.0 x 1.0 m spacing in back and shoulders; 2.4 m Swellex in ribs
#6 welded wire mesh down to 0.8 m above the sill
50-75 mm shotcrete on back and ribs
If required: spilling on 30 cm centres and/or mesh straps</td></tr>
<tr><td colspan="2">Benching Ground Support</td><td>Prior to start of benching
Install 10' Swellex in hangingwall to sill on 1.0 x 1.0 m pattern
#6 weldmesh hangingwall to sill
8' split sets and straps 1.0 x 1.0 m on footwall to sill
Maximum bench width 3.5 m
Shotcrete hangingwall sill as benching progresses</td></tr>
</table>

Backfill

Various combinations of cemented rock fill (CRF) using mine waste and tailings (dry filtered) have been selected for stope backfilling, with the cement content adjusted between 2 and 7% based on the requirement for fill strength. The following backfill mix guidelines are considered reasonable for planning purposes:

CRF (with mine development waste):

- If needed for a sill: 6 – 7% cement;
- If needed for a standing backfill wall in a longhole stope: 6 – 7% cement;
- If consolidated fill is not required: 0% cement (cut-and-fill).

When dry filtered tailings are used:

- If needed for a sill: 6 – 7% cement;
- If needed for a standing backfill wall in a longhole stope: 2 – 3% cement;
- If needed for a working floor: 2 – 3% cement;
- If consolidated fill is not required: 0% cement.

Sill Mats

Where sill mats are required, a cemented backfill with 8% cement will be used to provide a stable back to mine up to from beneath. Extraction of the vein material from the final lift requires that the pillar is self-supporting and maintains integrity while the heading is active. The quality and the placement of the fill are both important factors in this application. In areas where additional caution is required during the final lift extraction, the lift will be mined using up-holes and remote mucking.

16.5 Planned Mining Methods

16.5.1 Mining Method Selection

Much of the historical mining in the Keno Hill silver district has been done using square set stoping, shrinkage stoping or conventional cut and fill stoping methods using handheld drills, slushers, and track haulage.

The previous PEA (Wardrop, 2009) assessed the viability of mechanized overhand cut and fill, mechanized underhand cut and fill, shrinkage stoping and small scale longhole stoping.

This current study has the benefit of almost three years of recent mining experience at the Bellekeno mine to provide valuable insight into what does and does not work in this challenging environment.

The main factors driving the mining method selection process were:

- Proven mining methods currently in use at the Bellekeno mine;
- Ground conditions in the vein and along the vein contacts range from good to very poor;
- Ground conditions can vary substantially over short distances (5 m);
- Vein geometries vary greatly between deposits:
  - Average dip ranges from 45° at Lucky Queen to almost vertical in sections of the SW and 99 zones at Bellekeno;
  - Average true width ranges from less than 1 m to several metres;
  - Strike directions are fairly uniform on the deposit scale with the exception of Lucky Queen where the vein has a steady change in strike that forms an arc in plan view.
- Metal content and distribution varies significantly between deposits and also varies over the stope mining scale;
- Vein continuity is good, but with variable mining grades;
- The footwall is often characterized by competent quartzite but can be weak in some areas;
- The hangingwall varies from competent quartzite to weak layers of quartz breccia with clay filled shear bands, graphitic schists, or serecite schists;
- Geological contacts at the hangingwall and footwall can often be visually identified but can be faulted or fractured contacts with gouge and breccias;
- Mineralization contacts are less clearly defined and are based on a combination of structure, vein mineralogy, and metal grades;

- Vein systems can be locally water bearing and required time to drain when they are first crosscut by development;
- Vein depths are shallow with a low-stress regime, high-stress issues are not a factor in mine planning, but lack of clamping forces contribute to the poor ground conditions.

In summary, the various deposits require the use of mining methods that can adequately support the vein and that are flexible and selective while minimizing the direct mining costs.

During 2010 and 2011, the mining method used at the Bellekeno mine was exclusively mechanized overhand cut and fill using rock fill. Several sill mats were also installed at critical locations. In 2012, some test mining was initiated at the Bellekeno mine using a very small scale longhole mining method with a fair amount of success.

Therefore, the mine design strategy was to design as many areas as practical using small scale longhole mining methods while planning mechanized overhand cut and fill for areas where ground conditions were poor, or where the combination of vein dip and true width was not compatible with longhole stoping methods.

Underhand cut and fill methods have been reviewed in the past, but are considered unsuitable in this environment due to the risks associated with potentially weak layers at the hangingwall and footwall contacts. Failure to properly buttress the backfill above into sound footwall and hangingwall rocks can lead to catastrophic failures.

Shrinkage mining has also been reviewed in the past, but is considered unsuitable due to the safety issues and the lack of available skilled manpower in Canada.

16.5.2 Overhand Mechanized Cut and Fill Mining at Bellekeno

Since Alexco resumed mining at the Bellekeno mine in 2010, the majority of the vein material has been mined by overhand mechanized cut and fill (MCF) methods (Figure 16-11). Each lift of MCF is typically accessed from the footwall ramp system by a 3.5 m wide by 3.5 m high attack ramp. Depending on the grade and length of the attack ramp, 3 to 4 additional cuts of MCF can be economically accessed. To do this, a section of the crosscut or attack ramp has the back blasted and rebolted. The broken waste rock from these take down back (TDB) is left in place and graded to access the next cut.

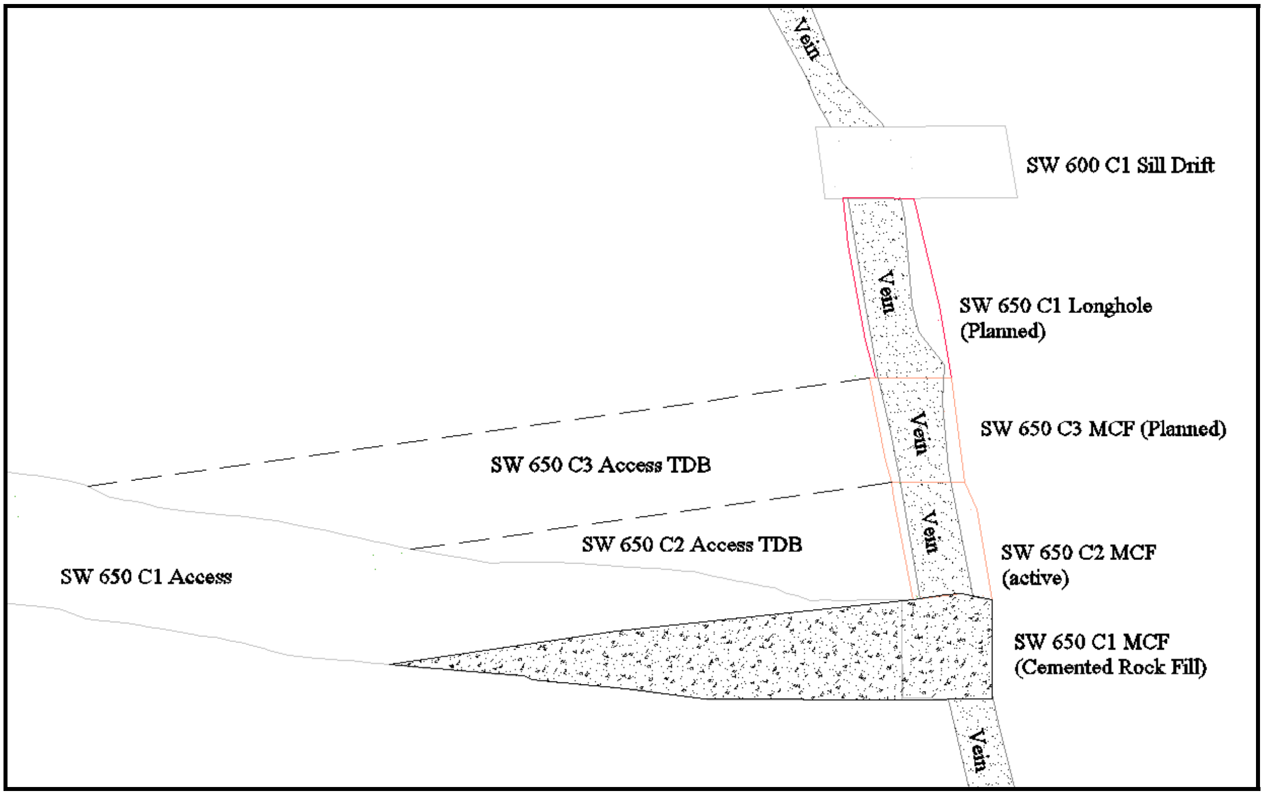


Figure 16-11: Schematic Cross-Section - Typical MCF Stope (SRK, 2013)

Each MCF stope is typically between 25 and 80 m in strike length, and is nominally 3.5 m high and a minimum of 2.5 m in width. Primary stopes are designated C1 and are developed the same as any development heading as the floor is solid rock. Secondary stopes (C2, C3, etc.) are developed by breasting along the strike length of the previous cut after the previous cut has been filled with rock fill or cemented rock fill. A load-haul-dump (LHD) equipped with a rammer jammer (Figure 16-12) is used to ensure the backfill is well consolidated and pushed up tight to the back.

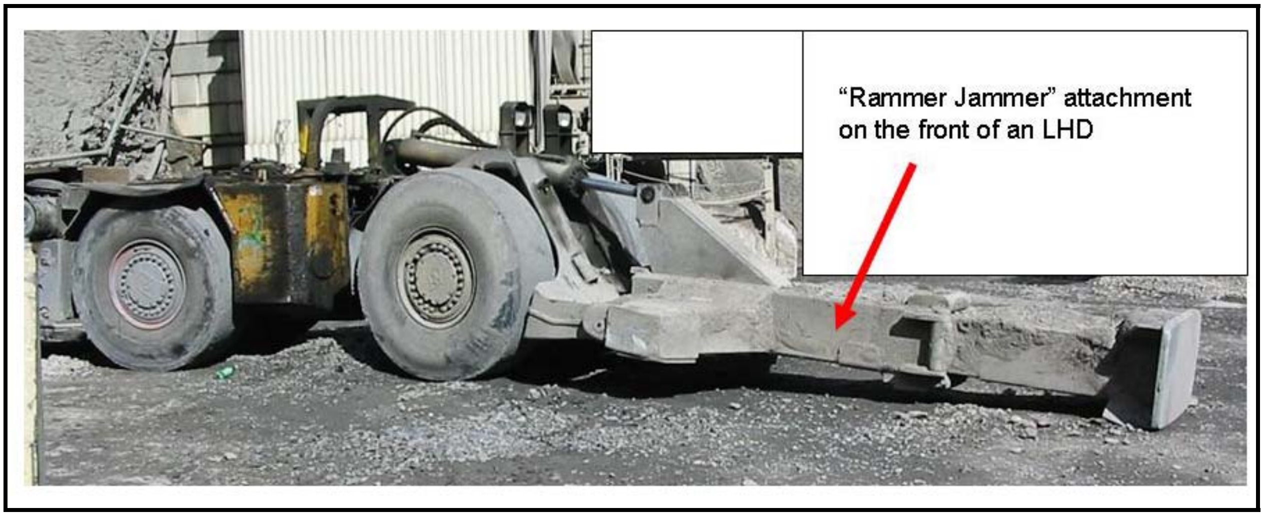


Figure 16-12: Example of a Rammer Jammer (SRK, File Photo)

A sill mat may be installed if the mining plan calls for the sill pillar below to be extracted later.

The PEA LoM plan for the Bellekeno mine does not require any additional sill mats to be installed beyond those that already exist.

16.5.3 Longhole Mining at Bellekeno

Alexco began trials of a small scale longitudinal retreat longhole mining method in 2012 and has been reasonably successful in applying this method to both the SW and 99 zones at Bellekeno (Figure 16-13). The intent is to mine a large portion of the mineral resources remaining in the SW and 99 zones using this method.

The overcut and undercut are developed on nominal 10.5 m intervals from the footwall ramp system at the height of 3.5 m with typical widths of 2.5 to 4 m. The mining sequence is begun by drilling and blasting a drop raise at one end or both ends of the zone, depending on the access point. The strike length of the individual stopes is limited to 10 m, which limits the tonnage per stope to between 500 to 1,000 tonnes excluding development.

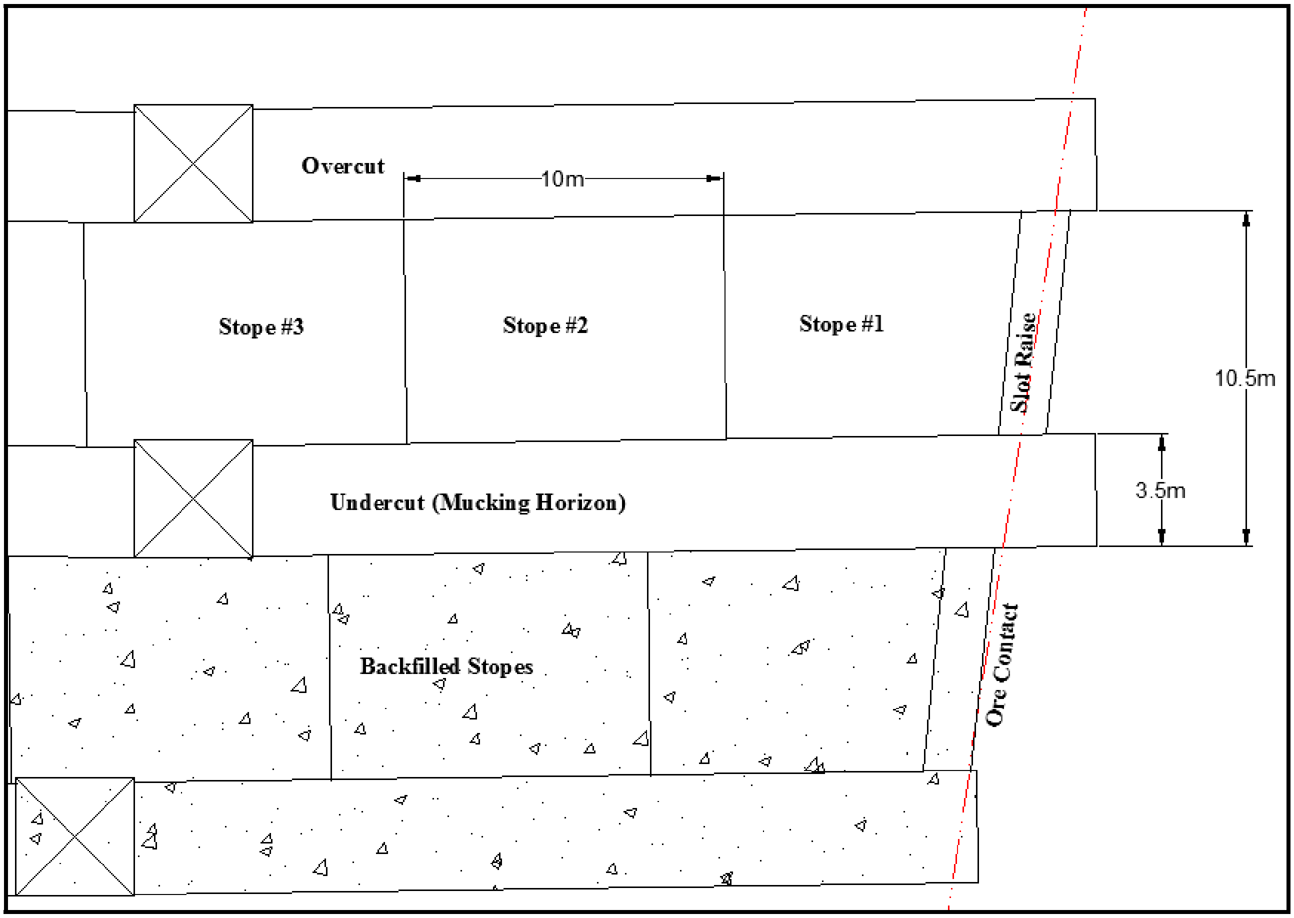


Figure 16-13: Schematic Long Section - Small Scale Longitudinal Retreat Longhole Stopes (SRK, 2013)

Once the zone is prepared for production, the first stope is blasted and mucked over a period of a week or less, with backfilling occurring during the next week. Speed of mining and filling is an important aspect of successfully mining in these types of ground conditions.

In the past, much of the backfill used has been cemented rock fill with some use of cemented dry filtered tailings. The plan going forward is to increase the use of dry filtered tailings in the backfill mix for the longhole stopes.

In order to keep a slot open for the next stope, a plastic culvert with a cap is chained to the wall and dropped into the stope to be filled (Figure 16-14). Backfilling then proceeds normally, with the culvert being strong enough that it does not collapse.

Figure 16-14: Culvert Installed in Longhole Stope (SRK, 2013)

Longhole drilling is being done using a Boart BCI2 Drill Carrier equipped with a Secan S36 rockdrill. The general practice is to drill 2.5-inch diameter up drill holes from the undercut and held back from breakthrough by 0.3 m or so. These drill holes are immediately cased with 2-inch ID plastic pipe to prevent the drill holes from collapsing or plugging.

Drill holes are double primed using 277-gram Pentax boosters and loaded with ammonium nitrate/fuel oil (ANFO) immediately prior to blasting. Several rows are also typically pre-loaded to minimize the loading crew's exposure to the open stope brow. Pre-loaded holes are collar primed and blasted with the next blast.

All remote mucking is done using a JS-220 LHD (2.2 yard) equipped with a remote package, while manual mucking is done with either a JS-220 LHD or a JS-350 LHD (3.5 yard).

16.5.4 Overhand Mechanized Cut and Fill Mining at Lucky Queen

With the dip of the Lucky Queen mineralization averaging 45° through the mining area, an overhand MCF method has been selected as being the most suitable approach. (Figure 16-15) Each lift of MCF will typically be accessed from the footwall ramp system by a 3.5 m wide by 3.5 m high attack ramp. Depending on the grade and length of the attack ramp, four to six additional cuts of MCF can be economically accessed. To do this, a section of the crosscut or attack ramp has its back blasted and rebolted. The broken waste rock from these take down back (TDB) areas is left in place and graded to access the next cut.

Each planned MCF stope is typically between 25 m and 80 m in strike length with a maximum of 50 m on either side of the access point to be mined from that access point. This maximum is recommended in order to limit the time that any particular cut remains open and thereby reduce the risk of geotechnical instability. Therefore, the operating practice will be to concentrate on cycling the active stopes as fast as practical.

MCF stopes will nominally be 2.5 m high and a minimum of 3.0 m wide. The height of the cut has been reduced as compared to the current practice at Bellekeno mine in order to reduce the external dilution with 2.5 m being close to the practical minimum height required to operate a 1.1 to 1.5 m^3 class LHD.

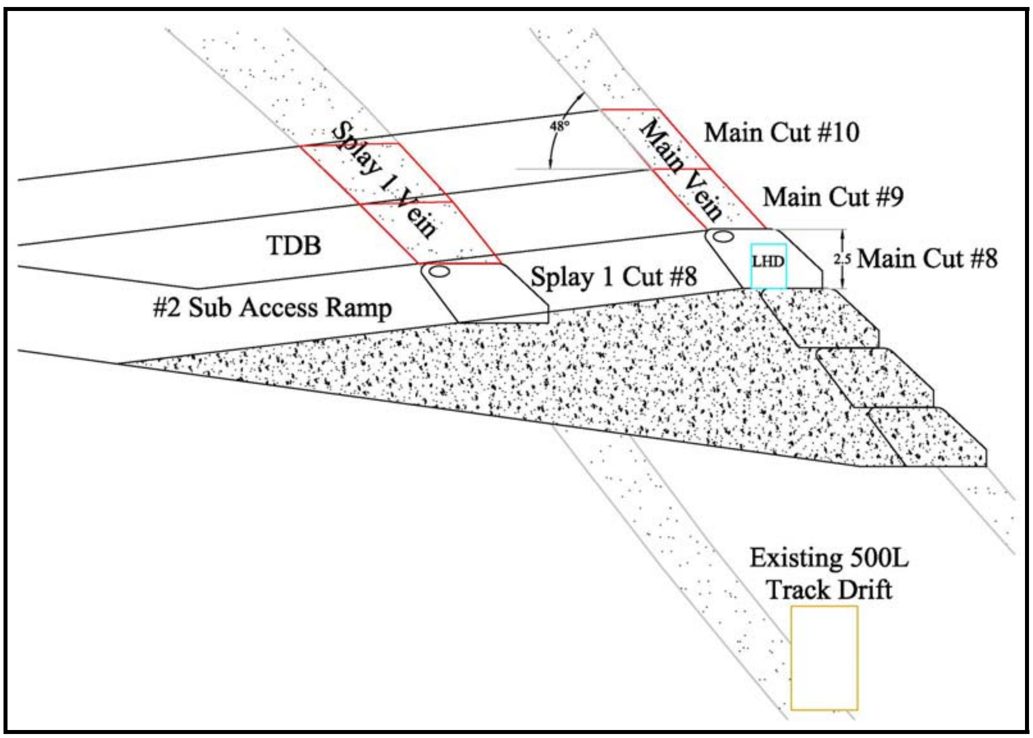


Figure 16-15: Schematic Section - Typical Cut and Fill Stopes, Lucky Queen (SRK, 2013)

Due to the shallow dip, additional external dilution will be realized due to practical limits on how shallow the hangingwall and footwall profiles can be maintained, issues with drilling the footwall with a jackleg and issues with adequate clearances for the LHDs. See Figure 16-16 for an illustration of the impact of different dips on external dilution values. The overall external dilution value for Lucky Queen is estimated at 30% using the W/(W+O) formula or 42% using the W/O formula.

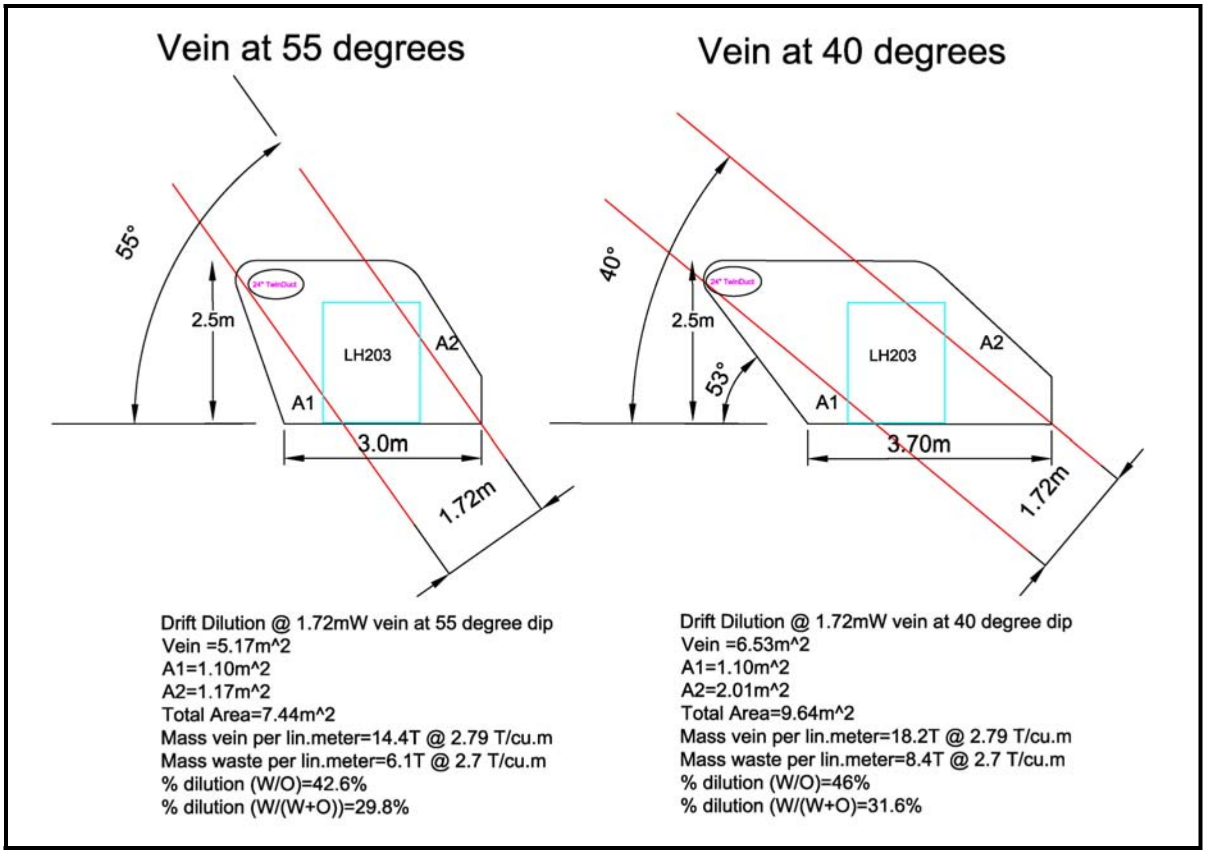


Figure 16-16: Schematic Section - Examples of Impact of Dip on Drift Profiles (SRK, 2013)

Primary stope sill cuts will be developed the same as any development heading as the floor will be solid rock. Subsequent cuts above the sill cut will be developed by breasting along the strike length of the previous cut after the previous cut has been filled with a good quality cemented rock fill to support the hangingwall. A rammer jammer is to be used to ensure the backfill is well consolidated and as tight to the back as is feasible.

An issue that will be encountered due to the shallow dip will be the requirement to drill and blast a few additional lifter drill holes on the footwall side to ensure that the LHDs can properly muck the broken rock. This is due to the fact that the breasted cuts will be offset from the cuts below and, therefore, the footwall side must be brought down to the mucking level, which is the top of cemented rock fill. The other option is to accept the loss of vein material, but this is not an acceptable alternative given the high grade nature of the Lucky Queen mineralization.

16.5.5 Planned Mining Methods for Flame & Moth

Planned mining methods for Flame & Moth include longhole, overhand MCF, and drift and fill. The application of longhole and MCF methods at Flame & Moth will be the same as the Bellekeno mine application.

The longhole method for Flame & Moth is based on a sublevel spacing of 10.5 m vertically, measured sill to sill, with a stope strike length of 10 m. Stopes will be small, averaging only 800 to 1200 tonnes per stope after development tonnes are removed. Small diameter down-hole drilling will be used. Stope development will only be on vein with stopes being mined in a retreat sequence along strike. Backfill will be handled by truck and LHD and it will consist of a mix of development waste rock and dry filtered tailings back hauled underground by truck. Refer to Figure 16-13 and Figure 16-14.

Overhand cut and fill mining planned for Flame & Moth will be on 3.5 m high cuts with central crosscut access. Stope lengths will vary in the range of 30 to 80 m. Three cuts will be accessed from each primary access crosscut by back slashing. Where the vein is wider than 7 m, drift and fill will be employed in two passes. Backfill will be handled by truck and LHD and it will consist of a mix of development waste rock and dry filtered tailings. A rammer jammer attachment will be used to tight fill to the back. Refer to Figure 16-11 and Figure 16-12.

16.5.6 Sill Pillar Recovery Methods

Where future recovery of sill pillars is scheduled, a cemented backfill along with a carefully prepared sill mat will be used to provide a stable back to mine up to from beneath. Extraction of the vein by MCF methods requires that the pillar is self-supporting and maintains integrity while the heading is active. The quality and the placement of the backfill and sill mat are both important factors in this application. An increased cement content of 8% will be required to provide the required backfill strength.

Figure 16-17 shows a sill mat construction plan for the SW zone of Bellekeno.

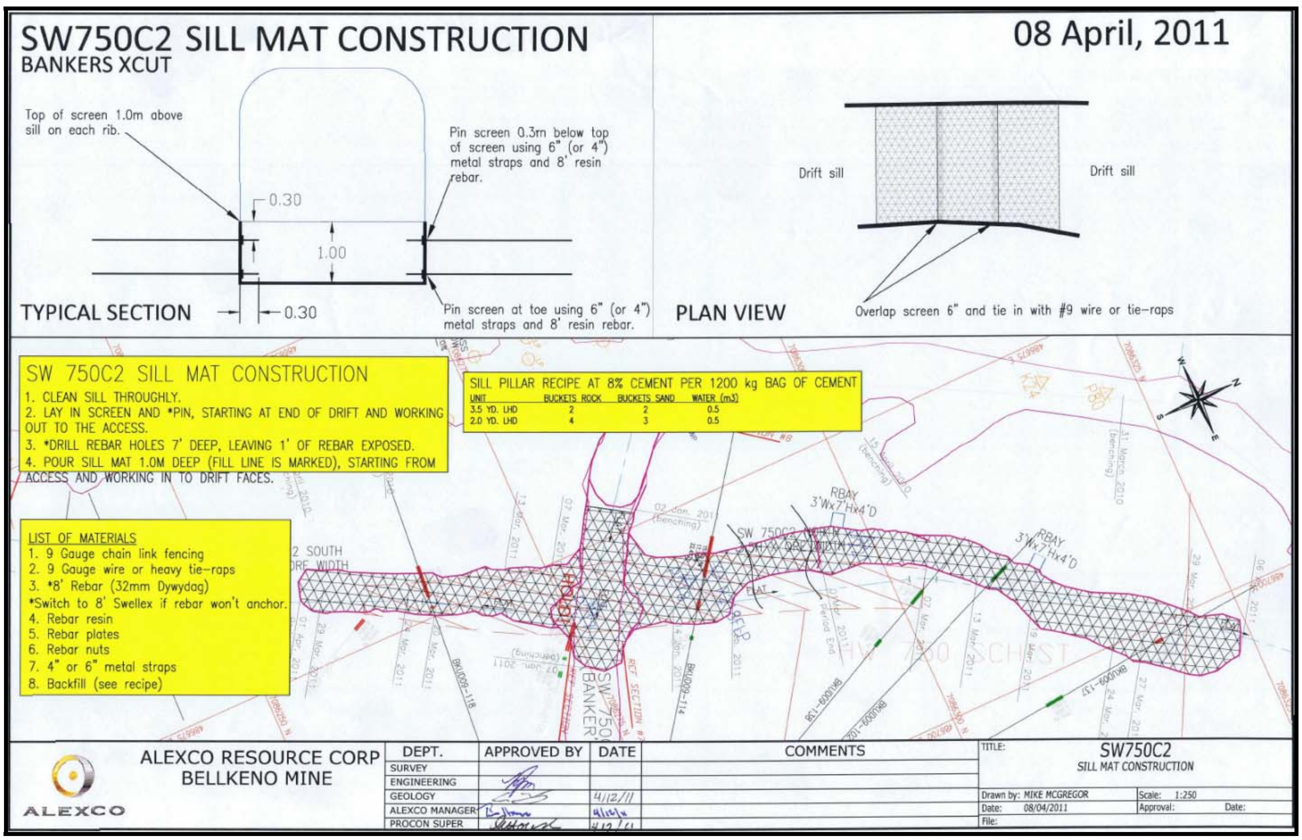


Figure 16-17: Sill Mat Installation Plan (Alexco, 2013)

In areas where additional caution is required during final extraction, the sill pillar will be mined using a 7.5 m longhole uppers and remote mucking. Up drill holes will be held back from the sill mat, dipped forwards and arched to minimized blasting damage to the sill mat. When recovering these sill pillars, speed of mining is critical to success.

Also critical is careful preparation of the excavation where the sill mat and cemented fill is to be placed, including blasting beyond the vein contacts to provide a clean, rough surface for the fill to hang on. The floor should be cleaned prior to placement to prevent material falling from the back following mining. An appropriate lead time should be provided to allow set-up and cure for the cemented fill. Standard quality control procedures (e.g., unconfined compressive strength and slump tests) should be completed during batching and following placement of cemented tailing fill materials.

16.6 Estimate of Potentially Mineable Tonnes – Methodology

16.6.1 Introduction

This section provides a description of the methodology used by SRK in estimating the potentially mineable tonnes and production rates for the following deposits that are part of the EKHSD project and comprise the plant feed schedule for this PEA:

- Bellekeno (SW zone, 99 zone);
- Lucky Queen;
- Flame & Moth.

In each case, SRK applied typical mine planning methods to the resource block models. Metals of economic interest include silver, lead, zinc, and gold for all properties except Bellekeno where the block model did not have an estimate for the gold grade. SRK included Measured, Indicated, and Inferred mineral resources in the underground production plans. SRK estimates that Inferred mineral resources form the basis of approximately 6% of the “potentially mineable tonnes” included in the plant feed schedule of this PEA.

SRK’s estimate of the potentially mineable tonnes includes the impact of the Silver Purchase Agreement which calls for 25% of the payable silver ounces produced to be sold to Silver Wheaton at a price of US$3.90 per ounce.

With the market price for silver well above US$3.90 per ounce, this results in lowering the value of each block in the block model, in turn reducing the mineable tonnes available when an economic cut-off criteria is applied to the block model. In addition, gross revenue is reduced in the cash flow model since the full market price can’t be applied to all of the silver production.

In addition to methodology, the following sections provide certain planning results where they are common to the three planned mines.

16.6.2 Initial Estimate of Site Operating Cost for Bellekeno and Lucky Queen

An estimated site operating cost is required as an input to the mine planning economic cut-off criteria (an NSR value in this case). The initial site operating cost referred to here is for the purpose of creating mining shapes, and does not necessarily match the final operating costs shown in the economic model.

As mine planning work on Bellekeno and Lucky Queen was undertaken independently, and at a different time than the work on Flame & Moth, the methods used to estimate the initial site operating costs are presented separately.

At the start of the project, Alexco provided SRK with the approved 2012 budget files, which were based on a 325 tpd operating plan using mainly MCF mining methods. The majority of the mine plan was based on production at Bellekeno, but did include small contributions from Lucky Queen and Onek. These budget costs were based on contractor mining and are summarized in Table 16-4.

The 2012 budget projections were compared to the year to date actual costs available at the time. The actual costs reported were not used as they were noted to be highly variable, and included capital costs and other costs not directly related to site operations that would have to be removed. SRK determined that the 2012 budget projections were a reasonable basis for developing the cut-off criteria.

Later, SRK did conduct an analysis of the actual site operating costs when Alexco requested that SRK add the Flame & Moth deposit to the PEA LoM plan, and the results are shown in Table 16-5. A comparison of the two approaches shows that the actual site operating costs for 2012 Q4 were $296/t versus the annual budget estimate of $307/t.

Table 16-4: 2012 Budget Breakdown (325 tpd Contractor Mining)

Area	Cost/tonne
Mining	$214.74
Milling	$66.66
G&A	$25.63
Total Site	**$307.03**

Two assumptions regarding the future site operations required the costs in Table 16-4 to be factored before being used in mine planning for Bellekeno and Lucky Queen. These are:

- The mill would operate at a 400 tpd throughput (nominal capacity);
- Alexco would operate the underground mines with its own equipment by buying out some of the contractor’s fleet as part of a mining contract ending February 2013, and by purchasing additional mobile equipment as required by the mine plans.

Both assumptions will tend to reduce the total site unit operating cost.

SRK applied factoring to the 2012 budget operating costs to account for an increase in plant throughput from 325 tpd to 400 tpd. To accomplish this, SRK reviewed Alexco’s 2012 budget details and estimated the fixed cost/variable cost split for the mine. Since a previous operating cost estimate existed for a milling rate of 400 tpd from the 2009 PEA, this cost was selected and escalated by 3% per year to factor the milling cost. The general and administrative (G&A) cost was factored assuming 100% fixed costs.

These adjustments resulted in an estimated site operating cost of $268/t representing a plant throughput of 400 tpd. Since the 2012 budget was based mainly on MCF mining methods, SRK used a rounded figure of $265/t as the diluted cut-off for designing MCF stopes at Bellekeno and Lucky Queen. Under the assumption that longhole mining would be more efficient, SRK used a diluted cut-off of $185/t as a guide in designing mineable shapes for the small scale longhole stopes at Bellekeno.

16.6.3 Initial Estimate of Site Operating Cost for Flame & Moth

Alexco provided SRK with detailed breakdown of the actual site costs for Q4 2012. During that quarter, the Bellekeno mine produced 22,385 t averaging 243 tpd, while the mill facility's throughput totalled 26,777 t averaging 291 tpd. The mining costs during the quarter reflected contractor mining.

Alexco provided SRK with the split of the total costs into operating costs and capital costs for the quarter. Alexco prepares a separate general and administration site cost, (G&A) and then allocates it to operating departments on a percentage basis. SRK reorganized the G&A costs in order to report a separate Bellekeno G&A cost, and also mine and mill costs without G&A allocations. It is noted that Alexco allocated additional G&A costs to the other Keno Hill silver district mines being developed at that time (Lucky Queen and Onek).

The reported Bellekeno-related site operating cost is summarized in Table 16-5.

Two assumptions regarding the future operations at the EKHSD project required the costs in Table 16-5 to be factored before being used in the Flame & Moth mine planning. These are:

- The mill facility would be supplied with 400 tpd plant feed (nominal capacity);
- Alexco would operate the underground mine(s) with its own employees and equipment, eliminating the need for a mining contractor.

Both assumptions will tend to reduce the total site unit operating cost.

Table 16-5: Actual Bellekeno Site Operating Cost - Q4 2012

Area	Total Opex	Cost/tonne
Bellekeno Mine	$4,829,460	$180
Mill Facility	$2,282,883	$85
G&A	$815,518	$30
Total Site	**$7,927,861**	**$296**

Alexco provided SRK with an estimate of the expected mine operating cost reduction that would apply to an owner operated underground mine. SRK reviewed this information and found the savings were clearly presented in the areas of contractor equipment rental and contractors mark ups for overhead costs and profit.

SRK applied factoring to the site unit operating cost to account for an increase in plant throughput from 291 tpd to 400 tpd. To accomplish this, SRK reviewed Alexco's cost details for Q4 2012 and estimated the fixed cost/variable cost split for the mine, the processing plant and for G&A costs. The estimated splits are:

- 51% variable costs in the mine including development, stoping, backfilling, and haulage;
- 26% variable costs in the mill including crushing, conveying, grinding, flotation, dewatering, and electrical power;
- G&A variable costs were estimated at 20%.

These adjustments resulted in the estimated quarterly site operating cost shown in Table 16-6 representing an owner operated mine with plant throughput of 400 tpd. The G&A cost shown includes the total G&A cost allocated to Keno Hill silver district mines.

Table 16-6: Estimated Site Operating Costs - 400 tpd Owner Operated

Area	Total Opex	Cost/tonne
Bellekeno Mine	$4,719,341	$131.09
Mill	$2,501,993	$69.50
G&A	$1,223,277	$33.98
Total Site	**$8,444,611**	**$234.57**

SRK used a diluted cut-off value of $230/t as a guide in designing mineable shapes for the Flame & Moth deposit.

16.6.4 Study Metal Prices and Exchange Rate

SRK estimated potentially mineable tonnes for Bellekeno and Lucky Queen based on:

- Metal prices of US$22.50/oz silver, US$0.85/lb lead, US$0.95/lb zinc, and US$1300/oz gold;
- An exchange rate of US$0.95/C$1.00.

SRK estimated potentially mineable tonnes for Flame & Moth based on:

- Metal prices of US$24.00/oz silver, US$0.90/lb lead, US$1.00/lb zinc, and US$1400/oz gold;
- An exchange rate of US$0.96/C$1.00.

SRK notes that these initial metal price and exchange assumptions were for the purpose of mine planning and they generate mine planning NSR values. Report Section 22 Economic Analysis presents a different (final) set of metal prices used in the EKHSD project economic assessment, and they generate different NSR values.

16.6.5 Net Smelter Return Estimate

It was deemed appropriate to utilize NSR estimates as a measure of resource block value since the targeted mineralization includes four economic metals (silver, lead, zinc, and gold) that report to two concentrates (a silver/lead concentrate and a zinc concentrate).

For Bellekeno and Lucky Queen SRK prepared a simplified NSR model based on Alexco's 2012 budget revenue model, incorporating the current metallurgical balance used by Alexco that was based upon the historical performance of the mill with the Bellekeno feed.

Using the NSR model, SRK derived NSR factors for each payable metal that could be entered into the resource block models for each deposit in a formula allowing an NSR value to be calculated for each block. The following example formula yields NSR on a $/t basis.

$$NSR = (0.388xAg) + (13.92xPb) + (6.531xZn) + (7.523xAu)$$

For Flame & Moth, SRK used a similar approach and prepared a simplified NSR model based on Alexco's 2013 budget revenue model.

Using the NSR model, SRK derived NSR factors for each payable metal that could be entered into the Flame & Moth resource block models for each commodity in a formula allowing an NSR value to be calculated for each block. The following example formula yields NSR on a $/t basis.

NSR = (0.482xAg) + (8.298xPb) + (4.365xZn) + (20.93xAu)

Both of the NSR formulas incorporate the Silver Purchase Agreement, under which 25% of the silver production is sold at a reduced price of US$3.90 per ounce, which has the effect of reducing Alexco's average realized silver price.

SRK entered formulas of this type into the resource block models and then applied the economic cut-off values previously described to outline areas of economically mineable tonnes referred to as mining shapes. The impact of mining dilution was accounted for by assuming that the in situ block model grades and estimated NSRs would be reduced by the estimated external dilution amounts when included in the plant feed.

16.6.6 External Dilution Estimates

External dilution was applied to the in situ tonnes and grades contained in each mining shape. The dilution percentage is defined as tonnes of dilution material (W) divided by tonnes of vein material (O), dilution % = W/O x 100.

For the recently active Bellekeno mine, development on vein was modelled to fully diluted sizes, therefore, no additional external dilution was added. MCF stopes had 25% external dilution added as per the mine's standard operating practice. For the longhole stopes, a dilution study was carried out by SRK on the limited number of longhole stopes that had been completed and surveyed at Bellekeno. The results of this reconciliation indicated that the average external dilution for stopes in the SW zone was 12% while stopes in the less stable 99 zone experienced an average of 25% external dilution. Overall external dilution, accounting for dilution inherent in the vein development, was estimated at 20%.

For Lucky Queen, the situation is much more complex with variable true thickness, dip, and strike. In order to estimate the external dilution, each lift of cut and fill was assigned to one of 14 bins where each bin had similar true thickness and dip. For each bin, a drift section was drawn similar to the examples shown in Figure 16-16 and the external dilution was estimated. This external dilution was then applied to each lift of cut and fill in the mine plan. This resulted in a range of external dilution from 32 to 66% with an overall average of 43%.

External dilution percent for Flame & Moth was estimated based on true vein width. Average true vein width was determined by viewing veins in cross-section or by dividing wireframe volume by wireframe area (area as measured in vertical long section view with correction factor for vein dip). An external dilution percentage was estimated by assuming that 0.85 m of wall rock would be unavoidably mined with the vein. Thus thinner veins have higher dilution assigned. Average external dilution was estimated at 15%. Flame & Moth exhibits the greatest vein true thickness of the three deposits included in the production plan.

SRK notes that the specific gravity difference between wall rock at 2.7 to 2.80 and in situ vein material at 2.84 to 3.59 tends to reduce the external dilution percent when reported as a tonnage ratio.

For all deposits, dilution material metal grades as found in wall rock immediately adjacent to the veins were investigated by SRK. The rough average metal grades determined were relatively low and are not significant at this level of study. This is an aspect that should be considered further in higher level mining studies.

16.6.7 Minimum Mining Width

Minimum mining widths for all properties were 1.8 m for longhole and 2.4 m for cut and fill methods. The longhole minimum mining width was based on how tight the drilling can be done and still expect the stope to break reliably. The cut and fill stope minimum mining width is based on the equipment available with 2.4 m being the minimum practical drift width that can be mucked with the current equipment fleet.

The NSR value per tonne was considered in applying these criteria to vein width less than the minimum mining width.

16.6.8 Application of Cut-Off NSR and Creation of Mining Shapes

Practical mining shapes based on mining methods were created from the wire framed, generally steeply dipping vein structures of the four deposits using the diluted cut-off values ($/t) previously described as a guide. The veins were mainly viewed in vertical long section for this work.

The exception to this is Lucky Queen where the vein has a much flatter dip and the mining method is cut and fill. This deposit was done in plan view on a lift by lift basis.

The mining shapes were interrogated using commercially available mine planning software such as Gemcom and Datamine to report the in situ tonnes, metal grades, and NSR values associated with each shape. Internal dilution amounts were reported, and where deemed as high, the shapes were investigated to determine if optimization would be possible.

Mining shapes were created in sufficient quantity for each deposit to provide the level of detail needed for production scheduling. Appropriate starting sill elevations were considered and where geotechnical pillars were required, they were created as separate mining shapes.

16.6.9 Estimated Potentially Mineable Tonnes

Final estimates of external dilution were determined as previously described in Section 16.6.6 to calculate the diluted tonnes and grades. Mining recovery was applied at 95% for most shapes. For certain geotechnical and sill pillars, a mining recovery of 50 to 75% was applied.

Estimated potentially mineable tonnes were tabulated for each deposit and arranged to support production scheduling.

Table 16-7 shows the estimate of potentially mineable tonnes for the three deposits contributing to the PEA plant feed.

Table 16-7: Estimate of Potentially Mineable Tonnes for PEA Plant Feed

Mine	Diluted (kt)	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)	Calc'd NSR
Bellekeno	85.7	660		6.74	4.15	$405
Lucky Queen	129	1054	0.12	2.35	1.47	$557
Flame & Moth	593	690	0.52	2.18	5.44	$391
Total PEA Plant Feed (kt)	**807**	**745**	**0.40**	**2.69**	**4.67**	**$419**

In each of the three deposits there are some potentially mineable tonnes that were excluded from the PEA production plan for various reasons. Excluded tonnage is shown in Table 16-8. Potentially mineable tonnes shown in Table 16-8 are supported by scoping level mine plans.

Table 16-8: Potentially Mineable Tonnes Excluded from PEA Production Plan

Mine	Diluted (kt)	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)	Calc'd NSR
Bellekeno	111	545	0.00	3.50	3.20	$314
Lucky Queen	19.5	932	0.10	2.40	0.97	$495
Flame & Moth	32.1	419	0.31	1.25	6.77	$243
Excluded from PEA Plan (kt)	**163**	**566**	**0.07**	**2.92**	**3.64**	**$321**

SRK Comment

SRK worked with Alexco on an overall strategy to guide the development of the PEA production plan. This involved considering various combinations of the three deposits listed above, as well as the Onek mine, that would achieve a sustainable plant feed rate of 400 tpd as early as possible while balancing the capital development requirements.

A key part of the selected strategy was to give priority to Flame & Moth, to bring it into production without delay. Other mines were fit into the schedule to supplement the Flame & Moth production while respecting a maximum plant feed rate in the range of 400 to 420 tpd. Most of the tonnage shown in Table 16-8 as being excluded resulted from the “fitting together” of the overall production schedule.

SRK notes that the PEA is based on the specific strategy selected, however there are other possible scenarios for defining an overall production schedule that may warrant further study, particularly if changing metal prices or exploration results alter the mine planning context.

16.6.10 Planned Production Rates

SRK estimated maximum production rates to be respected during production scheduling. They were estimated based on mining method, vein thickness, mining shape geometry, and the layout of the vein access crosscut.

Full stope cycle models (including backfilling) were prepared for longhole and cut and fill mining, intended to show the maximum production rate for one independent face (one cut and fill face or one retreating longitudinal longhole mining sequence).

Monthly stope production records for the Bellekeno mine were reviewed representing actual tonnes mined by longhole and cut and fill methods. Stope cycle theoretical estimates were benchmarked against the actual production records.

16.7 Bellekeno Mine Plan

16.7.1 Introduction

Operations at the Bellekeno mine were temporarily suspended at the end of August 2013. Alexco provided SRK with a survey of all underground development and production areas as of August 31, 2013. Earlier in 2013, SRK had prepared a LoM plan for the Bellekeno mine that was based on the mineral resources for the Bellekeno deposit (Table 14-29) and a start date of January 1, 2013. The development and production schedule was prepared as a Gantt chart using Enhanced Production Scheduler (EPS) mine planning software.

The Bellekeno LoM plan presented in the current PEA was prepared by depleting the original LoM plan using the Bellekeno survey to represent the status of the mine at August 31, 2013. With a temporary suspension of operations inserted into the schedule, this then defined the start-up status of the development headings and production stoping for the planned re-start of operations. It is planned that some waste development will begin in early November 2014 with production stoping beginning in January 2015.

The Bellekeno mine plan was based on maintaining a nominal production rate of 280 tpd as long as possible.

The relevant characteristics of the deposit from a mining method selection perspective are:

- The deposit consists of three zones, the SW zone where the majority of mining has occurred to date, the central 99 zone with its more challenging ground conditions, and the undeveloped East zone;
- Both the East and 99 zones have a main vein and a subparallel splay vein with some economic material;
- It is a vein type deposit dipping at between 64° and 80°;
- Veins vary in true width from less than 1 m to almost 6 m;
- The selected mineable portions of the veins are mainly in the range of 2 to 4 m wide;
- It is a high grade, high value deposit requiring good mining recovery;
- The deposit is hosted in steep terrain with all of the deposit above the valley floor;
- The mining levels in the SW zone range from 980 to 570 level, a 127 m vertical extent;
- The mining levels in the 99 zone range from 665 to 545 level, a 53 m vertical extent;
- Vein continuity is reasonably good with contacts that can be visually identified;
- Wall rock strength is good with the vein material being fair to weak. Vein material strength is much improved when dewatered;
- Grade continuity in the areas above cut-off is generally good although the strike length of these areas is usually limited to less than 100 m.

Planned mining methods include longhole and MCF. Until mid-2012, most of the mining was by MCF methods. Testing of longitudinal retreat longhole mining methods began in early-2012 with 15 small scale longhole stopes being mined by late 2012.

16.7.2 Potentially Mineable Tonnes

The PEA mine plan for Bellekeno mine (starting January 2015) is based on potentially mineable tonnes totalling 85,700 with average grades of 660 gpt silver, 6.74% lead, and 4.15% zinc. The Bellekeno block model did not include an estimate of gold grades.

Mining shapes were created by applying a $185/t and $265/t diluted cut-off value to the resource mining blocks for areas identified as amenable to longhole mining methods and MCF methods, respectively. The resource mining blocks were given values based on a diluted NSR calculation that included the Silver Purchase Agreement referred to as NSRSW. Table 16-9 shows a summary of the potentially mineable tonnes (diluted plant feed) included in the PEA mine plan.

As discussed above in report Section 16.6.9, Table 16-9 does not include all of the potentially mineable tonnes identified for the Bellekeno mine. The table also shows estimated external dilution percentages averaging 19% and planned mining recoveries averaging 89%. Internal dilution within the mining shapes averaged 18%.

Table 16-9: Bellekeno Potential Mineable Tonnes for PEA

Mining Area	External Dilution (%)	Mining Recovery (%)[1]	Plant Feed Mineable tonnes	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)	NSRSW $/tonne
SW Vein	17%	87%	70,384	640		7.84	4.68	$ 406
99 Vein	27%	94%	15,317	748		1.71	1.71	$ 395
Total	**19%**	**89%**	**85,700**	**660**	**0**	**6.74**	**4.15**	**$ 404**

[1] - Mining Recovery includes 100% on development ore plus 95% on Stope ore broken less pillar losses

The distribution of mining methods by tonnes mined is 16% development on longhole sill drifts, 67% longhole stoping, and 17% MCF.

Figure 16-18 and Figure 16-20 show undiluted resource block NSRSW values in long section view for the South West and 99 zones at Bellekeno mine.

Table 16-10 and Table 16-11 present the colour legend for the Figures that follow. The colours can be related to either diluted NSRSW values or equivalent undiluted NSRSW values. The tables differ due to the higher percentage of external dilution applied to the 99 zone block model.

Table 16-10: Colour Legend - Bellekeno Southwest Zone Resource Block NSRSW Values

Block Colour	Diluted NSRSW $/tonne	Undiluted NSRSW $/tonne
Blue	150 to 185	175 to 216
Yellow	185 to 500	216 to 585
Red	500 to 2,317	585 to 2,711

Table 16-11: Colour Legend - Bellekeno 99 Zone Resource Block NSRSW Values

Block Colour	Diluted NSRSW $/tonne	Undiluted NSRSW $/tonne
Blue	150 to 185	188 to 232
Yellow	185 to 500	232 to 625
Red	500 to 2,169	625 to 2,711

The following figures are presented from the southwest end of the Bellekeno deposit (the SW zone) to the northeast of the deposit (the 99 zone).

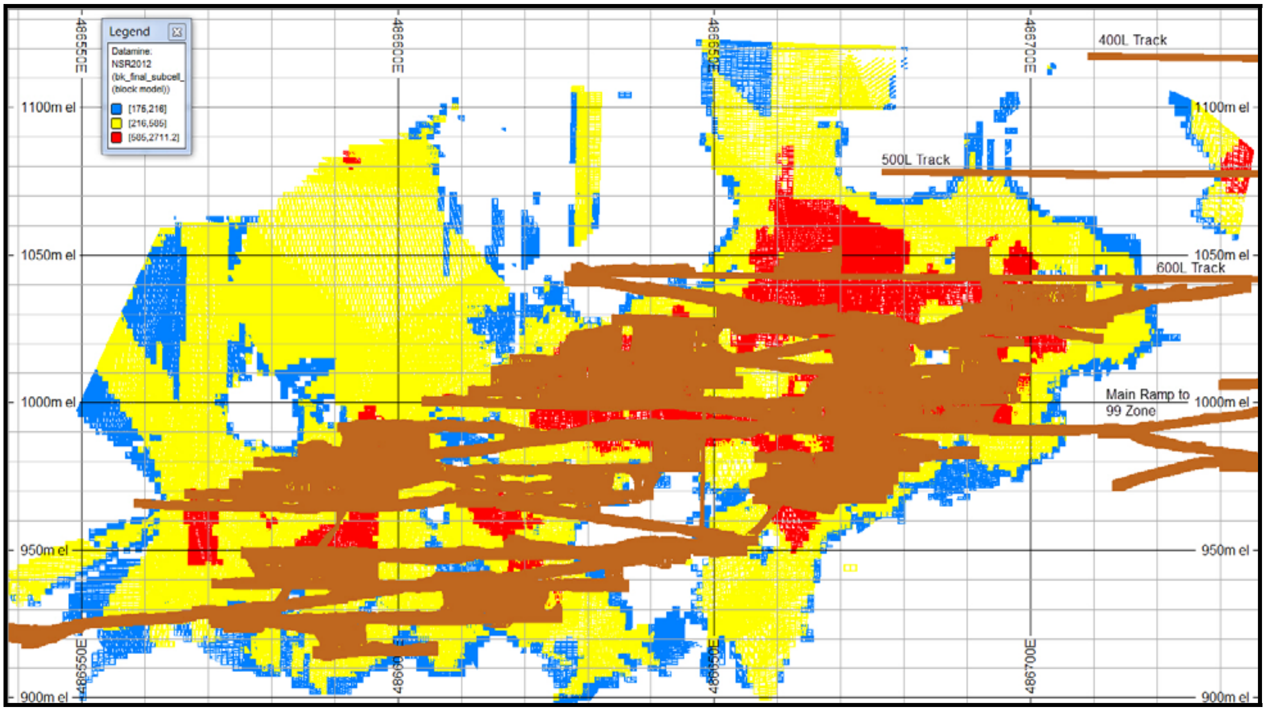


Figure 16-18: Longsection Looking Northwest - Bellekeno Southwest Zone NSRSW Undiluted Block Values (SRK, 2013)

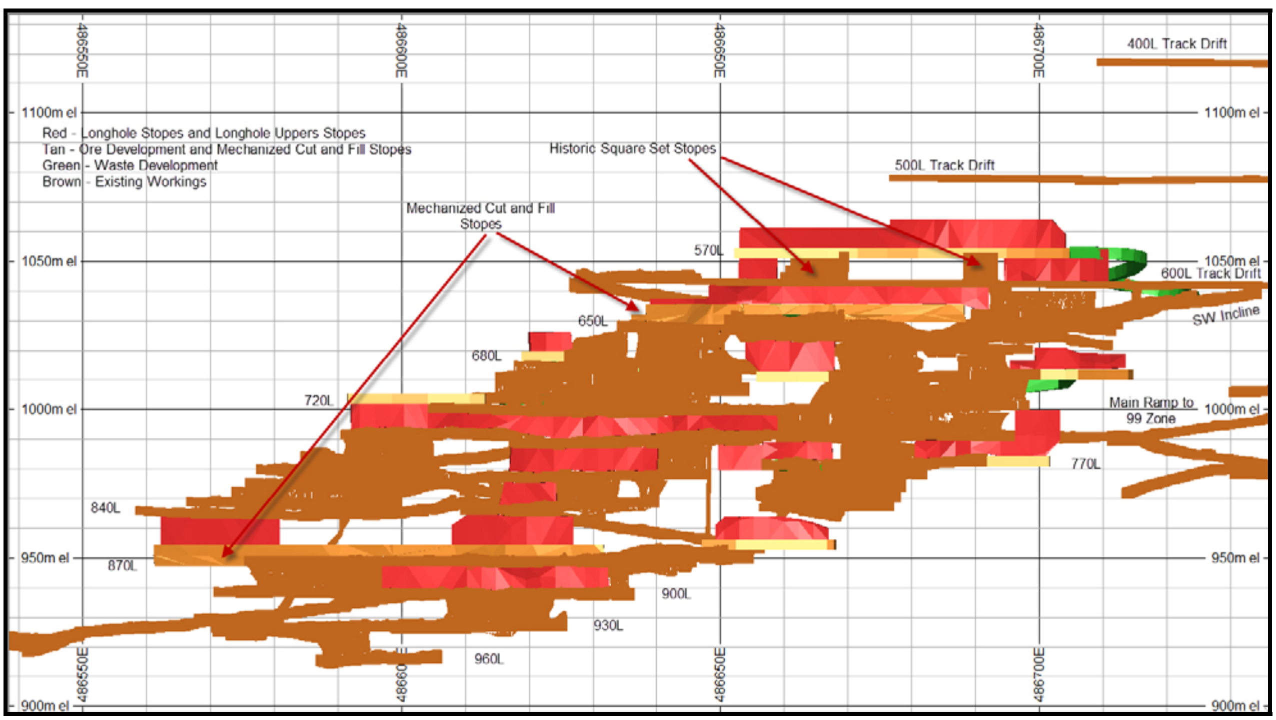


Figure 16-19: Longsection Looking Northwest - Bellekeno Southwest Zone Mining Shapes (SRK, 2013)

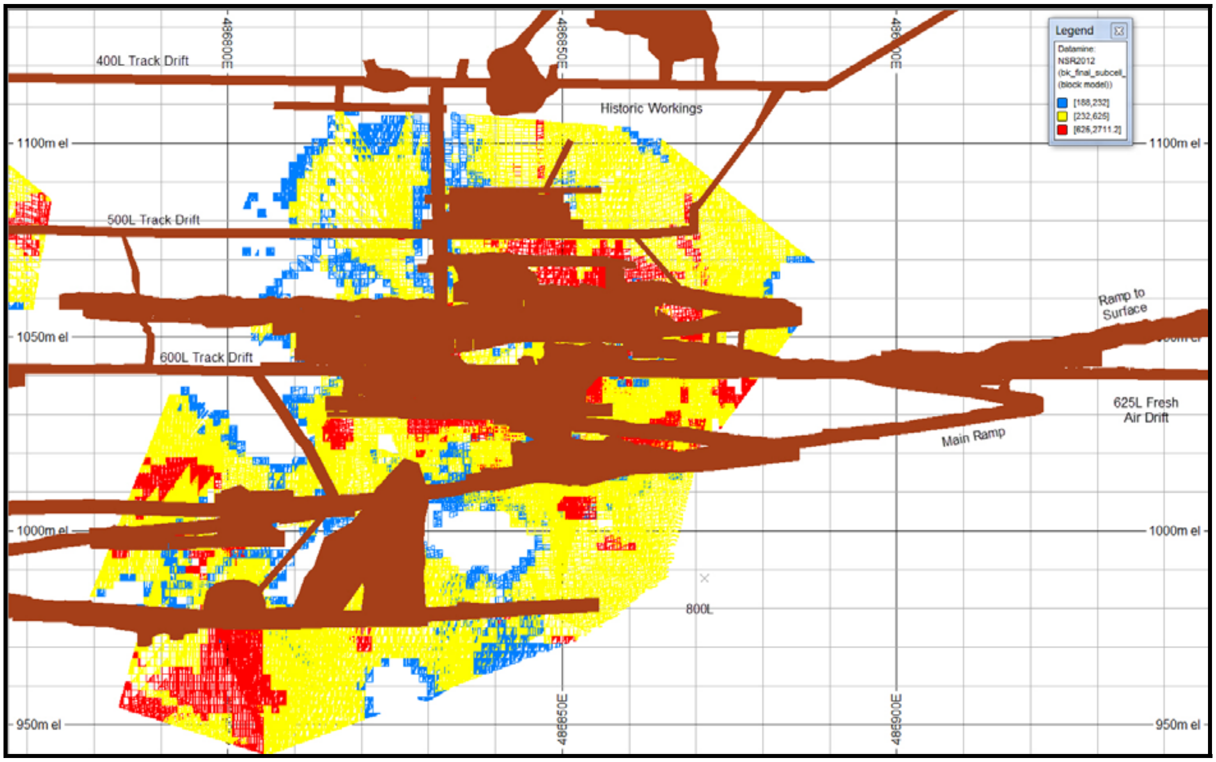


Figure 16-20: Longsection Looking Northwest - Bellekeno 99 Zone NSRSW Undiluted Block Values (SRK, 2013)

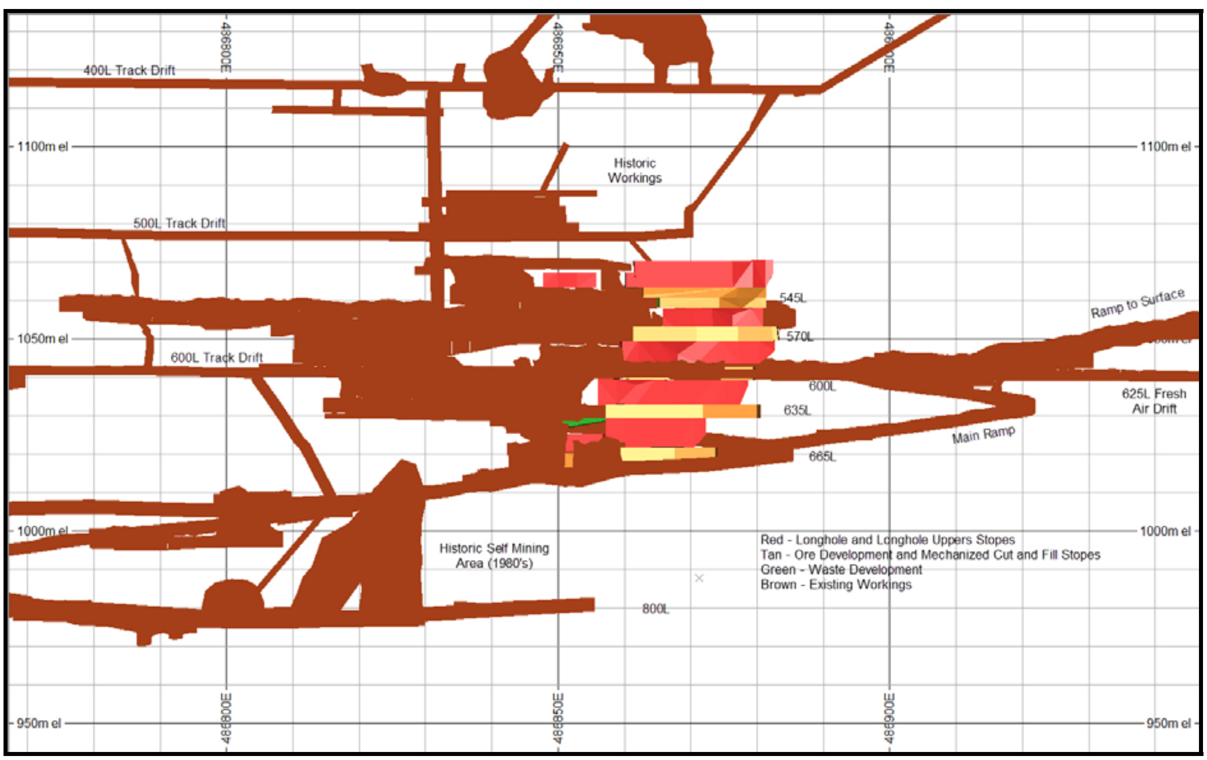


Figure 16-21: Longsection Looking Northwest - Bellekeno 99 Zone Mining Shapes (SRK, 2013)

16.7.3 3D Mine Model

Figure 16-22 and Figure 16-23 show the 3D mine models created to access the mining shapes for the SW and 99 zones, respectively. The view is from the hangingwall side of the deposit, looking north.

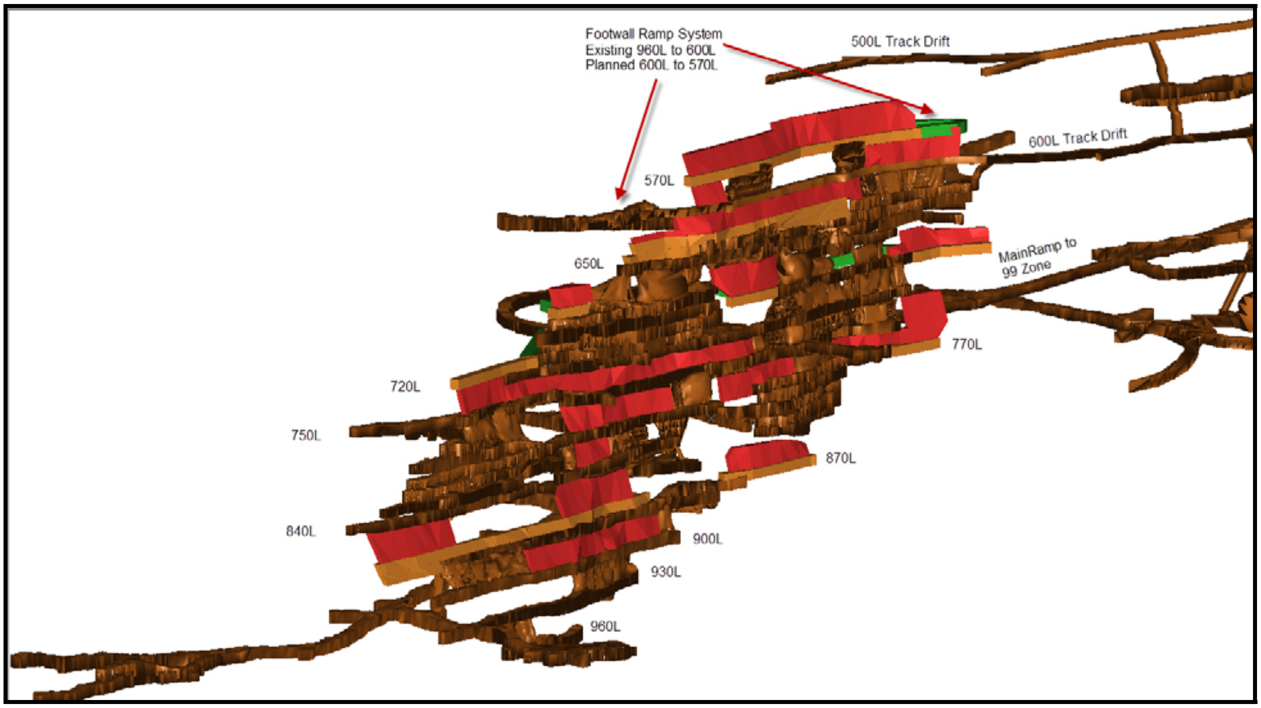


Figure 16-22: Isometric View - Bellekeno Southwest Zone Mine Model (SRK, 2013)

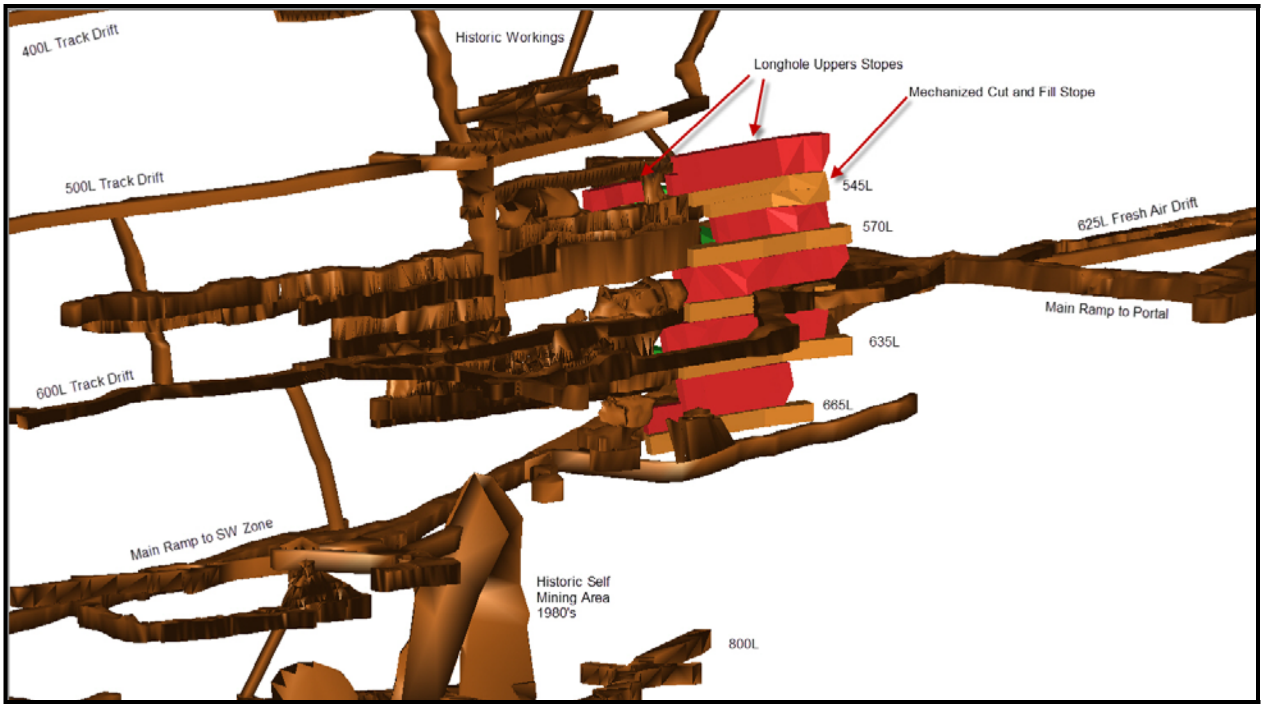


Figure 16-23: Isometric View - Bellekeno 99 Zone Mine Model (SRK, 2013)

The mine models show the 3D solid models of the planned ramps, crosscuts and raises for each of the three zones within the Bellekeno mine. The full mine models included geology wireframes of three veins and two splay veins, block model attributes, existing workings, surface topography, geotechnical domains, and the core drill hole database.

Primary access to the Bellekeno mine is via the existing main portal and ramp system. New internal ramps or extensions of existing ramps will be sized at 3.7 m x 4.0 m and driven within the range of +/-15% gradient, consistent with current mine practices.

The main ventilation system is well established and no additional ventilation raises or emergency manways are required to support the PEA mine plan.

The mine model includes major development but does not include the many additional cut outs that will be required such as remuck bays, local sumps, parking areas, gear storage areas, etc. To account for this extra development, the modelled waste development amounts have been factored up by 5% for ramps plus 10% for primary vein access crosscuts. The lower mark-up for ramps is to account for the existing development, some of which will be re-purposed to support the future development.

Based on the mine model and factored development amounts, SRK prepared LoM development summaries to show total lateral and vertical development.

Table 16-12 is a summary of the required lateral development. Considered as a stand-alone project, the Bellekeno mine plan achieves a ratio of 73 tonnes per lateral development metre.

Table 16-12: Bellekeno LoM Lateral Development Summary

Lateral Development	Length (m)
Capitalized Waste Development	
South West Zone Ramp & Levels	587
99 Zone Ramp & Levels	152
Total Capitalized Waste Development	**738**
Expensed Waste Development	
South West Accesses	5
99 Zone Accesses	0
Subtotal Expensed Waste Development	**5**
Expensed Mineralized Development	
South West vein (m)	296
99 Zone vein (m)	128
Subtotal Expensed Mineralized Development	**424**
Total Expensed Development	**429**
Total Lateral Development	**1,167**

No additional raising is required to execute the PEA mine plan except for slot raises for longhole mining.

LoM development waste rock broken for lateral and vertical development is estimated at 32 kt.

16.7.4 Development and Production Schedules

SRK prepared a development and production Gantt type schedule using EPS software. The schedule tracks and reports development metres and vein production material tonnes by quarter. The main purpose of the EPS Gantt was to schedule in detail the pre-production ramp up period tasks to determine the time required to reach the full planned production rate and to identify critical path items.

The production schedule is based on the assumption that the small scale longhole stopes will continue to perform similar to the test stoping programs. However, there is always the risk that a particular stope will fail prematurely or that certain areas may have to be mined by MCF methods due to unexpected adverse ground conditions.

SRK scheduled the waste development for the Bellekeno mine on an as needed basis and at no more than 3 m per day line advance and usually much less. Historical data from the mine suggests that any given ramp or level face typically advances at an average of 1.1 m per day. The intention was to schedule rates that can be achieved by well-organized owner’s development crews.

The production schedule includes some time allowances for vein water drainage after the vein has been intersected by access crosscuts. One month or more has been allowed for drainage before mining in the vein begins. Another constraint is that production stoping is not scheduled to begin until a second route out of the mine has been established to that location. The preparation time required to begin longhole stoping has been allowed for by delaying the start of blasting 30 days from the time that both the top sill and bottom sill development is completed.

Stope production rate capacity must be understood to create a realistic production schedule that has sufficient flexibility and can be reliably achieved. SRK used maximum stope production rates of:

- 1600 to 2100 tonnes/month for the longhole method;
- 1000 to 2100 tonnes/month for the cut and fill method.

These rates are long term averages that include the entire stope cycle including production and backfilling phases. In the case of longhole stoping, the rate includes both the on vein development material and the stope production material. This approach was used to simplify the production schedule.

Table 16-13 shows the Bellekeno lateral development schedule.

Table 16-14 shows the Bellekeno production schedule. For a high level of production surety, SRK considers the rate of 300 tpd to be the maximum for production planning though the mine has produced up to 540 tpd for one month in 2012. The production shown in Table 16-14 is the contribution of the Bellekeno mine to the total planned plant feed.

Table 16-13: Bellekeno Lateral Development Schedule

Mine/Zone	2014	2015				Total (m)
	Q4	Q1	Q2	Q3	Q4	
Bellekeno Mine						
Bellekeno SW Zone Ramps and Levels	117	274	72	96	28	**587**
Bellekeno 99 Zone Ramps and Levels	61	21	21	28	21	**152**
Lateral Waste Development (Capitalized)	**177**	**295**	**93**	**124**	**49**	**738**
Bellekeno SW Zone			5			**5**
Bellekeno 99 Zone						**-**
Lateral Waste Development (Expensed)	**-**	**-**	**5**	**-**	**-**	**5**
Subtotal Lateral Waste Development	**177**	**295**	**98**	**124**	**49**	**743**
Bellekeno SW Zone Longhole Sill Drifts		102	127	61	6	**296**
Bellekeno 99 Zone Longhole Sill Drifts		104	24			**128**
Lateral Vein Development (Expensed)	**-**	**206**	**152**	**61**	**6**	**424**
Subtotal Lateral Vein Development	-	206	152	61	6	**424**
Total Lateral Vein and Waste (m)	**177**	**501**	**249**	**185**	**55**	**1,167**

Table 16-14: Bellekeno Planned PEA Production Schedule

Milestones	2014	2015				Total
	Q4	Q1	Q2	Q3	Q4	
BK SW Upper Ramp						
BK SW Cross Cuts and Attack Ramps						
BK 99 Zone Cross Cuts and Attack Ramps						
Zone/Activity		**Tonnes per quarter**				
Bellekeno SW Zone Vein Dev.		3,776	4,919	2,350	191	11,236
Bellekeno 99 Zone Vein Dev.		3,892	926			4,818
Bellekeno East Zone Vein Dev.						-
Subtotal Lateral Vein Development	**-**	**7,668**	**5,845**	**2,350**	**191**	**16,054**
Bellekeno SW Zone LH		12,024	13,427	5,615	16,065	47,131
Bellekeno 99 Zone LH		1,220	3,311	3,446	766	8,743
Bellekeno East Zone LH						-
Subtotal Longhole Stoping	**-**	**13,244**	**16,738**	**9,061**	**16,831**	**55,874**
Bellekeno SW Zone MCF		1,770	3,038	6,918	290	12,016
Bellekeno 99 Zone MCF		312	390	344	711	1,756
Bellekeno East Zone MCF						-
Subtotal MCF Stoping	**-**	**2,082**	**3,428**	**7,262**	**1,001**	**13,772**
Total Mineralized Vein (t)	**-**	**22,994**	**26,011**	**18,673**	**18,023**	**85,700**
TPD	**-**	**255**	**289**	**207**	**200**	
Ag		563	639	685	786	660
Au		0.00	0.00	0.00	0.00	0.0
Pb		5.45	6.31	7.18	8.56	6.74
Zn		4.21	4.75	4.06	3.29	4.15
NSRSW		$344	$391	$421	$484	$404

The PEA mine plan calls for 18 kt of vein material to be mined in Q4 of 2015. Some 13 kt of this material will be stockpiled near the mill and used to supplement mill feed through 2016 as Lucky Queen and Flame & Moth ramp up production as shown in Table 16-27.

16.7.5 Mine Services

Mineralized Vein and Waste Handling

Vein material and waste are currently being handled underground by 15-tonne capacity haulage trucks. Trucks are loaded at remuck bays on the ramp systems or at the level entrances and haul directly to the portal vein material and waste storage bays. Surface haulage trucks with 28-tonne capacity enter the portal far enough to be loaded by a 14-tonne capacity LHD so that these materials can be hauled to the mill or to the existing surface waste rock storage facility.

Backfill materials consisting of development waste rock and dry filtered tailings are back hauled to underground storage locations as close as possible to stopes being backfilled.

Backfilling

Backfill materials consisting of development waste rock and dry filtered tailings will be placed into empty stopes by LHD. Several of the LHDs are equipped with ejector buckets for working in tight spaces. The mix of these materials is flexible and will be varied to minimize the surface environmental impact. For cut and fill stopes, the backfill will be pushed up tight to the back using an LHD equipped with a rammer jammer. For longhole stopes, dry filtered tailings are mixed with bagged cement and water in a remuck and placed by LHD into the stope as a slurry. SRK estimates the LoM backfill requirement to be 46 kt of cemented tailings and rock fill. The ratio of materials used could vary significantly.

Cemented backfill at approximately 3% cement by weight is used in longhole stopes, though poor quality control could result in significant variation. The cement, rock, and water will be mixed by LHD bucket in a small sump-like cut out near the empty stope. Cement will be transported underground in bulk bags.

Ventilation

The measured air flow entering the Bellekeno mine through the 625 level fresh air drift is 31 to 36 cubic metres per second (cms), equivalent to 66,500 to 76,000 cubic feet per minute (cfm). Heated fresh air is delivered centrally to the mine as needed through the 625 level fresh air drift that connects to the ramp system. The fresh air is distributed through the main ramp system to the work areas and then exhausted out through the main portal.

Mine Dewatering

Main dirty water and clean water sumps exist at the bottom of the ramp from the main portal near where the 625 level fresh air drift intersects the main ramp. All water collected in the active mining areas is pumped in stages from sump to sump to this dirty water sump. After decanting the clarified water into the clean water sump, the water is pumped out the 625 level portal to a surface pond.

No addition infrastructure should be required to complete the planned mining.

Maintenance Facilities

Most of the mobile equipment maintenance is performed in a surface shop constructed near the main portal. The mine area is relatively small and it is not difficult to bring underground equipment to the surface shop.

In addition to the mobile equipment, the mine maintenance department will be responsible for the stationary equipment consisting of air compressors, main ventilation fans and propane air heaters, underground electrical distribution system, and main dewatering pumps.

16.8 Lucky Queen Mine Plan

16.8.1 Introduction

The deposit is located approximately 10 km from Alexco's mill facility with an established haul road. At the time SRK began work on the PEA, the Alexco's mining contractor was reconditioning an old 1980s track drift in order to get to the underground starting point for a planned new ramp. The mine plan was therefore based upon all new mine planning work starting from the estimated date for the new ramp development to begin.

The relevant characteristics of the deposit from a mining method selection perspective are:

- The deposit consists of three veins, the majority of the planned mining is on the Main vein, with some planned mining on Splay 1 and Splay 3;
- Both of the splay veins are subparallel to the main vein and will share access drifts with the Main vein;
- It is a vein type deposit dipping at between 29° and 62°;
- Veins vary in true width from less than 1 m to 3.7 m through the planned mining area;
- The selected mineable portions of the veins are mainly in the range of 2 to 3 m wide;
- It is a high grade, high value deposit requiring good mining recovery;
- It is a deposit hosted in steep terrain with all of the deposit above the valley floor;
- The mine plan covers a vertical height of approximately 115 m with no mining currently planned below the 500 level;
- Vein continuity is good with contacts that can be visually identified;
- The vein tends to pinch out at each end;
- Wall rock strength is good with the vein material being of fair to weak. Vein material strength is much improved when dewatered;
- Grade continuity in the areas above cut-off is generally good although the strike length of these areas is usually limited to less than 100 m.

The planned mining method is MCF with cemented backfill consisting of development waste rock.

16.8.2 Potentially Mineable Tonnes

The PEA is based on Lucky Queen delivering 129,000 tonnes to the mill at average grades of 1,054 gpt silver, 2.35% lead, 1.48% zinc, and 0.12 gpt gold,.

Mining shapes were created by applying a $265/t diluted cut-off value to the resource mining blocks for areas identified as amenable to MCF methods. The resource mining blocks were given values based on a diluted NSR calculation that included the Silver Purchase Agreement referred to as NSRSW. Table 16-15 shows a summary of the potentially mineable tonnes (diluted plant feed).

Table 16-15: Lucky Queen Potentially Mineable Tonnes

Mining Area	External Dilution (%)	Mining Recovery (%)	Plant Feed						NSRSW $/tonne
			Mineable tonnes	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)		
Main Vein	44%	95%	112,798	1,073	0.129	2.41	1.53		$568
Splay 1	48%	95%	7,829	534	0.047	1.38	1.06		$285
Splay 3	43%	95%	7,952	1,299	0.076	2.42	1.18		$679
Total	**44%**	**95%**	**128,579**	**1,054**	**0.120**	**2.35**	**1.48**		**$558**

The table also shows estimated external dilution percentages averaging 44% and planned mining recoveries averaging 95%.

Internal dilution within the mining shapes averaged 4.9%.

The distribution of mining methods by tonnes mined is 100% MCF.

Figure 16-24 shows diluted resource block NSRSW values in long section view. Table 16-16 shows the colour legend for Figure 16-24.

Table 16-16: Colour Legend - Lucky Queen Diluted Resource Block NSRSW Value

Block Colour	Diluted NSRSW $/tonne	Undiluted NSRSW $/tonne
Blue	150 to 265	218 to 377
Yellow	265 to 500	377 to 712
Red	500 to 1,244	712 to 1,773

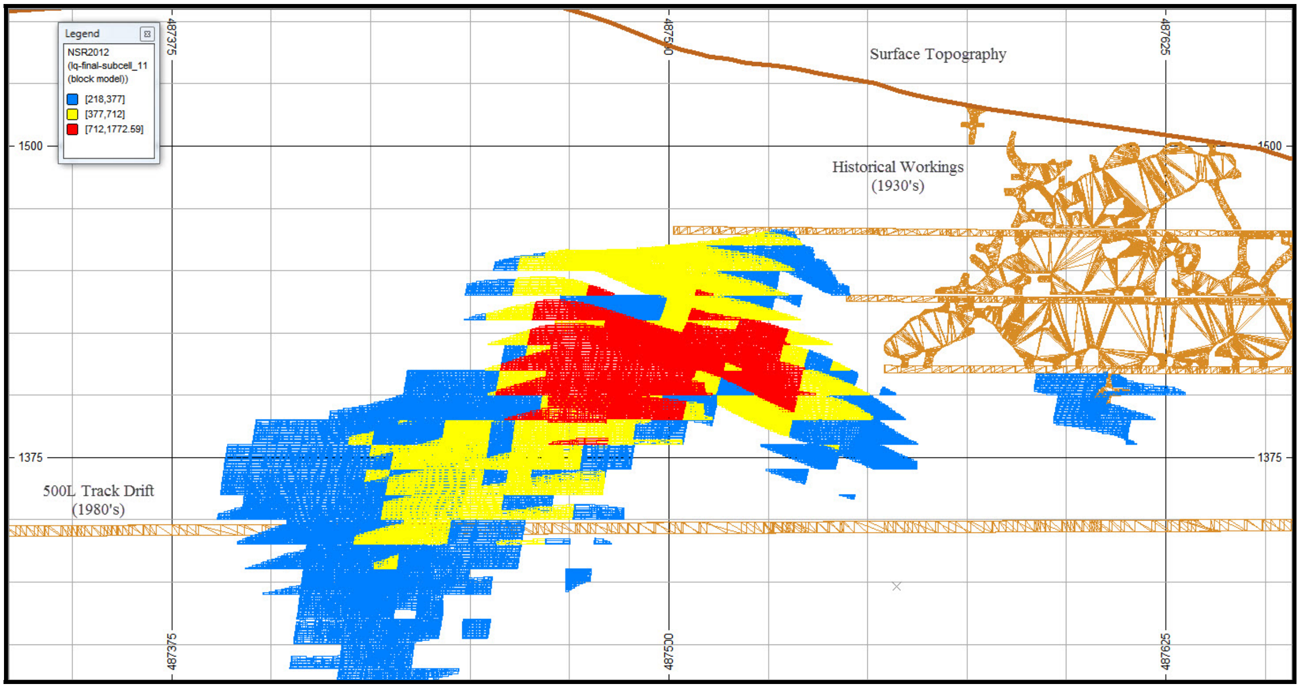


Figure 16-24: Longsection Looking Northwest - Lucky Queen NSRSW Undiluted Block Values (SRK, 2013)

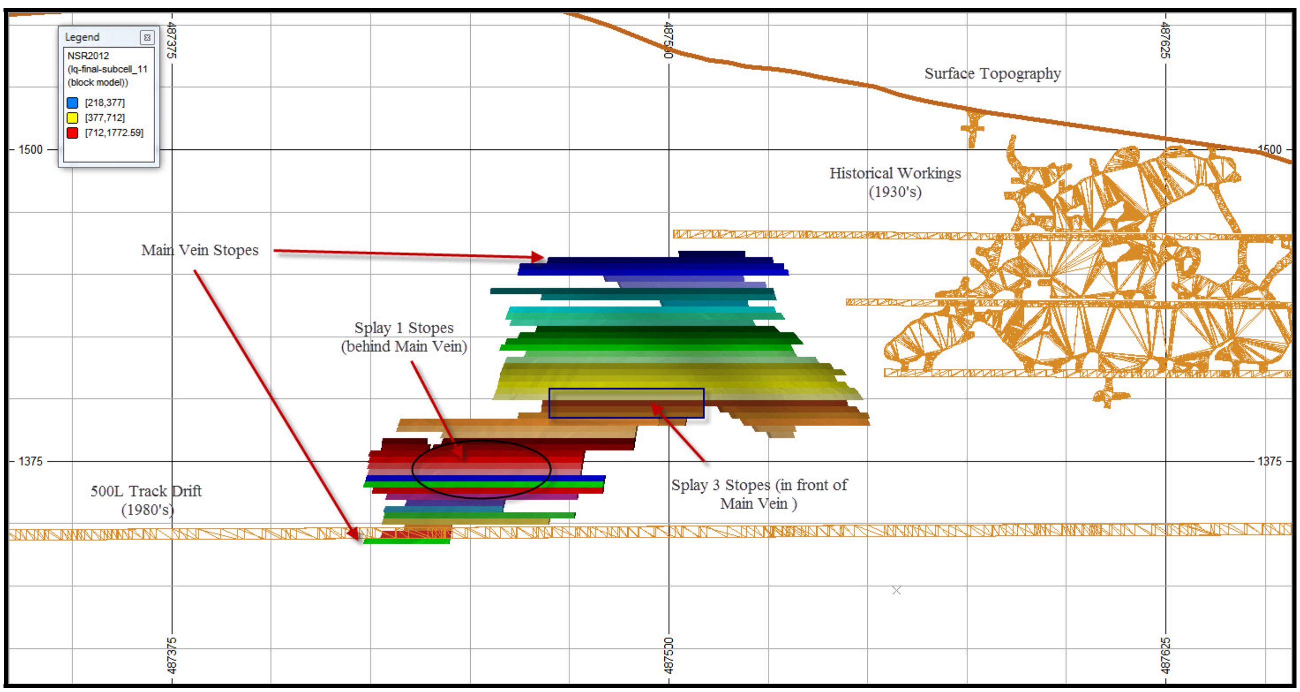


Figure 16-25: Longsection Looking Northwest - Lucky Queen Mining Shapes (SRK, 2013)

16.8.3 3D Mine Model

Figure 16-26 shows the 3D mine model created to access the mining shapes. The view is from the hangingwall side of the deposit, looking north.

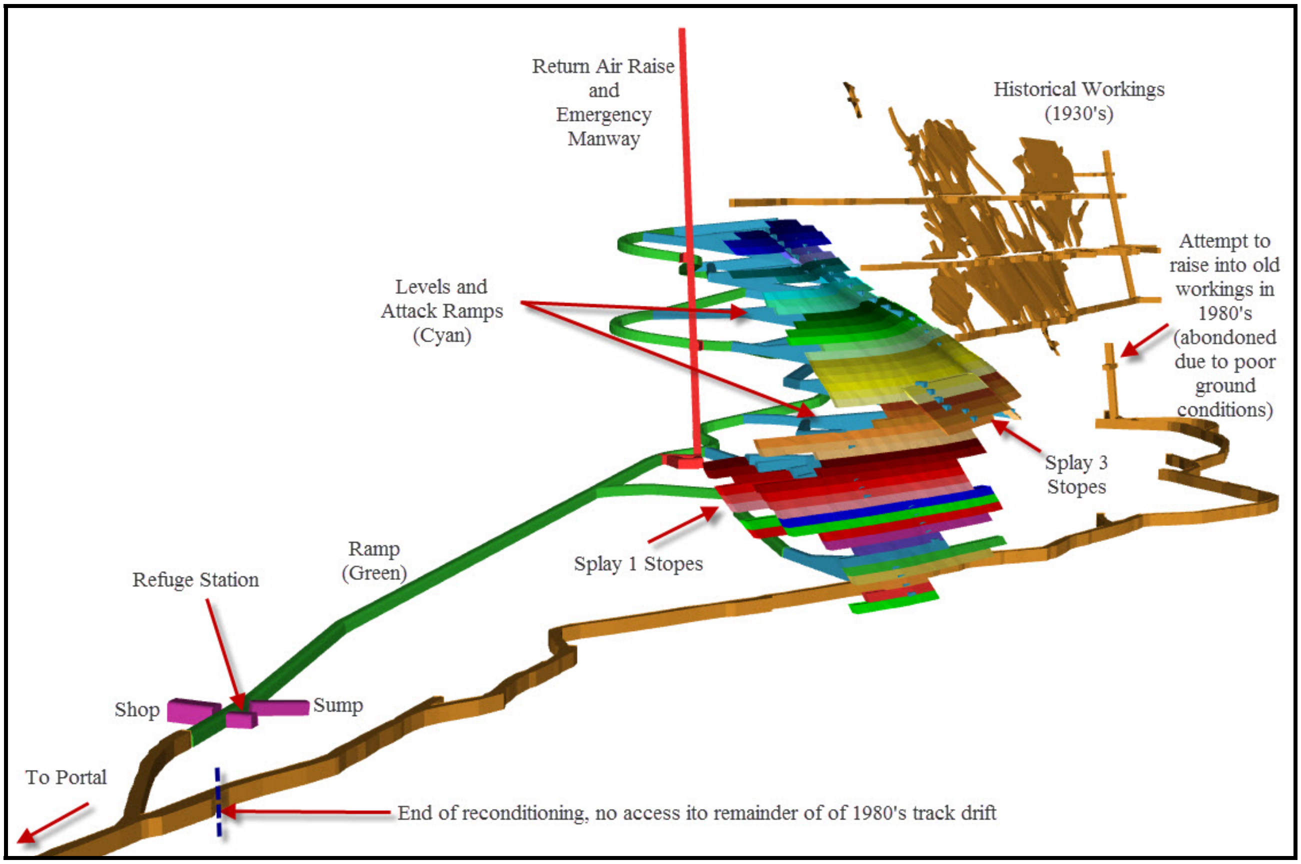


Figure 16-26: Isometric View - Lucky Queen Mine Model (SRK, 2013)

The mine model view shows the 3D solid models of the planned ramps, crosscuts and raises. The full mine model included geology wireframes of one vein and three splay veins, two fault models, block model attributes, existing workings, surface topography, geotechnical domains, and the core drill hole database.

At the time SRK became involved in mine planning in mid-2012, Alexco was in the process of reconditioning the 500 level track drift. The portal location was already well established with plenty of room and good road access to the portal site. Later, at Alexco's request, SRK reviewed an alternate portal location farther up the mountain side proposed by Alexco, and reached the conclusion that the existing portal location was preferable. This was mainly due to the fact that the Lucky Queen mine is located on the back side of the mountain where existing surface exploration roads are in very poor condition, and there are no utilities nearby.

Primary access to the mine is through the 1-kilometre-long 500 level track drift, which is too narrow for most underground haulage trucks. Alexco already removed the existing track during the reconditioning process and purchased a Young's 470 TZ underground haul truck rated at 6.4-tonne capacity. One of the major limiting factors to the mine's productivity will be the limited ability to effectively haul vein material and waste out of the mine and later backhaul in waste rock for cemented rock fill. One truck is capable of hauling 100 tpd of vein material to the portal, while a second, additional truck, will be required to haul the development waste rock to the portal or to the stope to make cemented rock fill. A third truck will be required as a spare.

From the underground starting point of the main ramp development, ramp size increases to 3.5 m x 3.5 m and it will be driven at a maximum +15% gradient. A shop facility, refuge station, and main sump are planned for the area at the bottom of the ramp.

Figure 16-27: Young's 470 TZ Haul Truck (6.4-tonne capacity) (Volvo AE30 in background) (SRK, 2013)

All underground development is planned on the footwall side of the veins to ensure the ramp is in stable ground and to optimize use of the attack crosscuts into the vein. Due to the flatter dip of the Lucky Queen deposit (averaging 45°), more lifts can be accessed economically from each attack crosscut. The primary crosscuts are planned at a -15% gradient with dimensions of 3.5 m x 3.5 m.

A main return air raise to surface is planned next to the main ramp. Fresh air will be delivered through the 500 level drift from the portal to the bottom of the ramp, then up the ramp to the active workings. After the auxiliary ventilation systems have flushed the active workings, the exhaust air will continue up the ramp to the next ventilation crosscut to be exhausted to surface. The return air raise will be equipped with a manway to provide a second exit from the mine. The raise collar on surface is planned in an area where bedrock is near surface. Road access exists to the area but needs to be upgraded if anything other than a 4 x 4 pickup truck is to visit the site.

The capital budget plan includes building a shelter on surface as it would take considerable time for surface vehicles to reach the raise collar area in the event of an evacuation of the underground workings.

The mine model includes major development but does not include the many additional cut outs that will be required such as remuck bays, local sumps, parking areas, gear storage areas, etc. To account for this extra development, the modelled waste development amounts have been factored up by 10% for ramps plus the equivalent of 15 m per planned attack crosscut for take down backs (TDBs) for vein access.

Based on the mine model and factored development amounts, SRK prepared LoM development summaries to show total lateral and vertical development.

Table 16-17 is a summary of the required lateral development. Considered as a stand-alone project, the Lucky Queen mine plan achieves a ratio of 43 tonnes per lateral development metre.

Table 16-17: Lucky Queen LoM Lateral Development Summary

Lateral Development	Length (m)
Lucky Queen Main Ramp	1090
500L Infrastructure	12
Ventilation Infrastructure	40
Levels and Attack Ramps	1100
Subtotal Capitalized (m)	**2,242**
Stope Access:	
Total Waste (m)	765
Total Vein (m)	0
Subtotal Expensed (m)	**765**
Total Lateral (m)	**3,007**

Table 16-18 is a summary of the required raising. Each of the raises listed requires a manway for the purpose of establishing an escape route from the mine.

LoM development waste rock broken for lateral and vertical development is estimated at 114 kt.

Table 16-18: Lucky Queen LoM Raising Summary

Ventilation/Escape Raise	Length (m)	Type	Size (m)
Main Fresh Air Raise	216	Alimak	2.5x2.5
Total Raising (m)	**216**		

16.8.4 Development and Production Schedules

SRK prepared a development and production Gantt type schedule using EPS software. The schedule tracks and reports development metres and vein production material tonnes by quarter. The main purpose of the EPS Gantt was to schedule in detail the pre-production ramp up period tasks to determine the time required to reach the full planned production rate and to identify critical path items.

Development work on the Lucky Queen main ramp was temporarily suspended in March 2013. At that time, the main ramp (green in Figure 16-26) face location was 20 m past the sump shown. Development for the refuge station and sump is complete, but the cut out for the small shop has not been made. This defines the Lucky Queen development start-up status for the Q2 2016 planned re-start.

The Lucky Queen ramp system was scheduled at a 2.3 m per day line advance with an additional 1 m per day line advance in secondary faces as available. These rates are lower than typical contractor advance rates partly due to the haulage situation as one Young's 470 TZ truck takes most of two shifts to haul a ramp round to the surface waste dump.

The EPS development and production schedule is based on Alexco restarting ramp development in Q2 2016 after the project was shut down in March 2013.

SRK scheduled the waste development for the Lucky Queen mine on a reduced, as needed basis once two mining fronts were established on vein.

The production schedule includes taking a bulk sample on #3 sublevel to support a production decision. This will allow for additional geotechnical and metallurgical testwork to be performed to ensure that this high grade deposit is mined in a manner that maximizes the recovered value. Two mining fronts are required to sustain the planned production rate of 100 tpd. One month or more has been allowed for vein drainage before mining in the vein begins.

Stope production rate capacity must be understood to create a realistic production schedule that has sufficient flexibility and can be reliably achieved. SRK used maximum stope production rates of 50 tpd per mining front. Each mining front has a minimum of two faces active with the splay veins adding an additional face at certain points in the schedule. To maintain a production rate of 100 tpd, the two mining fronts will need to cycle three rounds per day at an average of 38 tonnes per round.

Table 16-19 shows the Lucky Queen lateral development schedule.

Table 16-20 shows the Lucky Queen production schedule. For a high level of production surety, SRK considers the rate of 100 tpd to be the maximum for production planning although 120 tpd may be possible when splay vein faces are available. The production shown in Table 16-20 is the contribution of the Lucky Queen mine to the total planned plant feed.

Table 16-19: Lucky Queen Lateral Development Schedule

Mine/Zone	2016			2017				2018				2019				2020		Total
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(m)
Lucky Queen																		
Ramp from 500L to #3 Sub	8	224	25															257
RAR Alimak Nest			40															40
Ramp from #3 Sub to #4 Sub			50															50
Ramp from #4 Sub to #5 Sub			37	19														56
Ramp from #5 Sub to #6 Sub				87														87
Ramp from #6 Sub to #7 Sub								43										43
Ramp from #7 Sub to #8 Sub										25								25
Ramp from #8 Sub to #9 Sub										89								89
Ramp from #9 Sub to #10 Sub										3	40							43
Ramp from #10 Sub to #11 Sub												70						70
Ramp from #11 Sub to #12 Sub														100				100
Ramp from #12 Sub to #13 Sub														17				17
Ramp from Main Ramp to #2 Sub												78						78
Ramp from #2 Sub to #1 Sub												5	83					88
Sub-Levels and Attack Ramps			104	159	32	-	55	28	78	92	80	23	127	180	53			1,009
Miscellaneous	1	21	11	26	3	-	6	7	8	21	12	18	21	30	5			190
Lateral Waste Development (Capitalized)	**9**	**245**	**267**	**291**	**35**	**-**	**61**	**78**	**85**	**230**	**132**	**193**	**231**	**327**	**58**	**-**	**-**	**2,242**
Take Down Backs & Miscellaneous				30	45	60	60	60	60	60	60	60	60	60	60	45	45	**765**
Lateral Waste Development (Expensed)	**-**	**-**	**-**	**30**	**45**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**45**	**45**	**765**
Subtotal Lateral Waste Development	**9**	**245**	**267**	**321**	**80**	**60**	**121**	**138**	**145**	**290**	**192**	**253**	**291**	**387**	**118**	**45**	**45**	**3,007**

Table 16-20: Lucky Queen Production Schedule

	2016			2017				2018				2019				2020		
Development Milestones	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Total**
LQ Ramp Reaches #3 Sub																		
LQ Ramp to #5 Sub to start 2nd mining front																		
Ventilation and Emergency Manway in place																		
Bulk Sample, establish 1st Mining Front																		
Establishment of 2nd Mining Front																		
Establishment of 3rd Mining Front																		
Commercial Production Reached																		
Zone/Activity			**Tonnes per quarter**															
MCF from #1 Sub (S)														4515				4,515
MCF from #2 Sub (S)														26	4350	4,550	4,532	13,458
MCF from #3 Sub (S)			1,256	3,552	3,592	3,631	3,434	501										15,966
MCF from #4 Sub (S)								3,865	4,550	4,600	1,124							14,139
MCF from #5 Sub (N)					2,616	3,588	480											6,684
MCF from #6 Sub (N)							3,735	4,500	3,510									11,745
MCF from #6 Sub (S)											3,226	4,500	4,550	3,707				15,983
MCF from #7 Sub (N)									1,040	4,600	3,977							9,617
MCF from #8 Sub (S)														893	4,350	4,395		9,638
MCF from #9 Sub (S)																155	4,550	4,705
MCF from #10 Sub (N)											373	4,500	4,550	1,006				10,429
MCF from #11 Sub (N)														3,594	2,639			6,233
MCF from #13 Sub (N)															1,711	3,756		5,467
Total Production - Mineralized Vein (t)	**-**	**-**	**1,256**	**3,552**	**6,208**	**7,219**	**7,649**	**8,866**	**9,100**	**9,200**	**8,700**	**9,000**	**9,100**	**13,741**	**13,050**	**12,856**	**9,082**	**128,579**
TPD	**-**	**-**	**14**	**39**	**69**	**80**	**85**	**99**	**101**	**102**	**97**	**100**	**101**	**153**	**145**	**143**	**101**	**95**
Diluted Metal Grades																		
Ag (gpt)			660	660	679	683	1003	1144	1186	1283	1423	1272	1272	969	966	978	975	**1054**
Au (gpt)			0.11	0.11	0.15	0.15	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.10	0.10	0.12	**0.12**
Pb (%)			1.40	1.40	1.73	1.79	2.29	2.40	2.44	2.56	2.90	2.79	2.79	2.25	2.31	2.30	2.33	**2.35**
Zn (%)			1.80	1.80	1.31	1.22	1.42	1.76	1.83	1.93	1.61	1.36	1.36	1.40	1.22	1.23	1.38	**1.47**
NSRSW ($/t)			**$351**	**$351**	**$364**	**$366**	**$532**	**$604**	**$626**	**$675**	**$748**	**$671**	**$671**	**$513**	**$512**	**$518**	**$517**	**$557**

16.8.5 Mine Services

Mineralized Vein and Waste Handling

Vein material and waste will be handled underground by 6.5-tonne capacity haulage trucks, these being the largest trucks that will fit in the existing 500 level, which was originally driven as a track drift. Trucks will be loaded at remuck bays on the ramp systems or at the level entrances and haul directly to the portal vein material and waste pads outside the portal. The 28-tonne surface haul trucks will be loaded by front end loader so that the vein material and waste can be hauled to the mill facility or to the proposed potentially acid or metal leaching (P-AML) storage cell.

Backfilling

Backfill materials consisting of development waste rock and dry filtered tailings will be back hauled to underground storage locations as close as possible to stopes being backfilled. Approximately 3% cement by weight will be added to the backfill materials before placement into empty cut and fill stopes by an LHD equipped with an ejector bucket.

The cement, rock, tailings, and water will be mixed by LHD bucket in a small sump-like cut out near the empty stope. Cement will be transported underground in bulk bags. The backfill will be placed, then pushed up tight to the back using an LHD equipped with a rammer jammer. SRK estimates the LoM stope backfill requirement to be 92 kt.

Ventilation

The measured air flow entering the Lucky Queen mine during the development stage via the 500 level portal was 9.8 cms, equivalent to 20,800 cfm. This was delivered by a 45 kW auxiliary ventilation fan through a 760 mm twin duct, with a number of booster fans required to overcome the losses caused by more than 1 km of ducting to the face.

Once the return air raise is broken through to surface, the boosters and twin duct will be removed, the portal fans will be installed in their permanent location with mine air heaters, and fans will be installed in a bulkhead at the return air raise to create a push-pull ventilation system capable of 30 cms or 65,000 cfm. The expected requirement at full production, given the planned equipment, is 22 cms or 47,000 cfm.

Once the changeover is complete, fresh air will be delivered to the mine through the 500 level drift that connects to the ramp system. The fresh air will be distributed through the main ramp system to the work areas and then exhausted out through the return air raise to surface.

Mine Dewatering

A main dirty water sump has been excavated at the bottom of the ramp at the 500 level elevation. All water collected in the active mining areas will be pumped in stages from sump to sump to this dirty water sump. The dirty water will then be pumped out the 500 level portal to a surface settling pond to be recycled.

No addition infrastructure should be required to complete the planned mining.

Maintenance Facilities

Most of the mobile equipment maintenance will be performed in a small underground shop that is planned near the bottom of the ramp at the 500 level. The mine area is relatively small and it is not difficult to bring underground equipment to this shop. Major work will be done at the larger surface shop located at Elsa.

In addition to the mobile equipment, the mine maintenance department will be responsible for the stationary equipment consisting of air compressors, main ventilation fans, propane air heaters, the underground electrical distribution system, and the main dewatering pumps.

16.9 Flame & Moth Mine Plan

16.9.1 Introduction

The Flame & Moth deposit is located in close proximity to Alexco's mill facility. It has been defined by surface exploration drilling. The relevant characteristics of the deposit from a mining method selection perspective are:

- The deposit is offset by approximately 95 m of apparent right lateral movement along the west-northwest trending post-mineral Mill fault. The Mill fault dips approximately 66° to the southwest with the mineralization in the hangingwall section referred to as the Lightning zone and that in the footwall section referred to as the Christal zone;
- Most of the deposit area is covered by overburden that ranges in depth from 0 to 50 m;
- It is a vein-type deposit dipping at roughly 64°, comprised of two main veins – Lightning and Christal – plus a much smaller splay vein called Lightning vein 2;
- Vein widths vary from less than 1 to 10 m. The selected mineable portions of the veins are mainly in the range of 4 to 7 m wide;
- It is a high grade, high value deposit requiring good mining recovery;
- It is a shallow deposit with mining depths ranging from the crown pillar 30 m below bedrock surface to a maximum depth of 270 m;
- Vein continuity is expected to be reasonably good with contacts that can be visually identified;
- Wall rock strength is good with the vein material being of fair to weak. Vein material strength is expected to be much improved when dewatered;
- Grade continuity in the areas above cut-off is generally good;
- A high volume of ground water inflow is possible but cannot be accurately estimated due to limited field data and analysis.

Planned mining methods include longhole, cut and fill, and drift and fill. Drift and fill in two passes is planned for areas where the vein is thicker than 7 m, the span being too great for single pass cut and fill.

16.9.2 Potentially Mineable Tonnes

Mining shapes were created by applying the $230/t diluted cut-off value to the resource mining blocks. The resource mining blocks were given values based a diluted NSR calculation that included the Silver Purchase Agreement referred to as NSRSW. Table 16-21 shows a summary of the potentially mineable tonnes (diluted plant feed).

The table also shows estimated external dilution percentages averaging 14.7% and planned mining recoveries. Internal dilution within the mining shapes averaged 20%.

The pillars listed include a 30 m crown pillar (K) and 20 m wide pillars (H, I, J) planned to bracket the Mill fault with the intention of minimizing potential ground water inflows.

The mine plan assumes that pillar mining near the end of the mine life will extract 50% of the pillar tonnes (66 kt with average metal grades of 604 gpt silver, 2.40% lead, 6.38% zinc, and 0.51 gpt gold).

Table 16-21: Flame & Moth Potentially Mineable Tonnes

			Plant Feed					
Mining Shape	Dilution %	Mining Recov. %	Mineable kt	Ag (gpt)	Au (gpt)	Pb (%)	Zn (%)	NSRSW $/tonne
D	14%	95%	14.6	797	0.53	3.79	8.43	$466
E	12%	95%	63.8	700	0.52	2.55	4.87	$398
M	12%	95%	40.4	758	0.48	2.81	5.26	$430
C	12%	95%	64.4	769	0.49	2.87	7.22	$440
C	12%	95%	110	647	0.61	1.98	7.30	$373
C	12%	95%	7.6	436	0.16	0.74	12.76	$256
E	28%	95%	29.5	751	0.32	1.41	5.21	$409
M	28%	95%	5.2	1077	0.41	1.46	6.18	$577
F	16%	95%	15.0	516	0.29	3.11	6.52	$309
F	16%	95%	17.4	516	0.29	3.11	6.52	$309
F	16%	95%	46.9	507	0.54	1.11	3.88	$286
G	16%	95%	32.4	806	0.63	1.64	1.37	$438
G	16%	95%	51.0	931	0.71	1.77	1.66	$505
G	16%	95%	28.5	569	0.33	1.63	2.94	$315
Subtotal	**14.8%**	**95%**	**527**	**700**	**0.52**	**2.15**	**5.32**	**$396**
H	16%	50%	22.6	748	0.56	3.66	6.58	$438
I	12%	50%	29.0	548	0.44	1.59	5.53	$312
J	12%	50%	1.3	746	0.49	1.68	4.62	$412
K	14%	50%	12.7	461	0.57	2.07	8.13	$281
Subtotal	**13.6%**	**50%**	**66**	**604**	**0.51**	**2.40**	**6.38**	**$351**
Total	**14.7%**	**86%**	**593**	**690**	**0.52**	**2.18**	**5.44**	**$391**

The distribution of mining methods by tonnes mined is 58% cut and fill, 23% drift and fill, and 19% longhole.

Figure 16-28 shows diluted resource block NSRSW values in long section view.

Table 16-22 shows the colour legend for diluted resource block NSRSW values ($/t) shown in Figure 16-28.

Figure 16-29 shows the mining shapes created. Shapes have names represented by letters that correspond to the mining shape names in Table 16-21. The complete geotechnical pillars are shown in blue colour even though Table 16-21 includes only 50% of their tonnes.

Table 16-22: Colour Legend – Resource Block NSRSW Value

Block Colour	NSRSW $/tonne
Yellow	over 350
Red	260 to 350
Green	230 to 260
Blue	150 to 230

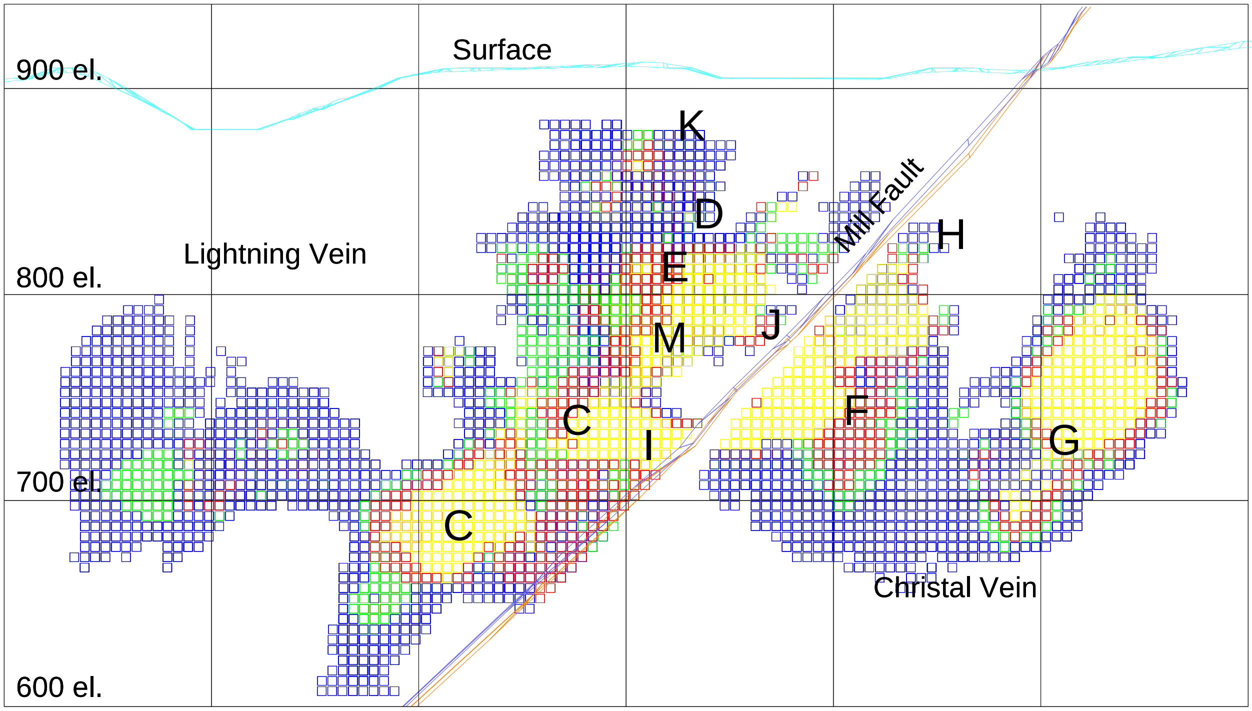


Figure 16-28: Flame & Moth Long Section - Block NSRSW Values (diluted), Looking Northwest (SRK, 2013)

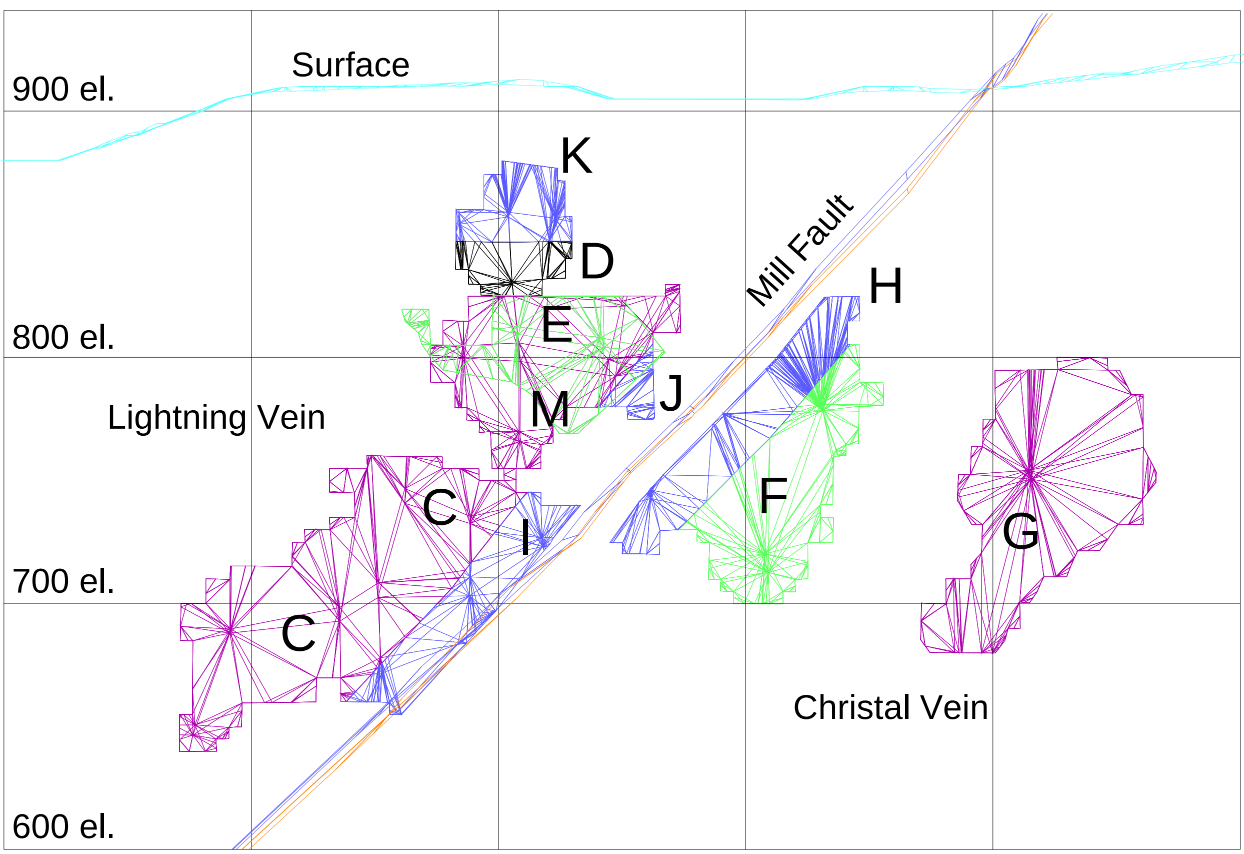


Figure 16-29: Flame & Moth Long Section - Mining Shapes, Looking Northwest (SRK, 2013)

16.9.3 Flame & Moth Mine Model

Figure 16-30 shows the 3D mine model created to access the mining shapes. The view is from the hangingwall side of the deposit, looking northwest.

The mine model view shows only the centre lines of the planned ramps, crosscuts, and raises. The full mine model included geology wireframes, topographic surface, bedrock surface, two major faults (Mill fault and Garbage fault), core drill holes and the mineralized veins of Flame & Moth. The bedrock surface is based mainly on drill hole information and it is observed to have some deep paleochannels where the overburden layer is 25 m thick and greater. There are large areas where the bedrock surface elevation is uncertain due to a lack of surface drill holes.

After considering a number of alternatives, the portal location was planned approximately 50 m southeast of the mill building in an area where bedrock is at or near surface, and where a portal face can be established into a hill side. In other locations considered for the portal, the overburden layer was modelled at up to 15 m thick.

Primary access to the mine will be by ramp sized at 3.7 m x 3.7 m and driven at a -15% gradient.

All underground development is planned on the hangingwall side of the veins where ground conditions are expected to be better. Excavations will avoid the graphitic schist located on the footwall side of the Christal vein. Spiral ramps at -15% gradients are planned for Lightning and Christal sized at 3.7 m x 3.7 m to accommodate 15-tonne capacity trucks. Underground development is planned to pass through the Mill fault in three places.

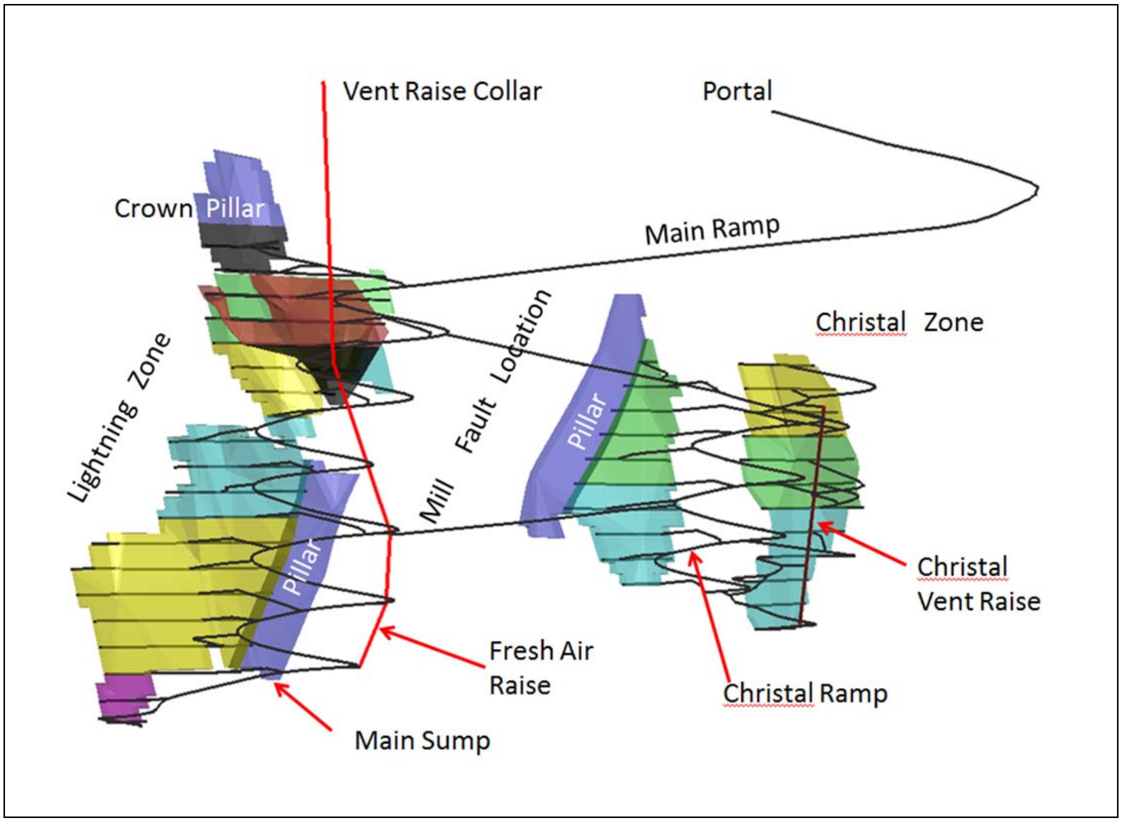


Figure 16-30: Flame & Moth 3D Underground Mine Model, Isometric View Looking Northwest (SRK, 2013)

A main ventilation raise from surface is planned next to Lightning spiral ramp. It will deliver fresh air and will be equipped with a manway to provide a second exit from the mine. The raise collar on surface is planned in an area where bedrock is exposed.

The mine model includes development centre lines but does not include the many additional cut outs that will be required such as remuck bays, local sumps, parking areas, gear storage areas, etc. To account for this extra development, the modelled development amounts have been factored up by 15% for ramps and 20% to 25% for primary vein access crosscuts.

Based on the mine model and factored development amounts, SRK prepared LoM development summaries to show total lateral and vertical development.

Table 16-23 is a summary of the required lateral development. Considered as a stand-alone project, the Flame & Moth mine plan achieves a ratio of 78 tonnes per lateral development metre.

Table 16-23: Flame & Moth LoM Lateral Development Summary

Lateral Development	Length (m)
Main Lightning ramp	2,091
Upper link to Christal	145
Lower link to Christal	147
Christal ramp	651
Stope Access	523
Subtotal Capitalized (m)	**3,556**
Stope Access:	
Total waste (m)	3,392
Total vein (m)	697
Subtotal Expensed (m)	**4,089**
Total Lateral (m)	**7,645**

Table 16-24 is a summary of the required raising. Each of the raises listed requires a manway for the purpose of establishing an escape route from the mine. The table does not include any slot raising for longhole mining.

LoM development waste rock broken for lateral and vertical development is estimated at 300 kt.

Table 16-24: Flame & Moth LoM Raising Summary

Ventilation/Escape Raise	Length (m)	Type	Size (m)
Main Fresh Air Raise	197	bored	3.0 dia.
Main Fresh Air Raise	72	open	2.4 x 2.4
Christal Raise	100	drop raise	2.4 x 2.4
Total Raising Metres	**369**		

16.9.4 Development and Production Schedules

SRK prepared a development and production Gantt type schedule using EPS software. The schedule tracks and reports development metres and vein production material tonnes by quarter. The main purpose of the EPS Gantt was to schedule in detail the pre-production ramp up period tasks to determine the time required to reach the full planned production rate and to identify critical path items.

The production schedule is based on the assumption that 50% of the geotechnical pillars will be mined at the end of the mine life. The pillar mining tonnes have simply been added at the end of the production schedule to extend the mine life.

SRK scheduled the main ramp from surface and all of the Lightning ramp system at advance rates of 3 to 4 m per day line advance (432 m at 3 m/d, 1366 m at 4 m/d). The Christal spiral ramp system was scheduled at 2 to 3 m per day line advance. The intention was to schedule rates that can be achieved by well-organized owner's development crews.

The EPS development and production schedule is based on starting site preparation for portal construction on April 1, 2014. This is based on the permitting timeline.

The production schedule includes some time allowances for vein water drainage after the vein has been intersected by access crosscuts. An average of 1.8 months (minimum 1 month) has been allowed for drainage before mining in the vein begins. Another constraint is that production stoping is not scheduled to begin until a second route out of the mine has been established to that location.

Stope production rate capacity must be understood to create a realistic production schedule that has sufficient flexibility and can be reliably achieved. SRK used maximum stope production rates of:

- Average 1,770 (1,480 to 2,290) tonnes/month for the longhole method;
- Average 1,370 (200 to 2,350) tonnes/month for the cut and fill method.

These rates are long term averages that include the entire stope cycle including production and backfilling phases.

Table 16-25 shows the Flame & Moth lateral development schedule.

Table 16-26 shows the Flame & Moth production schedule. SRK considers the rate of 370 tpd to be the maximum rate for production planning. The production shown in Table 16-26 is the contribution of the Flame & Moth mine to the total planned plant feed.

Table 16-25: Flame & Moth Development Schedule

	2014			2015				2016				2017				2018				2019				2020	Total
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Metres
Main Lightning ramp	115	309	423	414	419	246	164																		**2,089**
Christal ramp				275	251	132		78	150	57															**943**
Lightning stope access waste			38	163	154	123	128	131	131	125	121	120	118	110	99	51	50	51	40	42	55	25			**1,874**
Christal stope access waste						45	177	36	44	58	65	59	56	48	67	166	169	169	192	191	164	166	140	28	**2,041**
Christal stope access on vein									15	26	31	30	31	28	28	51	55	57	71	76	70	71	55	3	**699**
Total Metres (vein + waste)	**115**	**309**	**461**	**852**	**824**	**546**	**468**	**245**	**339**	**266**	**218**	**210**	**204**	**186**	**194**	**268**	**274**	**277**	**303**	**310**	**289**	**262**	**195**	**31**	**7,645**

Table 16-26: Flame & Moth Production Schedule

		2014			2015				2016				2017				2018				2019				2020			
		Q2	Q2	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Total
									Main ramp																			
												Christal ramp																
								Main vent raise																				
									→ Production period																			
Shape	Tonnes per quarter																											
E						5576	6650	6650	6577	6577	6049	6045	5914	5979	4694	3168												63,900
E						2154	2569	2569	2541	2541	2569	3020	2957	2990	3023	2567												29,500
M							2002	3627	3588	3588	3627	4457	4731	4784	4836	4836	284											40,400
M							150	605	598	598	605	605	591	598	605	267												5,200
C							3170	5743	5680	5680	5743	5743	5618	4827	4085	4080	3992	4036	4140	1882								64,400
C								6174	7026	7026	7103	7103	6949	7026	7103	7103	6949	7026	7103	7103	6949	7026	5572					110,300
C																					2366	5234						7,600
F							214	3929	4332	2109	1515	1511	950	440														15,000
F																2254	4140	3567	3023	3023	1365							17,400
F																	5293	5382	5441	5441	5910	5385	5441	5441	3128			46,800
G										2438	4232	4953	4849	4903	4536	4534	4436	4634	2155									41,700
G																	3772	4186	4232	4751	5322	4194	4232	1743				32,400
G																			2829	6587	6945	7026	7103	7103	188			37,800
D						486	3023	3023	2990	2990	2109																	14,600
H	pillar																							2464	9000	9618	1482	22,600
I	pillar																						1711	8000	9000	9500	794	29,000
J	pillar																								1286			1,300
K	pillar																								2341	9600	746	12,700
Total Vein Material (t)						8,200	17,800	32,300	33,300	33,500	33,600	33,400	32,600	31,500	28,900	28,800	28,900	28,800	28,900	28,800	28,900	28,900	24,100	24,800	24,900	28,700	3,000	**592,600**
TPD						**91**	**198**	**359**	**370**	**373**	**373**	**372**	**362**	**351**	**321**	**320**	**321**	**320**	**321**	**320**	**321**	**321**	**267**	**275**	**277**	**319**	**34**	
Ag	gpt					719	743	706	702	736	752	755	759	763	766	746	695	701	668	628	610	592	619	589	617	586	625	**690**
Au	gpt					0.47	0.48	0.48	0.48	0.52	0.53	0.53	0.53	0.54	0.54	0.53	0.56	0.57	0.54	0.51	0.49	0.46	0.52	0.47	0.51	0.52	0.53	**0.52**
Pb	%					2.33	2.68	2.60	2.59	2.50	2.42	2.32	2.31	2.28	2.24	2.32	2.05	2.01	1.96	1.85	1.60	1.45	1.58	1.70	2.33	2.44	2.72	**2.18**
Zn	%					5.17	6.02	6.38	6.41	6.05	5.76	5.48	5.46	5.39	5.40	5.51	4.87	4.77	4.82	4.55	4.82	5.69	4.02	4.18	5.88	6.75	6.69	**5.44**
NSRSW	$/t					$405	$423	$404	$402	$418	$425	$425	$427	$429	$430	$421	$392	$394	$377	$354	$343	$334	$347	$332	$357	$344	$366	**$391**

16.9.5 Mine Services

Mineralized Vein and Waste Handling

Vein material and waste will be handled by 15-tonne capacity haulage trucks underground and on surface. Trucks will be loaded at remuck bays on the ramp systems and will haul directly to the surface vein material pad at the mill or to the planned surface waste rock dump location, both surface locations being within 400 m of the portal.

LoM development waste rock broken underground is estimated at 300 kt. Approximately 230 kt of this waste rock is needed for Flame & Moth backfill, along with 124 kt of dry filtered tailings. The conceptual plan for the remaining waste rock amount of 70 kt is to use it for surface construction. Alexco plans to use the majority of the excess waste rock to construct a toe berm for the expansion of the DSTF. Detailed plans for the surface handling Flame & Moth waste rock depend on the geochemical characterization of the rock, which has not been done yet.

Flame & Moth backfill consisting of development waste rock and dry filtered tailings will be back hauled underground as close as possible to stopes being backfilled. DUX Machinery Corp. produces a teledump 15-tonne truck (model TD-15) with a two piece telescoping box that can dump with only a 2.7 m back height. This would allow backfill to be trucked very close to the stopes being filled. SRK estimates that a fleet of three 15-tonne trucks will be required.

Backfilling

Backfill materials consisting of development waste rock and dry filtered tailings will be placed into empty stopes by a LHD or 15-tonne truck. The mix of these materials is flexible and will be varied to minimize the surface environmental impact. For cut and fill and drift and fill stopes, the backfill will be pushed up tight to the back using an LHD equipped with a rammer jammer. SRK estimates the LOM backfill requirement to be 354 kt.

Cemented backfill at approximately 5% cement by weight will be used in drift and fill stopes and longhole stopes. The cement, rock and water will be mixed by LHD bucket in a small sump-like cut out near the empty stope. Cement will be transported underground in bulk bags.

Ventilation

The planned ventilation flow for Flame & Moth is 78 cms, equivalent to 165,000 cfm based on the equipment fleet and similar projects. Heated fresh air will be delivered centrally to the mine through a 3-metre diameter bored raise equipped with a manway. Two fans operating in parallel will be set up on the fresh air raise. Bedrock is exposed on surface at the planned raise collar location.

Exhaust air will be through the main Lightning ramp system that extends from the mine bottom to surface.

From the fresh air raise, fresh air will be distributed by lateral development (through the lower link) to the Christal zone. Fresh air will be distributed upwards through Christal zone by a ventilation raise. Exhaust will be removed from the upper extremity of Christal zone through the upper link that connects it to the main Lightning ramp.

Mine Dewatering

The Flame & Moth deposit extends below the valley floor and for that reason there is potential for significant inflows of water.

Alexco conducted preliminary hydrogeology investigations during the 2013 field season. Based on the findings, an independent hydrologist commissioned by Alexco provided an opinion on the potential mine water inflow of 150 to 350 gallons per minute (gpm). SRK assumed an inflow rate of 300 gpm as the basis of a scoping level capital cost estimate.

SRK conceptually planned a main dirty water sump at the 660 m elevation near the fresh air raise and main ramp. Metso dirty water centrifugal pumps are planned in two parallel banks of three pumps each in series. Two steel cased 125-millimetre diameter drill holes are planned to deliver dirty water from the main sump to surface.

Area sumps are planned as follows: one sump at the lowest area of Lightning and one at the lowest area of Christal. These sumps will be equipped with 45 kW dirty water submersible pumps to pump to the main sump at the 660 m elevation.

Maintenance Facilities

Most of the mobile equipment maintenance will be performed in a planned surface shop, to be constructed near the Flame & Moth portal. The mine area is relatively small and it will not be difficult to bring underground equipment to the surface shop. An additional small maintenance shop will be set up underground to handle small repairs and routine servicing.

At the time Flame & Moth production is planned to ramp up, mining activity at Bellekeno will be coming to an end. Used shop tools and equipment will become available for use at Flame & Moth.

The maintenance department will have a fuel/lube truck, a mechanic’s service truck, a tractor, and access to a scissor lift and a boom truck.

In addition to the mobile equipment, the mine maintenance department will be responsible for the stationary equipment consisting of air compressors, main ventilation fans, propane air heaters, underground electrical distribution system, and main dewatering pumps.

16.10 Consolidated Mining Schedules, Equipment and Manpower

16.10.1 Plant Feed Schedule

Table 16-27 shows the planned combined plant feed schedule for Alexco’s mill facility that totals 807 kt from January 1, 2015 through to mid-2020.

The average NSR value of the plant feed is $419/t based on an NSR formula incorporating the Silver Purchase Agreement, under which 25% of the silver production is sold at a reduced price of US$3.90 per ounce. Metal prices of US$24.00/oz silver, US$0.95/lb lead, US$0.85/lb zinc, and US$1300/oz gold, were used in the NSR calculation. An exchange rate of US$0.96/C$1.00 was also used.

Table 16-27: EKHSD Project Combined Plant Feed Schedule

Mine	2015	2016	2017	2018	2019	2020	Total
Bellekeno (kt)	**72.5**	**13.2**					**85.7**
Ag gpt	637	786					660
Au gpt							
% Pb	6.41	8.56					6.74
% Zn	4.30	3.29					4.15
Lucky Queen (kt)	**-**	**1.3**	**24.6**	**35.9**	**44.9**	**21.9**	**129**
Ag gpt		660	778	1258	1090	977	1,054
Au gpt		0	0	0	0	0	0.12
%Pb		1.40	1.88	2.57	2.49	2.31	2.35
%Zn		1.80	1.39	1.79	1.33	1.29	1.47
Flame & Moth (kt)	**58.3**	**134**	**122**	**115**	**107**	**57**	**593**
Ag gpt	719	736	758	673	602	602	690
Au gpt	0.48	0.52	0.54	0.54	0.48	0.52	0.52
%Pb	2.59	2.46	2.29	1.97	1.58	2.41	2.18
%Zn	6.10	5.92	5.44	4.75	4.73	6.36	5.44
Total Plant Feed (kt)	**131**	**148**	**146**	**151**	**151**	**79**	**807**
TPD	363	412	407	420	421	418	406
Ag gpt	674	740	762	811	747	707	745
Au gpt	0.21	0.47	0.47	0.44	0.37	0.40	0.40
%Pb	4.71	2.99	2.22	2.11	1.85	2.38	2.69
%Zn	5.11	5.65	4.76	4.05	3.72	4.95	4.67
NSRSW ($/t)	**$399**	**$423**	**$425**	**$447**	**$409**	**$397**	**$419**

16.10.2 Total Lateral Waste Development Schedule

Table 16-28 shows the total lateral waste development scheduled for the three mines included in the production schedule.

Table 16-28: EKHSD Project Total Lateral Waste Development

Mine/Zone	2014	2015	2016	2017	2018	2019	2020	Total (m)
Bellekeno SW	117	475						**592**
Bellekeno 99	61	91	-					**152**
Lucky Queen	-	-	521	582	764	1049	90	**3,007**
Flame & Moth	885	2,690	995	678	887	784	28	**6,946**
Total Lateral Waste (m)	**1,062**	**3,257**	**1,516**	**1,260**	**1,652**	**1,832**	**118**	**10,697**

The peak advance rate planned occurs in Q1 2015 with 1,148 m scheduled. Assuming a productivity of 0.8 metres per man-shift (11-hour shift basis) this will require approximately 30 development miners.

16.10.3 Waste Rock and Backfill Schedules

Table 16-29 shows LoM schedules for development waste rock broken and backfilling requirements. Backfill will be a mix of dry filtered tailings and development waste rock, with cement added when needed. On average, the backfill will be comprised of 31% dry tailings and 69% rock.

Table 16-29: Waste Rock and Backfill Schedules

Mine/Zone Waste Broken	2014	2015	2016	2017	2018	2019	2020	Total (kt)
Bellekeno SW	5.4	20.5	-	-	-	-	-	**25.9**
Bellekeno 99	2.8	3.2	-	-	-	-	-	**6.0**
Lucky Queen	-	-	19.8	22.2	29.1	39.9	3.4	**114**
Flame & Moth	37.3	119	41.9	30.3	37.4	33.0	1.2	**300**
Total Waste Broken (kt)	**45.5**	**143**	**61.8**	**52.5**	**66.5**	**72.9**	**4.6**	**447**
Mine Backfill Required								**Total(kt)**
Bellekeno Backfill	2.4	43.0	-					**45.5**
Lucky Queen Backfill			0.9	22.7	31.9	38.3	18.0	**112**
Flame & Moth Backfill	-	34.8	79.9	72.7	68.9	63.6	33.8	**354**
Total Backfill (dry kt)	**2.4**	**77.9**	**80.8**	**95.4**	**101**	**102**	**51.9**	**511**
Backfill Composition (kt)								**Total(kt)**
Waste Rock Backfill	2.4	5.6	-	5.1	6.3	6.3	2.4	**28.0**
Dry Tailings in Cemented Backfill	-	44.0	28.0	25.5	24.1	22.3	11.8	**156**
Waste Rock in Cemented Backfill	-	28.2	52.8	64.9	70.4	73.4	37.7	**327**

16.10.4 Equipment and Manpower

An underground mining contractor was engaged at the site up until the temporary shutdown began at the end of August 2013. Operations are planned to resume at site as follows. Development activity is planned to resume on April 1, 2014 while production stoping and processing are planned to start January 1, 2015. Alexco plans to undertake this work with its own equipment and employees to reduce operating costs.

Mining Equipment

SRK received a detailed list of the mining equipment owned by Alexco at the end of August 2013. SRK prepared a quarterly schedule of additional equipment and replacement (sustaining) equipment needed to support the PEA mining plans for Bellekeno, Lucky Queen, and Flame & Moth. SRK assumed that most of the new equipment required for Flame & Moth would be acquired by Alexco on a lease to own basis.

Table 16-30 and Table 16-31 show the planned consolidated mining equipment fleet requirements estimated for 2015 and 2017. The equipment listed is expected to be shared among the mines as production requirements change over time. This strategy is necessary to accommodate the changing production profile over time.

Common equipment includes equipment allocated to the mines to haul vein material and waste, maintain the haul roads, maintain the waste dumps, and move men and materials around the Keno Hill silver district. It does not account for the equipment owned by the mill, site services or any of the other non-operating departments.

Table 16-30: Consolidated Equipment List (2015)

Common Equipment	Number	Flame & Moth Equipment	Number
Surface Loader	3	1-boom Jumbo	1
Ambulance	1	2-boom jumbo	3
Surface Haul Truck 20 ton	4	Bolter - Mechanized	1
Surface Haul Truck 30 ton	2	LHD - 3.5-tonne	1
Service Truck	1	LHD - 6.7-tonne	4
Grader	1	UG Truck – 15-tonne	3
Crane Truck	1	Scissor Lift	3
Light Vehicles	4	Boom Truck	1
Cat D-3C Dozer	1	U/G Grader	1
Cat D-8K Dozer	1	Fuel/Service Truck	1
Bus	3	Utility Vehicle	1
Van	2	Personnel Carrier	1
Bellekeno Equipment	**Number**	Shotcrete Machine	1
1-boom Jumbo	1	UG Forklift	1
Bolter - Mechanized	1	Pickup Truck	2
LH drill – 63 mm	2	**Total Units (all Mines)**	**75**
LHD – 2-tonne	1		
LHD - 3.5-tonne	2		
LHD - 6.7-tonne	2		
LHD - 8yd	1		
Bolting Platform	1		
Rammer Jammer	2		
UG Truck – 15-tonne	2		
Scissor Lift	1		
Anfo Loader - pot style	1		
Shotcrete Machine	2		
UG Forklift	1		
Tractor	2		
Utility Vehicle	2		
Pickup Truck	2		

Table 16-31: Consolidated Equipment List (2017)

Common Equipment	Number	Flame & Moth Equipment	Number
Surface Loader	3	1-boom Jumbo	2
Ambulance	1	2-boom jumbo	3
Surface Haul Truck 20-ton	4	Bolter - Mechanized	1
Surface Haul Truck 30-ton	2	LH drill – 63 mm	1
Service Truck	1	LHD - 3.5-tonne	2
Grader	1	LHD - 6.7-tonne	5
Crane Truck	1	UG Truck – 15-tonne	3
Light Vehicles	4	Scissor Lift	4
Cat D-3C Dozer	1	Boom Truck	1
Cat D-8K Dozer	1	U/G Grader	1
Bus	3	Fuel/Service Truck	2
Van	2	Tractor	3
Lucky Queen Equipment	**Number**	U/G Forklift	2
1-boom Jumbo	1	Utility Vehicle	2
Bolting Platform	1	Personnel Carrier	1
LHD – 2-tonne	1	Shotcrete Machine	1
LHD - 3.5-tonne	2	Pickup Truck	2
UG Truck - 6.5-tonne	3	**Total Units (all Mines)**	**78**
Anfo Loader - pot style	1		
UG Forklift	1		
Shotcrete Machine	1		
Rammer Jammer	2		
Utility Vehicle	2		
Pickup Truck	3		

Manpower

Alexco plans to undertake planned future operations with its own employees, without the involvement of a general mining contractor. Some specialty tasks such as diamond drilling, alimak raising, and raise boring will likely be contracted out.

Table 16-32 shows the estimated 2015 site wide manpower levels. SRK notes that not all of the manpower listed under "Other Departments" are required to support the mining plan but are engaged in other district level work. The company manpower levels shown for "Other Departments" reflect the 2013 budgeted manpower levels for company personnel.

Table 16-32: Estimated 2015 Site Manpower

Common Mine Operations	
Function	**Number**
Mine Supervision	10
Safety & Training	4
Technical Services	12
Maintenance Supervision	6
Maintenance	18
Surface Trucking	8
Sub-total Mining	**58**
Bellekeno Production	
Function	**Number**
Lateral Development	12
MCF Stoping	6
LH Stoping	12
Vein & Waste Trucking	8
Backfill	6
Mine Services	6
Contractors	5
Sub-total Mining	**55**
Flame & Moth Pre-Production	
Function	**Number**
Lateral Development	17
Stoping	11
Vein & Waste Trucking	10
Backfill	5
Mine Services	7
Contractors	4
Sub-total Mining	**54**
Sub-total Mining (Owner)	**158**
Sub-total Mining (Contract)	**9**
Total Mining	**167**
Other Departments	
Function	**Number**
Management	5
Administration	4
Safety Department	3
Site Services	22
Environmental	1
Mill	41
Total Other Depts	**76**
Grand Total	**234**

The contractors working in the mine during 2015 will be involved in definition drilling (diamond drilling), raiseboring and longhole production drilling.

Table 16-33 shows the estimated site wide manpower requirements for 2018. By this time the Bellekeno mine will have been exhausted and the Flame & Moth mine will have taken over the bulk of the production and will be producing at 320 tpd. Lucky Queen will also be in full production during this period and producing 100 tpd.

Table 16-33: Estimated 2018 Site Manpower

Common Mine Operations	
Function	**Number**
Mine Supervision	10
Safety & Training	4
Technical Services	12
Maintenance Supervision	6
Maintenance	21
Surface Trucking	2
Sub-total Mining	**55**
Flame & Moth Production	
Function	**Number**
Lateral Development	6
Stoping	17
Vein & Waste Trucking	10
Backfill	7
Mine Services	8
Sub-total Mining	**48**
Lucky Queen Production	
Function	**Number**
Lateral Development	12
Stoping	32
Vein & Waste Trucking	8
Backfill & Mine Services	4
Sub-total Mining	**56**
Total Mining (Owner)	**159**
Other Departments	
Function	**Number**
Management	5
Administration	4
Safety Department	3
Site Services	22
Environmental	1
Mill	41
Total Other Depts	**76**
Grand Total	**235**

17 Recovery Methods

The mill facility started operating in late 2010 and commercial production was declared in January 2011. The 2012 production data were analyzed to assess plant performance while processing similar feed to that expected in the PEA production forecast. Daily production data and monthly production statistics were provided to SRK for review and, in agreement with Alexco, the 2012 monthly summaries (as received) were determined to be the basis for the assessment.

17.1 Process Flowsheet

The mill facility consists of a two-stage closed circuit crushing line (jaw crusher followed by cone crusher), feeding the fine material stockpile. The single-stage grinding circuit has a ball mill (1.8 x 3.6 m, 180 kW) in closed circuit with a 300 µm vibrating screen to produce a mill feed P80 size of 174 µm. The screen undersize feeds the lead rougher/scavenger flotation circuit to recover lead and silver minerals to a rougher concentrate and scavenger concentrate.

Rougher and scavenger silver-lead flotation concentrates feed a three-stage lead cleaner flotation circuit generating a final silver-lead concentrate. The lead scavenger tailings feed the zinc rougher scavenger flotation circuit to recover the zinc minerals generating the final, low pyrite tailings, which are stored in a dry stacking facility.

The zinc rougher flotation concentrate feeds a three-stage cleaner flotation circuit, which produces the final zinc concentrate and a high pyrite tailing. The silver-lead concentrate and the zinc concentrate are thickened and filtered prior to transport off site. The high pyrite tailings are thickened and used for underground backfill. Regrinding of either lead or zinc rougher concentrates is currently not included in the mill facility flowsheet.

Figure 17-1 is a schematic process flow diagram for the mill facility with the main circuit elements.

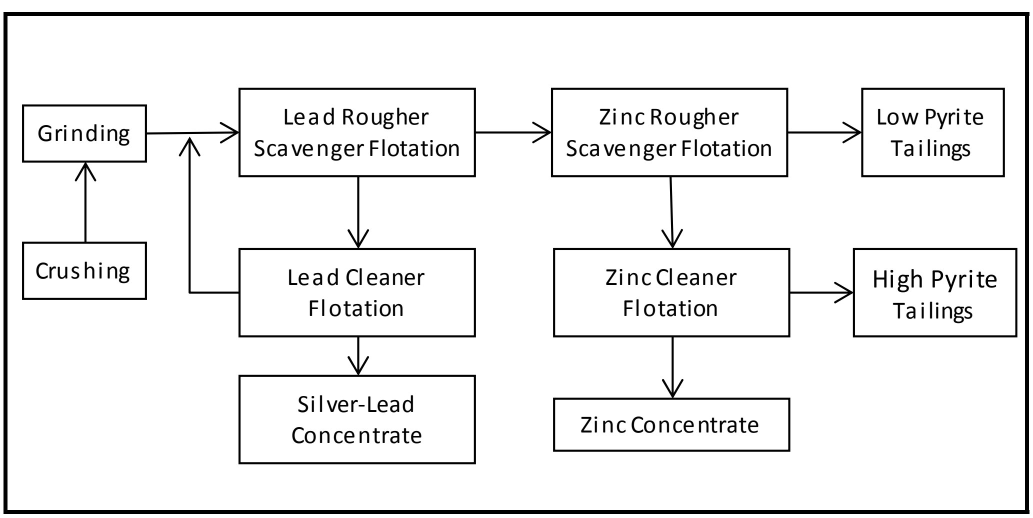


Figure 17-1: Mill Facility Simplified Process Flow Diagram (SRK, 2013)

Reagents used in the plant include flocculent, copper sulphate, frother (MIBC), collectors (SIBX, 3418A), sodium sulphite, zinc sulphate, and carbon dioxide. All of these reagents are standard operating practice for lead/zinc feed flotation circuits. A review of the mill facility production data for 2012 indicated the typical reagent consumptions were similar to other operations treating comparable grades and mineralogy.

17.2 Design Criteria

The mill facility was designed to process 408 tpd at an overall plant availability of 92%. The target grind size was at P80 size of 174 µm and the project included the option of a regrind mill before the lead cleaner circuit. The key design criteria are shown in Table 17-1. Despite the design criteria, the plant was built without the lead regrind mill.

Table 17-1: Mill facility Design Criteria

	Pb (%)	Zn (%)	Ag (gpt)	Au (gpt)
Head Grades	9.5	5.6	871	0.4
Lead Concentrate Grades	70	2.3	6185	1.5
Zinc Concentrate Grades	0.5	54	1.1	300
Concentrate Recovery, %	97	88	72	94
General				
Mill Throughput (tpd)				408
Availability (%)				92
Primary Grind P80 Size (µm)				174
Lead Regrind Grind P80 Size (µm)				45

17.3 2012 Mill Performance

In 2012, the mill facility processed 94,800 t of Bellekeno vein material generating 13,000 t of lead-silver concentrate and 5,700 t of zinc concentrate. The year average monthly throughput was 260 tpd at 89% availability. The maximum monthly throughput for the year was 305 tpd, with peak production in September and October.

Head grades averaged 760 gpt silver, 9.6% lead and 4.8% zinc. The head grades ranged from 620 gpt to 1075 gpt silver; 8% to 16% lead; and 4% to 9% zinc. The head grades recorded in the mill facility for the year of 2012 are in agreement with the project design criteria shown in Table 17-1.

The 2012 mill facility lead recoveries ranged from 84% to 98% with a concentrate lead grade of 55% to 68%. The silver recoveries to silver-lead concentrate ranged from 83% to 97% with silver grades from 4,231 gpt to 5,270 gpt. Zinc grade in the silver-lead concentrate ranged from 4% to 9% with recovery as high as 26%.

The zinc recovery to zinc concentrate ranged from 46% to 64% with a final zinc grade of 40% to 49% zinc. The silver recoveries to zinc concentrate ranged from 2% to 6% and the maximum lead recovery to zinc concentrate was 6% with a maximum grade of 7% lead.

The zinc grade of zinc concentrate produced in 2012 was considerably lower than the design specification shown in Table 17-1. It is common for smelter agreements to reduce % payable zinc for concentrate grades below 50%. The testwork results to date suggest the regrinding of rougher concentrates prior to cleaning to final concentrate will assist in improving the zinc grade of the final concentrate.

17.4 Plant Modifications

With the current equipment, the mill facility has not demonstrated the ability to achieve the target throughput of 400 tpd. In order to address this limitation, Alexco retained Starkey & Associates (S&A) of Oakville, Ontario, to perform a grinding circuit throughput analysis. In February 2013, S&A conducted a one hour benchmark survey on the grinding circuit and collected samples for grindability testing (Starkey & Associates, 2013).

Based on the results of the comminution analysis, S&A recommended the installation of a second ball mill in series after the existing mill. According to the S&A report, the addition of a secondary 1.8 x 3 m ball mill with 130 kW of installed power would allow the mill facility to process 430 tpd (at 89% availability) of material with similar hardness to the feed currently being processed. Alexco has already purchased the second ball mill and it will be installed during Q1 2015.

S&A reports the current mill grind P80 size at 137 µm; however, simulations to forecast mill performance with the additional mill are presented in their report with a grind P80 size of 180 µm. The coarser grind size, as presented by S&A, is expected to degrade flotation selectivity and lower concentrate grades when compared to the mill performance at the time of the grinding survey.

All recent testwork conducted to date has been performed at a grind P80 size below 115 µm, which represents better mineral liberation than that achieved by the mill facility (e.g., zinc recovery to lead concentrate in 2012 ranged from 12% to 26%). In order to improve zinc recovery, a regrind mill for the rougher/scavenger concentrates should be considered to allow more zinc to reach the zinc circuit. A regrind mill for the lead circuit would also improve concentrate grades.

Overall, Flame & Moth has shown relatively poor performance in zinc flotation on the samples tested to date. The effect of regrind on the zinc metallurgy was tested in the Flame & Moth metallurgical program and showed improvements in both zinc recovery and concentrate grade. More than 70% of the PEA production tonnage is expected from the Flame & Moth deposit, and Flame & Moth will be the main source of mill feed for the LoM plan. The addition of a zinc regrind mill may be necessary when Flame & Moth reaches production in 2016. Preliminary testwork showed an additional 8% zinc recovery was achieved with regrinding ahead of zinc cleaner flotation.

17.5 Expected Blended Feed Performance

No metallurgical testwork has been performed to date on blended samples from the different deposits. In addition, the tested sample grades for Lucky Queen and Flame & Moth were not representative of the PEA blended grades. In order to bridge this gap, metal recoveries were estimated by combining the 2012 mill facility performance and data from the most recent testwork on the individual deposits.

Lead, silver, and zinc recovery data to the two concentrates were plotted against head grade. The resulting relationships were used to estimate the concentrate recoveries for the blends expected in the PEA production plan. In addition, based on the concentrate mass recovery, the grade of minor elements was also estimated on an annual basis for the PEA production plan.

These relationships are preliminary in nature and it is SRK's opinion that they need to be verified with metallurgical testwork on actual blended samples. As they are preliminary, they should not be considered accurate to better than ±5% absolute in lead and zinc recovery.

17.5.1 Recovery and Concentrate Grade Estimation

A curve relating recovery to final concentrate versus head grade was determined for lead, silver, and zinc. These curves were used to estimate the performance of blended feeds for each year of the production plan. Concentrate grade was calculated based on recovered metal and concentrate mass, which in turn, was estimated from the lead or zinc recoveries.

Figure 17-2 shows lead recovery and lead concentrate grade for testwork on all three deposits. In addition, the range of the mill facility 2012 reported results is shown as a grey shaded box. The red icons represent the annual estimates for the production plan assumed in this PEA.

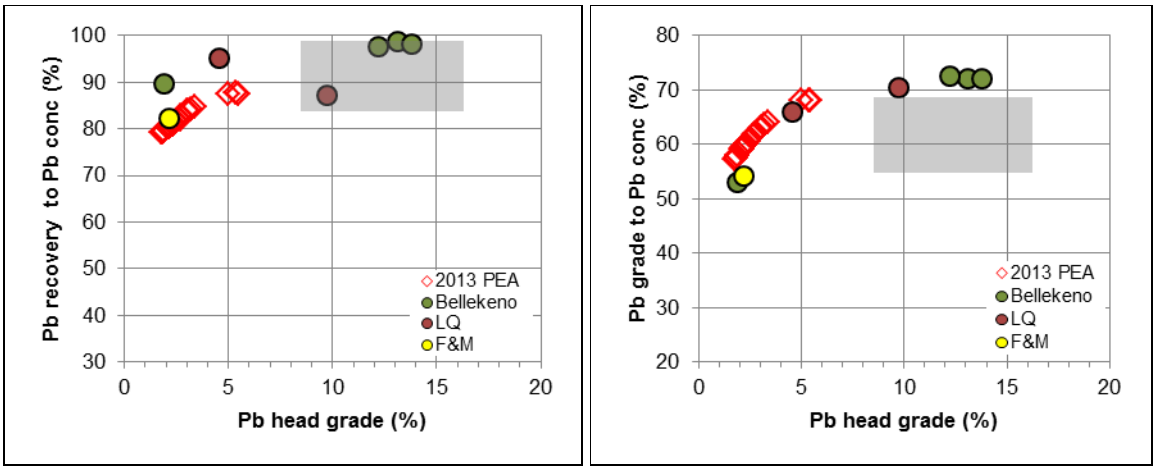


Figure 17-2: LoM Blended – Lead Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

Grey shaded box is the range of 2012 mill facility production data.

It can be seen that the PEA estimates agree with the mill facility production results as well as the difference between the PEA planned head grades and those of material processed in 2012. While the mill facility achieved lead recoveries of 82% to over 95%, the lower head grade for the PEA production plan will produce expected recoveries between 79% and 88%.

Figure 17-3 shows silver grade and recovery to lead concentrate for testwork on all three deposits. The grey shaded box represents the range of results for 2012. As the mass of the lead concentrate is estimated from lead recovery, the lower lead head grades for the PEA production plan result in a lower expected mass for the concentrate. Similar silver recoveries as the mill facility production data, combined with a lower mass of lead concentrate, result in the higher estimates of silver grade in the lead concentrate shown in the right graph of Figure 17-3.

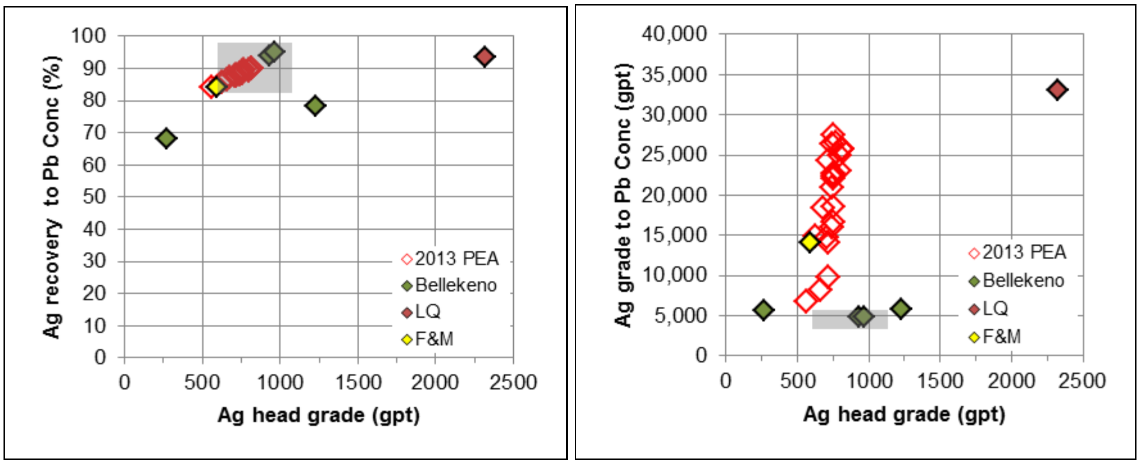


Figure 17-3: LoM Blended – Silver Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

Grey shaded box is the range of 2012 mill facility production data.

A similar plot for zinc recovery is shown in Figure 17-4. For zinc, the 2012 mill head grades were quite similar to those expected in the PEA plan and the estimated recoveries are also similar, at between 50% and 60%.

The estimated zinc grade of zinc concentrate (Figure 17-4 right side) is comparable to the mill facility results as zinc head grade and zinc concentrate mass are similar. All tests on Lucky Queen and Flame & Moth samples were performed at finer grind size than currently achievable by the mill facility's grinding circuit. The actual grindability of these deposits cannot be evaluated as hardness testwork has not been completed to date.

The yellow icons in Figure 17-4 show the test results for the single Flame & Moth sample tested to date. Based on these results, performance of the current mill facility flowsheet could range from 25% to 60% zinc recovery when processing exclusively Flame & Moth material. The higher recovery is associated with a low zinc grade of concentrate.

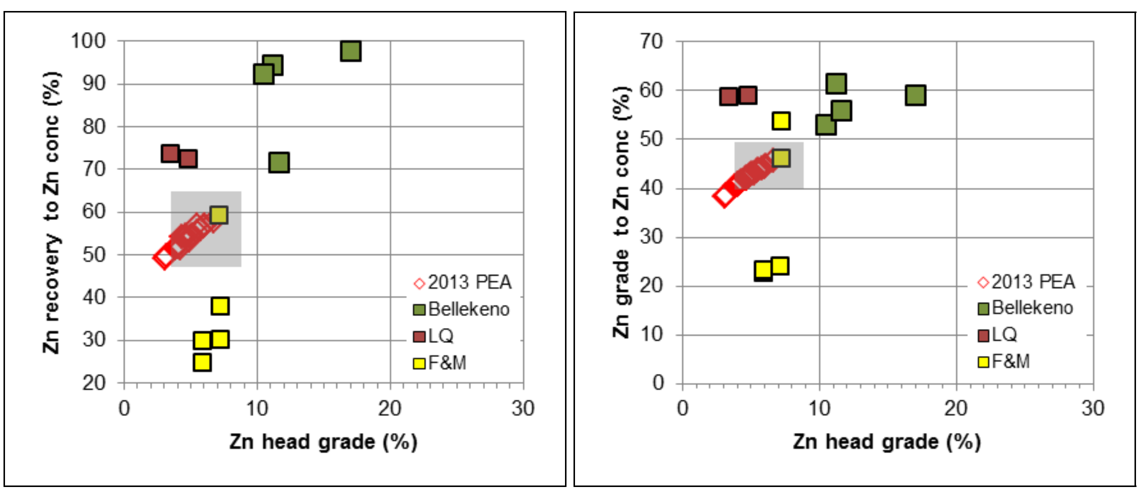


Figure 17-4: LoM Blended – Zinc Recovery and Concentrate Grade vs. Head Grade (SRK, 2013)

Grey shaded box is the range of 2012 mill facility production data.

17.5.2 Life-of-Mine Summary

Table 17-2 presents a summary of the overall LoM estimates. At a head grade of 3% lead, 5% zinc, and 745 gpt silver, the estimated LoM recoveries are 83% lead, 54% zinc, and 94% silver (to both concentrates). The LoM average lead concentrate grades are 62% lead, 8% zinc, and 18,364 gpt silver with 42% zinc and 643 gpt silver in the zinc concentrate.

Table 17-2: Overall Life-of-Mine Estimates

	Pb (%)	Zn (%)	Ag (gpt)
Head Grades	3	5	745
Lead Concentrate Grades	62	8	18,364
Zinc Concentrate Grades	0.4	42	643
Concentrate Recovery, %	**83**	**54**	**94**

\# Silver recovery to both concentrates

Figure 17-5 shows the LoM mine production plan with a breakdown of the mill feed blend by deposit. The graph shows Lucky Queen in production from 2016 through 2020, just after Bellekeno operations cease. Flame & Moth will start production towards the middle of 2015 and it will be the major component of the mill feed throughout the mine life.

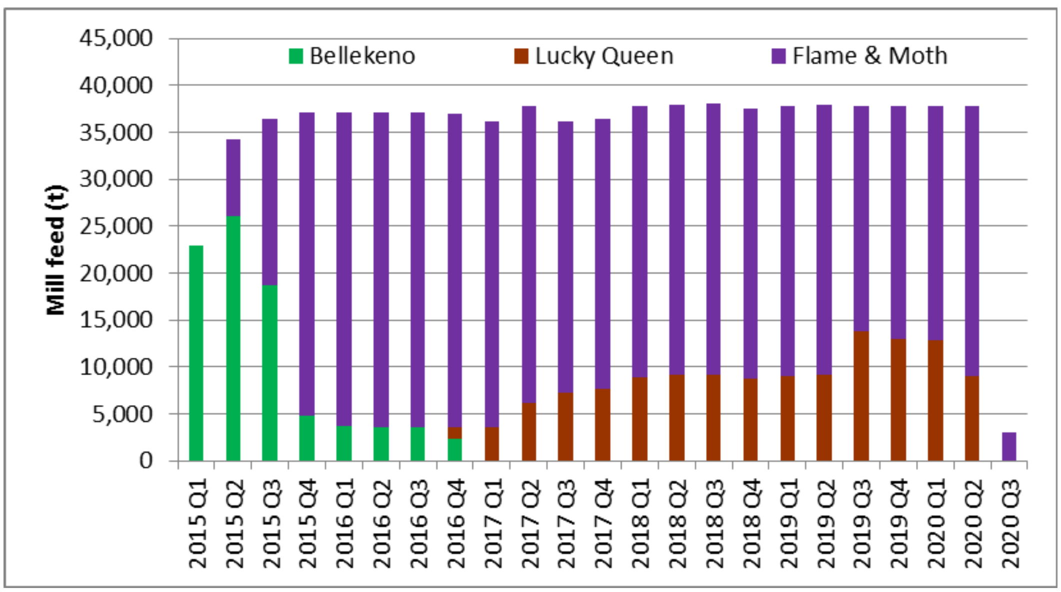


Figure 17-5: Life-of-Mine Tonnes by Source (SRK, 2013)

Figure 17-6 shows the PEA LoM head grade estimates with the lead grade increasing when Bellekeno mineralization is processed. Silver grade improves while Lucky Queen is in production.

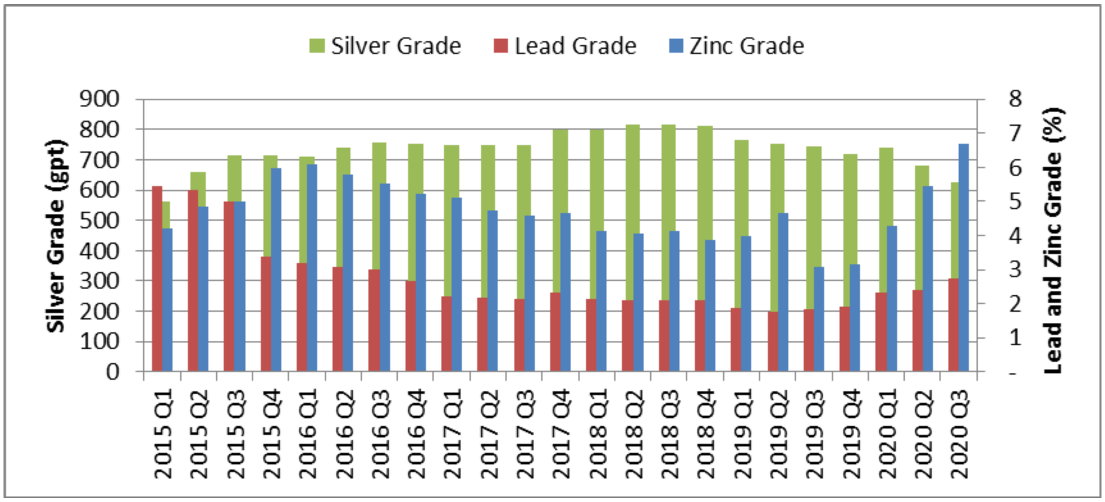


Figure 17-6: Life-of-Mine Head Grade Estimates (SRK, 2013)

Figure 17-7 summarizes the recovery estimates for the LoM. Silver recovery is to both lead and zinc concentrates.

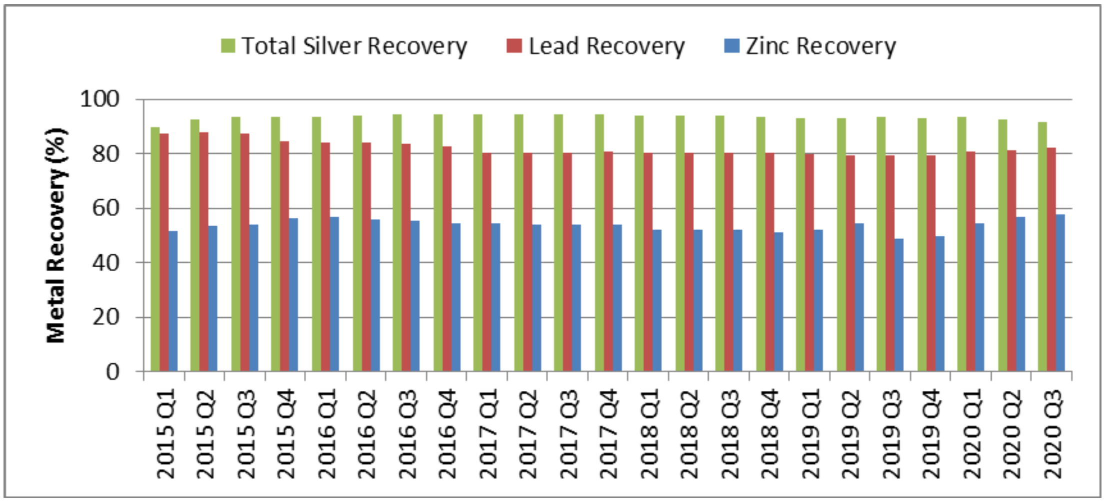


Figure 17-7: Life-of-Mine Recovery Estimates (SRK, 2013)

It is SRK's opinion that the accuracy of all relationships used to estimate future mill facility concentrate grades and recoveries needs to be verified with additional data. This includes testwork on a range of blends from all three deposits that reflect the latest production plan.

No blended samples have been tested to date to verify the assumptions implicit in the simple recovery versus the head grade relationships presented.

The estimates for lead recovery to lead concentrate and zinc recovery to zinc concentrate should be considered accurate to ±5% absolute (perhaps even broader) considering the lack of information available to date. As inputs to a technical economic model, a range of likely recoveries and grades should be used to test their influence on the overall project economics.

18 Project Infrastructure

18.1.1 Elsa Administrative, Maintenance, and Warehousing Facilities

The administrative offices and first aid facilities are based in Elsa, Yukon in a large facility that also accommodates the exploration group offices and core processing area.

Maintenance and warehouse facilities are located at Elsa. The warehouse building in Elsa is a two-story building with warehousing on both levels and a fully serviced maintenance shop on the northern end of the bottom floor. This building is used as a centralized warehouse/surface equipment facility for the Keno Hill silver district operations and requires no further upgrades.

18.1.2 Flat Creek Camp Facilities

The currently licensed Flat Creek camp facilities include a trailer camp, kitchen facility, and drillers dry assembled at the old Flat Creek town site (part of Elsa). The camp has a total capacity of 90 permanent beds. During peak construction season, temporary bunks are brought in to allow for another 20 personnel in double bunk rooms. These bunks are not occupied during the winter. There are four refurbished houses located nearby with a total of 28 rooms, and an additional 20 rooms available in a bunkhouse. A fourth bunkhouse located adjacent to the houses is primarily used for seasonal surface exploration programs. The entire capacity of the camp facilities is 140 rooms. The facilities will require expansion to accommodate the estimated 230 operations employees in addition to the ongoing surface exploration employees and contractors.

Alexco is licensed to withdraw water from Flat Creek and an existing groundwater well for domestic use. A water treatment facility located within the Flat Creek camp and compliant with Yukon Environmental Health standards consists of 5,000 litres (L) of storage, a water softener, UV treatment, and chlorination. Monthly samples are submitted for analyses for toxic metals, bacteria, and hydrocarbons.

Alexco has two sewer permits at Elsa: one for the Flat Creek camp and one for the houses. Waste water is treated in septic tanks and released via drain fields.

A Commercial Dump Permit # 81-012 is currently held from YG Environment in accordance with the *Environment Act* Solid Waste Regulations as well as the *Public Health and Safety Act*. This permit was renewed effective January 1, 2012 and will continue to be used in support of mine operations. In compliance with this permit, upgrades to the location of solid waste disposal included upgrades to the electric bear fence and the addition of a cattle guard to prevent animals from entering the facility.

18.1.3 Mill Facility

The current facilities at the mill facility include mill offices and dry, an assay lab, and the mill and dry stack tailings facility (DSTF) complex, as seen in Figure 18-1.

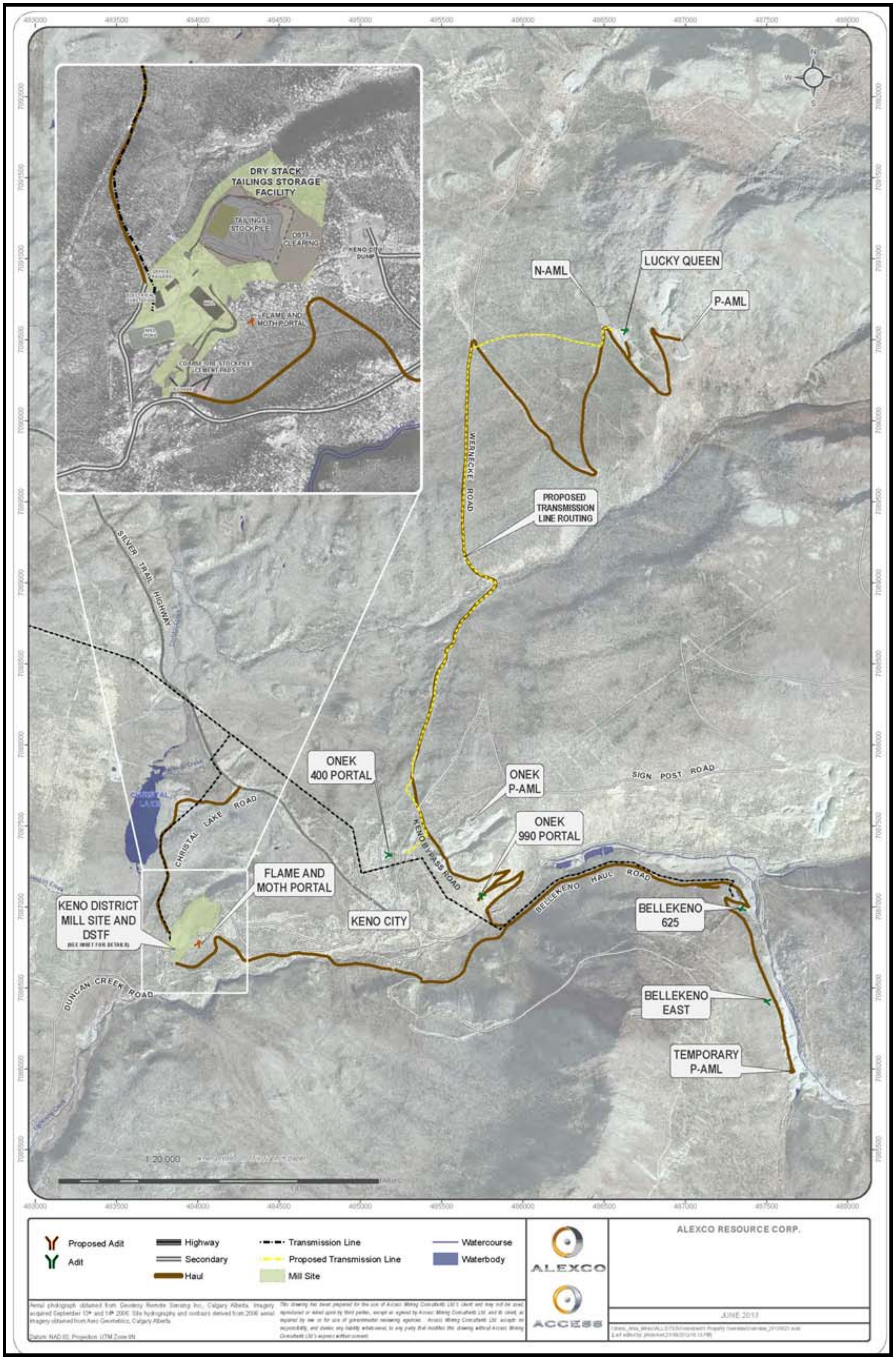


Figure 18-1: Bellekeno, Lucky Queen, Flame & Moth, and Mill Facility Infrastructure (Alexco, 2013)

A metallurgical and assay laboratory conducts all basic testwork to monitor and improve the process flowsheet metallurgy and efficiency, and to support environmental monitoring.

The assay laboratory was constructed as a pre-packaged unit consisting of two retrofitted 40-foot shipping containers converted into laboratory modules, which are located adjacent to the mill building. The laboratory is equipped with the necessary analytical instruments to provide all routine assays for the mine, plant, and environmental quality control monitoring. The equipment included allows the preparation and analysis of approximately 80 samples per 12-hour shift. Standard analysis includes acid digestion of samples followed by analysis on an atomic absorption spectrometer.

18.1.4 Area Haul Road System

Alexco has constructed a series of access and haul roads to route mine traffic around the Keno City community.

All traffic between Elsa and the mill facility and/or the Bellekeno mine is routed along the Christal Lake road and subsequently the Bellekeno haul road.

During mine production, heavy truck traffic from Lucky Queen will be routed along the Keno City bypass road to/from the Bellekeno haul road. Light truck traffic from Lucky Queen will continue to be routed through Keno City during mine operations. The Keno City bypass road was developed from the Wernecke road, crossing Sign Post road, along the historic Onek power line, to the Onek 990 portal, crossing Lightning Creek road and the Onek access bridge across Lightning Creek to the Bellekeno haul road. The bypass road is approximately 2.1 km long and 6 - 9 m wide as per Yukon Workers' Compensation Health and Safety Board regulations and the identified haul road type (i.e., single or double lane).

18.1.5 Bellekeno Mine Surface Infrastructure

The Bellekeno East portal is fully equipped with all infrastructure needed to operate the underground mine including office buildings with septic storage, maintenance shop, miners' dry area, warehouse containers, and surface layout area.

A temporary potential acid metal leaching (P-AML) storage pad is located near the Bellekeno East portal.

Water discharge from the Bellekeno mine is treated at the Bellekeno 625 adit portal water treatment facility.

18.1.6 Lucky Queen Mine Surface Infrastructure

The existing Lucky Queen portal pad, developed on a historic waste dump, will be used to support mining operations at Lucky Queen.

Mine support facilities, such as the miners' dry area, equipment and supplies laydown area, offices and trailers, and fuel storage are in place on the Lucky Queen portal pad.

A set of fresh air fans with mine air heaters are also installed at the portal. Compressed air and power were being supplied by a portable diesel compressor and a diesel generator set mounted in a seacan. The plan is to replace the diesel compressor with an electrical compressor once the planned power line extension is completed.

A planned return air ventilation raise will provide additional ventilation to the underground workings and function as an emergency escapeway to surface. A small building will be constructed over the ventilation raise surface break through and signage will be installed warning of the open hole hazard.

Non-acid metal leaching (N-AML) waste rock generated from development and mining at Lucky Queen will be deposited in a new N-AML waste rock storage facility, which will be built as an extension to the historic waste rock storage area at Lucky Queen. P-AML waste rock is expected to be deposited in a P-AML waste rock storage facility constructed nearby.

A settling pond is located on top of the historic waste rock storage area near the Lucky Queen portal and is used to settle suspended solids from adit water prior to discharge. A diversion ditch is proposed above the Lucky Queen portal and the non-acid or metal leaching (N-AML) waste rock storage facility.

Fuel and petroleum products are held in two Envirotanks to supply fuel for mine development and production operations: one 28,500 L main tank and a 2,100 L “day tank” for the diesel generator.

At Lucky Queen, up to 4,500 kg of explosives will be stored in an appropriate location on the portal bench. Explosives use, transport, handling, storage, and disposal are governed by the Yukon *Occupational Health and Safety Act*, Blasting Regulations and Occupational Health & Safety Regulations, and the *Transport of Dangerous Goods Act* and Regulations.

18.1.7 Flame & Moth Mine Planned Surface Infrastructure

The planned infrastructure in the area of the proposed Flame & Moth mine portal, northeast of the mill building, consists of:

- An office trailer and miners’ dry facility;
- Maintenance shop;
- Cold storage structure;
- Fuel storage facility;
- Air compressors;
- Settling pond for mine water discharge, with clarified water supplying the underground mine.

The fresh air raise collar location is planned south of the crusher and coarse vein material stockpile (Figure 18-1). The main ventilation fans and mine air heater will be located at the raise collar.

18.1.8 Electrical Power

The EKHSD project is supplied with electrical power from a hydroelectric plant near Mayo. In the past, this facility had sufficient capacity to supply electricity to the mill and all of the various mines. However, after the closure of UKHM, Yukon Energy Corporation (YEC) built a transmission line from Mayo to Dawson City to allow the shutdown of diesel power generation in Dawson City. There remains ample capacity on the grid to power the combined mine and mill operations at a 400 tpd throughput.

The Yukon and federal governments announced in August 2009 approval and financing for the expansion of the hydroelectric plant in Mayo (Mayo B Project) as well as the extension of the power line from Pelly Crossing to Stewart Crossing, thus completing the northern grid and tying in Mayo/Elsa with the entire southern Yukon electrical generating and distribution systems. The power line extension was completed in 2010 and is able to provide ample power for any future mine throughput increases at Bellekeno and throughout the rest of the Keno Hill silver district.

A new 69 kV/4.16 kV 3 MVA substation was installed to deliver power to the mill facility and associated infrastructure.

Alexco owns several substations in the area, including the Elsa substation, the Onek substation, and the Bellekeno 625 portal substation. It also owns the transmission line connecting the latter two. Power for the Bellekeno mine is now provided exclusively by the YEC electrical distribution system and no diesel powered generators are required.

Electrical power for Lucky Queen was initially provided by on-site diesel-powered generators and eventually will transition to grid power. Under full operating conditions, Lucky Queen is expected to require 750 kW. A transmission line (via surface teck cable) will be established along Wernecke road to the site, as shown on Figure 18-1.

Power for the camp is supplied from the local grid that runs through Elsa to Keno City.

19 Market Studies and Contracts

19.1 Smelter Contract

Production of both a silver/lead concentrate and a zinc concentrate from the mill facility was being sold under contract. Alexco and Glencore Ltd., of Stamford, Connecticut (Glencore), a branch of a wholly owned subsidiary of the Swiss-based international resources group Glencore International AG, entered into a lead and zinc concentrate off-take agreement in December 2010, coincident with the initiation of concentrate shipments from Alexco's Bellekeno operations.

The terms of the contract are reviewed and renegotiated annually to reflect current market conditions. The terms of the current contract are considered confidential, but the structure is typical of such contracts and includes:

- Formula for payable metal;
- Price determination for payable metal;
- Concentrate treatment charge;
- Metal refining charge;
- Penalties determination and cost;
- A price participation clause.

The terms of the current contract are included in the economic model in order to generate NSR values for the LoM plan.

19.2 Concentrate Transportation

Table 19-1 shows the estimated annual concentrate production for the LoM plan.

Table 19-1: Estimated Annual Concentrate Shipments

Concentrates	2015	2016	2017	2018	2019	2020	Total
Pb-Ag Conc.							
Dry Tonnes	**7,960**	**5,910**	**4,390**	**4,330**	**3,850**	**2,510**	**28,950**
Pb, %	67	63	60	59	58	60	62
Zn, %	5.1	6.4	9.0	12.4	13.4	7.3	8.4
Au, gpt	2.1	7.0	9.4	9.3	8.8	7.6	6.7
Ag, gpt	9,603	16,376	22,515	25,473	26,097	19,429	18,364
Zn Conc.							
Dry Tonnes	**8,450**	**10,640**	**8,930**	**7,800**	**7,240**	**5,080**	**48,140**
Pb, %	0.52	0.38	0.39	0.45	0.45	0.38	0.43
Zn, %	43	44	42	41	40	43	42
Au, gpt	0.4	0.7	0.9	1.0	0.9	0.7	0.8
Ag, gpt	626	619	726	626	670	560	643

The concentrates were being trucked directly to the smelter using standard 40-ton capacity trailers and semi-trucks at a typical cost of US$270 per wmt. During April and May of each year, costs can increase due to load restrictions put in place by the various municipalities along the route.

These trucking costs, including approximately six weeks of load restrictions every spring, are included in the economic model.

The same trucks are utilized to back haul bulkier supplies such as bagged cement, shotcrete, and rock bolts from suppliers in British Columbia.

19.3 Contracts

Alexco has entered into contracts with the following companies to support the operations of the EKHSD project:

- As discussed above, Alexco has a lead and zinc concentrate off-take agreement with Glencore;
- Procon Mining and Tunnelling (mining contractor) was, since start-up, performing a full scope of service covering underground development and stope production at the Bellekeno mine. This included provision of equipment, manpower, supervision, and procurement of certain mining supplies. When operations at the site resume, a mining contract will not be required as Alexco plans to conduct development and production mining activities with its own equipment and employees;
- Boart Longyear (core drilling contractor) provides equipment and manpower for surface and underground exploration drilling;
- ESS Compass Group (camp catering company) is contracted to operate Alexco’s main camp and kitchen located at Flat Creek approximately 1 km west of Elsa;
- Canadian Lynden Transport is contracted by Alexco to transport lead and zinc concentrates to a smelter in North America;
- Yukon Energy provides power under contract to various substations and to the Bellekeno mine and mill facility;
- Superior Propane provides propane under contract to Bellekeno with the largest consumption for mine air heating in the winter.

SRK has reviewed the concentrate off-take agreement, and has conducted a review of rates and charges included in the actual operating costs for the EKHSD project. It is SRK’s opinion that the contract rates and charges are within industry norms.

Alexco will require these contracts or similar contracts (except for a mining contractor) for re-starting site operations. Development activity is planned to resume on April 1, 2014 with production stoping and processing planned to start January 1, 2015.

20 Environmental Studies, Permitting, and Social Impact

20.1 Site and Regulatory Context

The Bellekeno, Lucky Queen, and Flame & Moth deposits are part of the former UKHM claims, which include a number of historical mines and processing operations within the Keno Hill silver district. The historical operations in the district are spread out over 15,000 hectares, and include nine major mines, three tailings disposal areas, and dozens of different shafts and adits. The Bellekeno and Lucky Queen sites both have historical mine workings, waste rock storage areas, and mine water discharges, whereas the Flame & Moth site only has historical mine workings and a waste rock storage area that was reclaimed during the construction of the mill.

The property is located within the Yukon Plateau (North) Ecoregion and is characterized by rolling upland areas and wide open valleys. Vegetation communities include Northern boreal forests along the lower slopes and valley bottoms, and open scree slopes above treeline. Many of the valley bottoms include open peatlands, fens, and meadows. A variety of wildlife, birds, and fish species are present in the area. The Keno Hill silver district is situated in the traditional territory of the First Nation of Na-cho Nyak Dun. The Bellekeno, Lucky Queen, and Flame & Moth sites are located in close proximity to the community of Keno City, which has roughly 12 permanent residents, and 50 km from the community of Mayo, which has a population of approximately 450 residents. The region supports mineral development activities (including placer mining), tourism, and recreation and traditional pursuits.

Alexco and its subsidiary, ERDC, have a unique arrangement with the Government of Canada in which Alexco is responsible for the care, maintenance, and closure of the historical mines, with government and company funding provided to address the historical liabilities. The company, along with territorial, federal, and First Nation governments, is responsible for developing a district-wide closure plan that addresses these historic environmental liabilities arising from past mining activities. However, some high priority activities have already been implemented. Currently, active water treatment is carried out at five locations in the Keno Hill silver district.

Under this agreement, Alexco is responsible for environmental assessment, permitting, compliance, and costs associated with its ongoing exploration and mine development activities. Additionally, if a new mine is brought into production including infrastructure associated with a historic mine, terrestrial liabilities (i.e., waste rock storage areas and roads) and water related liabilities located within a designated “production unit” become the responsibility of Alexco. For example, water treatment from the Bellekeno workings (which are intermixed with historical workings) is now Alexco’s responsibility. At this time, Bellekeno is the only area that has been defined as an active production unit. However, as soon as vein material is produced for commercial purposes, the other mining areas would be classified as production units for which Alexco would be responsible.

20.2 Environmental Assessment and Permitting

Existing approvals for the care and maintenance, exploration, and mine development activities are summarized in Table 20-1. These existing licences cover all aspects of the mine development at the Bellekeno and Lucky Queen mines. Although licences are also in place for Onek, there are currently no plans to bring this deposit into production.

Table 20-1: Relevant Assessment and Regulatory Approvals – EKHSD project

Purpose	YESAA Approval	Quartz Mining Act Approval	Water Use Licence
Onek and Lucky Queen Mine Production	Project#2011-0315 Decision Document	Quartz Mining Licence (QML-0009, amendment 1, expires 2025)[e]	Type A Water Use Licence QZ09-092, amendment 1 expires 2020[d]
Bellekeno Mine Production	Project # 2009-0030 Decision Document	Quartz Mining Licence (QML-0009, expires 2025)[a]	Type A Water Use Licence QZ09-092, expires 2020[b]
Advanced Exploration	Project # 2008-0039 Decision Document	Class 4 Mining Land Use Approval (LQ00240, expires 2018)	Type B Water Use Licence QZ07- 078/Amendment 1 QZ10-0606, expires 2018[c]
Care and Maintenance	Project # 2006-0293	N/A	Type B Water Use Licence QZ12-057 expires 2018[d]

* a http://www.emr.gov.yk.ca/mining/pdf/mml_khsdmo_QML_0009.pdf

** b www.yukonwaterboard.ca/registers/quartz/QZ09092/Volume%204/10-1%20Water%20Use%20Licence.pdf

*** c www.yukonwaterboard.ca/registers/quartz/QZ10-060/Licence.pdf

**** d http://www.yukonwaterboard.ca/WATERLINE/

*****e http://www.emr.gov.yk.ca/mining/pdf/mml_khsdmo_QML_0009.pdf

Production from the Flame & Moth deposit will require as a minimum, amendment of the existing mine production Water Use Licence QZ09-092 and Quartz Mining Licence QML-0009. Additional minor approvals will also be required. The amendments to the Type A Water Use Licence and the QML will both need to be assessed under the *Yukon Environmental and Socio-economic Assessment Act* (YESAA) process.

Alexco intends to initiate the permitting process by submitting the Flame & Moth Mine Project Proposal for adequacy review to the Yukon Environmental and Socio-economic Assessment Board (YESAB) during Q4 of 2013 and expects to be fully permitted during Q4 of 2014.

It is anticipated that a YESAB decision document for the project would be received in Q2 of 2014, outlining a number of recommendations that need to be considered by the proponent and the licensing agencies, thus completing this phase of the review process. An application to amend the Water Licence and QML would be submitted in Q2 of 2014. A detailed permitting schedule for the Flame & Moth mine is presented in Table 20-2. The colours in the table indicate common types of activities (yellow – project proposal, dark grey – QML amendment, blue – water licence amendment and light grey – underground development and mineral processing).

Table 20-2: Flame & Moth Permitting Schedule

	2013	2014				2015	
Activity	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**
YESAB Project Proposal							
Decision Document							
QML Amendment							
Water Licence Amendment							
Underground Development							
Mineral Processing							

20.3 Environmental and Socio-Economic Considerations

Key environmental and socio-economic considerations associated with this project are:

- Water quality (metal leaching and acid rock drainage, nutrient release);
- Noise/traffic/dust;
- Land, resource use, and heritage resources;
- Community and First Nations relations.

20.3.1 Water Quality Considerations

The underground mine workings, waste rock and tailings are all potential sources of metal leaching and/or acid rock drainage. Residues from blasting may also be a source of ammonia and nitrate from these areas.

Information on the water quality and the geochemistry of waste rock and tailings was provided in the project proposal (Alexco, 2012a), and in annual monitoring reports from the site (Alexco, 2012b), and is summarized below. Information on the water quality and the geochemistry of waste rock and tailings for Flame & Moth will be provided in the project proposal. Although this section of the PEA was prepared by a geochemical specialist, detailed review of the data and assumptions was not part of the scope of this PEA.

Mine Workings

Adit drainages from Bellekeno have neutral pH levels but elevated total zinc concentrations. Active mining operations have also resulted in slightly elevated ammonia concentrations. This water is treated to remove metals and ammonia prior to discharge. Treatment for metals is likely to continue over the long-term, and it is assumed that Alexco will be responsible for the costs. The current approved closure plan indicates that the long-term water treatment plan would be converted to a passive treatment system.

Historical adit drainages at Lucky Queen have metal concentrations below the licensed discharge criteria, but have slightly elevated zinc concentrations. The water is currently directed to a settling pond for control of total suspended solids (TSS), and is then allowed to infiltrate into the ground. Flows are small (approximately 1 L/s), and there is approximately 3 km of distance before groundwater flows from this area would reach Christal Creek, suggesting that attenuation mechanisms should be sufficient to protect down gradient water quality.

The new workings at Lucky Queen will not intersect the historical workings and will be above the current groundwater table as understood at present. However, the new workings will connect with the 500 level adit, and, therefore, any water from this new area will be allowed to mix with water from the historical area. Water balance estimates (Alexco, 2012a) indicate that the new workings represent a 23% increase in surface area for meteoric water infiltration, resulting in a potential increase in flows from 56 m^3/day to 85 m^3/day.

During operations, much of this water will be consumed as part of operations, but at closure, this additional water would likely report to the 500 level adit drainage. It is assumed that this water will continue to meet discharge criteria. SRK notes that due to the geometry of these workings, it is possible that some of the flow originating from both the historical and the new workings could infiltrate into the groundwater system. Alexco should ensure that there is adequate monitoring in the down gradient environment to assess potential changes in flow or chemistry resulting from the new workings, and should consider some sampling and testing of water from within the mine to assess whether the water quality data from the portal is representative of the water quality from the mine as a whole. Additionally, further consideration of the groundwater system may be warranted.

The majority of the Flame & Moth mine workings are expected to be below the water table.

A review of the existing groundwater data in the mill area and a drilling program are being undertaken to characterize the potential mine inflow rates and water quality associated with the Flame & Moth deposit. Water encountered in the underground workings may require treatment. The mill pond currently has a design storage capacity of 5000 m^3 and has effluent quality standards listed in water licence QZ09-092 for a discharge up to 10 L/s via land disposal (not exceeding 10% of the flow in Christal Creek at KV-6).

Waste Rock

Prior to mining, an assessment of acid rock drainage and metal leaching (ARD/ML) potential of waste rock from Bellekeno was completed. Approximately 26% of the rock was identified as being P-AML, while the remainder was identified as N-AML. Alexco is using a field segregation method to separate these materials during mining and direct them to an appropriate disposal location. Monitoring data presented in the annual reports (Alexco, 2012b) indicates that the screening criteria currently used to segregate P-AML and N-AML waste rock is working reasonably well.

The project proposal (Alexco, 2012a) documents geochemical characterization work completed by Access Consultants on Lucky Queen. The geology and mineralization at Lucky Queen was reported to be similar to that of Bellekeno. The main rock types are quartzite, graphitic schist with interbedded carbonaceous quartzite and schist, greenstone, and sericite schist. Acid base accounting tests and metal analyses were used to characterize the ARD/ML potential of the waste rock from these two sites.

Key findings extracted from the project proposal (Alexco, 2012a) are as follows:

Analysis of the Lucky Queen data set indicated that while much of the rock is unlikely to produce net acidity and/or metal leaching, a significant proportion is indicated to be P-AML. The following key distinctions between Lucky Queen and Bellekeno are presented below:

- A higher overall proportion of samples at Lucky Queen are indicated by acid base accounting testing and geochemical screening criteria as P-AML when compared with Bellekeno;
- The Lucky Queen deposit contains generally lower base metal concentrations (especially zinc) than the Bellekeno deposit, both within the veins and in the surrounding country rock, leading to less likelihood of metal leaching from these materials;

- While sulphur content and net acid potential are similar at Lucky Queen, calcium content and neutralization potential are significantly lower than Bellekeno.

Based on this information, Lucky Queen was estimated to have approximately 35% P-AML rock and 65% N-AML rock.

Seepage monitoring data for P-AML rock stored in the Bellekeno East temporary waste rock storage facility (Station KV-78b) was sampled on three occasions in 2011 and 2012. Seepage pHs were neutral, but cadmium and zinc concentrations were somewhat elevated (cadmium ranging from 0.004 to 0.016 mg/L and zinc from 0.17 to 0.81 mg/L), indicating that the more mineralized waste rock is a potential source of metals in any of the surface waste rock storage facilities. There was no seepage data for any N-AML waste rock. Therefore, the potential for metal leaching is unknown. Nonetheless, the total footprint area of the new waste rock sources are expected to be relatively small, and the flows associated with these are minor in comparison to the adit drainages.

A geochemical characterization program has been initiated for Flame & Moth including static testing of 50 drill core samples for metals, acid base accounting, and shake flask extraction. Five kinetic field leach bins have been established that will collect leachate from Flame & Moth drill core. Additionally, a humidity cell will be initiated to characterize leachate from N-AML waste rock using Flame & Moth drill core. The results will be provided in a technical report, and recommendations from the testing program will be used as a basis for an updated Waste Rock Management Plan.

Tailings

Tailings are stored in a DSTF located near the mill. The tailings from Bellekeno and Lucky Queen are non-acid generating. For the purposes of this PEA, it is assumed that tailings from Flame & Moth will also be non-acid generating and, therefore, will not result in any appreciable differences in water quality. Seepage and runoff are currently directed to the mill for use as make-up water. At closure, the DSTF will be covered, and a biological treatment system will be constructed to remove any residual metals that originate from this area. For the purposes of this PEA, SRK has assumed that this system will function as expected and will not result in any additional closure related costs. Progressive reclamation has already begun on the DSTF with final slopes being recontoured and revegetated with a soil cover.

20.3.2 Noise, Vibrations, Dust and Traffic Considerations

Due to the close proximity of this site to the community of Keno City, noise, dust, and traffic have been high profile issues at this site, and are the subject of ongoing discussions with the community. Several specific issues were raised during the YESAA process, and have been included in the decision document. These will need to be addressed during permitting and ongoing consultation with the community. Mitigation measures that have already been implemented or that are proposed by the company include limiting certain activities and types of traffic to the hours of 7 am – 7 pm, and better communication regarding scheduled blasts.

Dust is closely managed and monitored at the site. The dust monitoring data are compared to the Yukon ambient air standards.

Traffic-related issues have resulted in the construction of bypass roads and signage to separate public traffic from mine operations in key areas. A new bypass road has been constructed to haul vein material from Lucky Queen to the mill facility. No additional roads are required for the Flame & Moth mine.

20.3.3 Land, Resource Use, and Heritage Resources

The local community and First Nations have expressed concerns regarding continued access for recreation and tourism in the area, subsistence harvesting and traditional use, sport and commercial hunting, fishing and trapping, mineral development, and preservation of historical resources. Although impacts are expected to be minor, Alexco is working with the various stakeholders to address these concerns.

20.3.4 Community and First Nations Relations

Alexco has met regularly with stakeholders and First Nations regarding their ongoing operations as well as the new plans for Flame & Moth, presenting detailed information about the project and seeking expression of concerns. Additional consultation facilitated by the regulators is also part of the formal YESAA and licencing processes.

Alexco has signed a comprehensive Cooperation and Benefits Agreement with the First Nation of Na-cho Nyak Dun (FNNND) that recognizes the rights, obligations, and opportunities of the two parties. Individual chapters in the Agreement include human resources (employment and training), contracting, a formal drug and alcohol policy, business contracting and business partnering opportunities, environmental issues, and financial resourcing for the Agreement including legacy funding contributions.

Since environmental matters occupy prime importance with FNNND, the Agreement includes detailed discussion about respecting and protecting the environment, including enhanced opportunities for FNNND to be involved in environmental management of all operations, from mining through to closure and reclamation. The Agreement also describes a “Cooperative Engagement Process” that allows for early engagement of FNNND in the mine permitting process.

20.4 Waste and Water Management Plans

20.4.1 Overview

In the application for recent amendments to the water use and QMLs (Alexco, 2012a), it was assumed that production from the Lucky Queen and Onek deposits[1] would be incorporated into the current mining operations without expanding either currently licensed mill throughput or total tonnage mined. Additionally, it was assumed that there would be no additional tonnage of tailings deposited on the DSTF, no additional tonnage of waste rock or P-AML waste rock stored on surface, no increase in the use of water for milling and no change to the mill water balance resulting from the addition of the Lucky Queen and Onek mines. Therefore, the current licence approvals allow for the production of 613,000 t of ore, storage of 322,000 t of tailings within a DSTF, and the production of 500,000 t of waste rock from the underground workings, and include specific limits on the amount of material that can be placed in the various approved surface storage locations. The licence amendments allow the site to reallocate some of this production between the three sites, depending on the performance of the three mines. However, the majority of the production is still expected to be from Bellekeno until the commissioning of Flame & Moth. It is expected that further amendments to the water licence will be required to increase the amount of production and the size of the tailings and waste rock storage areas.

[1] The Onek deposit has since been dropped from the current production plans, but the approvals remain in place.

20.4.2 Waste Rock

Annual monitoring reports record the actual waste rock production (Alexco, 2011; 2012b). Bellekeno mine production between 2010 and 2012 generated 58,535 tonnes of N-AML waste rock, which was brought to surface and used for road construction and rehandled for underground backfill. A total of only 2,059 tonnes of P-AML waste rock was stored in in the temporary P-AML waste rock storage facility and upon temporary suspension of operations all of this P-AML material was used as underground backfill. The remainder of the development rock was used as underground backfill.

As part of this PEA, SRK has estimated the amount of waste rock that would be produced from Bellekeno from Q4 2014 to Q4 2015 when Bellekeno operations cease. The total waste rock broken during this period is estimated at 32,000 t, while the planned use of waste rock for backfill requirements is approximately 14,000 t. Therefore, an additional 18,000 t of waste rock will be available for construction or backfill, or will need to be stored on surface. It may be possible to incorporate into backfill all of the P-AML rock from previous and future operations in the underground mine.

For the Lucky Queen mine, SRK has estimated that approximately 114,000 t of waste rock will be produced between Q2 2016 and Q2 2020, and that approximately 112,000 t will be required for backfill. This will result in a net storage requirement of 2,000 t of waste rock on surface. Alexco is proposing a new P-AML waste rock storage facility of 5,000 m^2 based on an approved generic design, and a new N-AML disposal area of 8,000 m^2. The new P-AML facility is estimated to cost approximately $144,000 to construct. It is unclear how much material these facilities can accommodate. However, the current licence allows for additional storage if required. During operations, seepage from the P-AML storage area will be monitored, and if needed, water would be collected and trucked to the Bellekeno water treatment facility. At closure, if any P-AML material remains that cannot be used as backfill, the storage area will be covered with 0.5 m of low permeability borrow material.

It is projected that 300,000 t of waste rock will be produced from Flame & Moth between Q2 2014 and Q1 2020, and that 230,000 t will be used in backfill. This leaves approximately 70,000 t of excess waste rock. Alexco plans to use the majority of the excess waste rock to construct a toe berm for the expansion of the DSTF, while a small quantity will require permanent storage on surface. An additional temporary waste rock storage facility with a maximum capacity of 63,000 t will be built for temporary stockpiling of waste rock until it can be used underground as backfill.

20.4.3 Tailings

Tailings will continue to be deposited in the licensed DSTF or used as backfill in the operating mines.

Based on the information provided on the tailings geochemistry, the introduction of tailings from Lucky Queen ore is not expected to have a negative impact on the geochemical stability of tailings within the DSTF. Metallurgical tests will characterize the tailings from Flame & Moth and the results will be compared to the Bellekeno and Lucky Queen tailings. For the purpose of this PEA, it is assumed that the Flame & Moth tailings will be geochemically similar to the already licensed tailings and that no additional measures will be required to control metal leaching/acid rock drainage.

As of December 2012, 136,000 t of tailings have been placed in the DSTF. The current material balance for the project indicates that a total of 785,000 t of tailings will be produced from Q1 2013 to Q3 2020. Of this, 613,000 t will be stored in the DSTF, bringing the total storage requirements for the DSTF to 749,000 t. Although a relatively low quantity of tailings (<10% of total) has been used as backfill to date as a consequence of using more waste rock for backfill than originally predicted, current projections indicate that approximately 21% or 156,000 t of the future tailings produced can be backfilled into the underground workings (comprising 31% of the backfill by mass).

Although the water licence allows for the production and placement of 322,000 t of tailings, the operation, maintenance, and surveillance manual for the DSTF (EBA, 2010) indicates that it has a design capacity of 123,220 m^3 (or 198,000 t based on placed density of 1606 kg/m^3). Designs are now complete for an expanded facility that would bring the capacity up to 322,000 t, which is the current permitted capacity of the facility. Future expansions for a total capacity of 850,000 t are also planned, as shown in Figure 20-1. This expansion will require additional amendments to the permits and licences. EBA (pers comm. Justin Pigage) have indicated that the expansion would be constructed using the same foundation system, tailings placement techniques, and geometry (side slopes and bench elevations) as the current DSTF design. All other conditions regarding placement and compaction of the tailings as detailed in the DSTF Operation, Maintenance, and Surveillance Manual (EBA, 2010) are assumed to remain the same as those used in the current facility. The subsurface conditions within the footprint of the expansion are assumed to be generally similar to those under the existing approved footprint, but will be investigated as part of the detailed design.

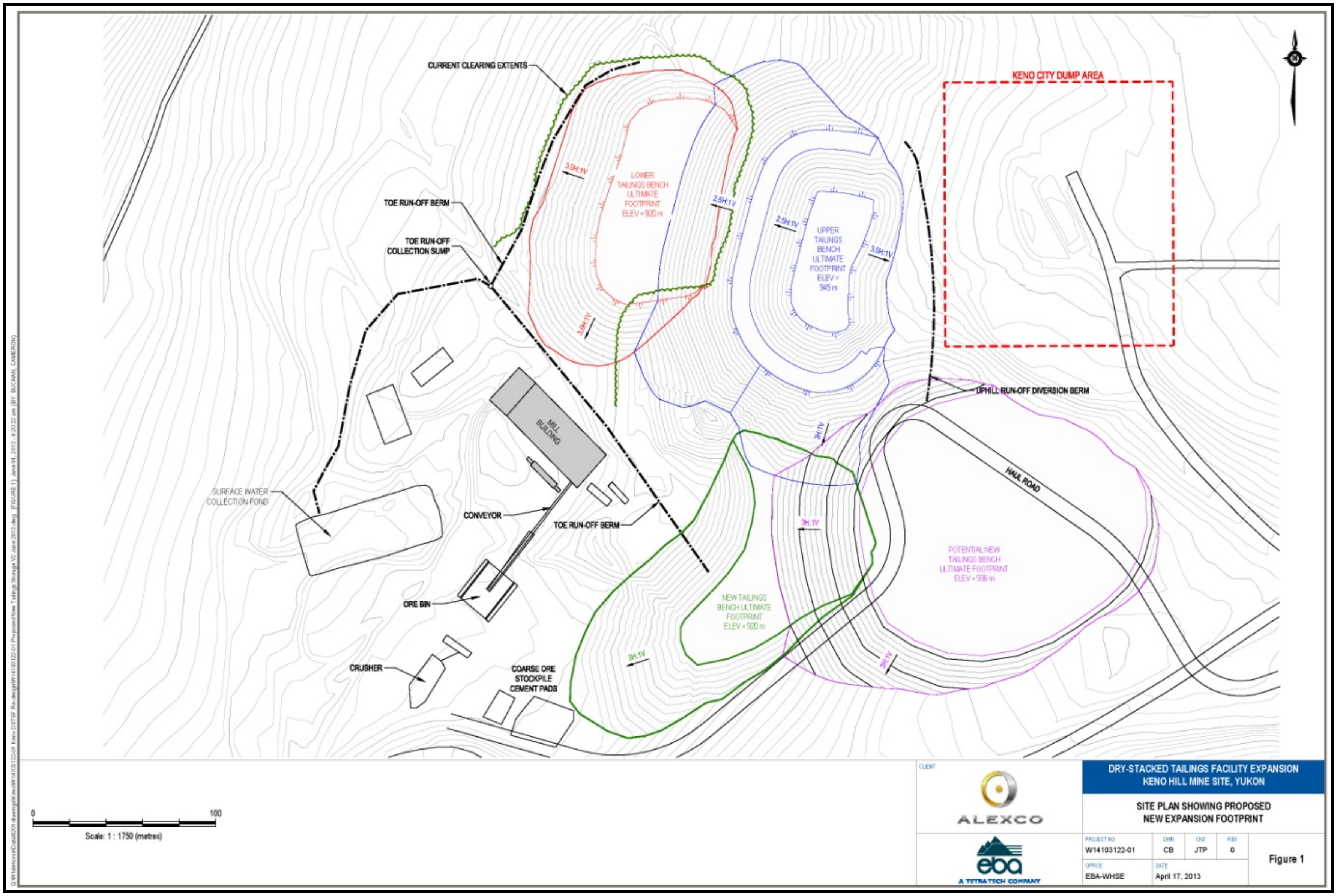


Figure 20-1: Preliminary Dry Stack Expansion Design to 850,000 Tonnes (Alexco, 2013)

20.5 Reclamation and Closure

In September 2012, Alexco submitted a revised reclamation and closure plan that encompasses all of the active mining and processing activities in the Keno Hill silver district (Alexco, 2012c). Some key aspects of the closure plan are listed as below:

- P-AML waste rock will either be placed as backfill in the mine or sloped to shed water and then covered with a 0.5 m layer of low permeability borrow material. Reclaimed areas will be covered with growth material and then seeded to promote vegetative growth;
- N-AML waste rock storage facilities will be regraded and then scarified. Organic materials may be blended into the surface to promote growth of vegetation;
- Adits and raises will be sealed to prevent access. Bulkheads will be constructed in some areas to enhance water management activities;
- At the Bellekeno mine, in-pool treatment measures will be implemented to reduce metal loadings. The active treatment system will be converted to a passive bioreactor system;
- All buildings and equipment that are not needed for the treatment activities will be removed from the portal areas. Any additional debris will be transferred to the Elsa solid waste disposal facility. The portal areas will be re-contoured and scarified to facilitate re-vegetation;
- Linear disturbances (roads) will be subject to standard decommissioning measures such as removal of culverts, scarification, re-vegetation, and removal of safety berms;
- The Flat Creek camp will be downsized as needed to support ongoing care and maintenance activities in the Keno Hill silver district;
- Buildings and other infrastructure in the mill area will be dismantled and sold for salvage or demolished on site and disposed of in an approved landfill. Concrete footings will be covered with overburden, scarified, and re-vegetated;
- The DSTF will be covered. If monitoring indicates that it is necessary, meteoric water will be directed to a passive biological treatment system for polishing prior to discharge;
- Various monitoring activities will continue until the performance of the closure measures has been verified.

Alexco will have a site presence for many years while reclamation of the historical liabilities occurs. Therefore, monitoring of the Bellekeno, Lucky Queen, and Flame & Moth mine areas can be integrated with Keno Hill silver district monitoring programs over the long term. This is expected to improve the efficiency of these ongoing water treatment and monitoring activities.

A key aspect of the closure planning is how liabilities associated with the new mine development will be separated from historical liabilities that are also under Alexco's mandate. Alexco's position on the liabilities for Lucky Queen are summarized in Table 20-3.

Table 20-3: Lucky Queen Development and Production Project Liabilities

Alexco Liabilities	Aboriginal Affairs and Northern Development Canada (AANDC) Liabilities
Lucky Queen	
New N-AML waste rock storage facility(ies)	Existing Waste rock storage areas
Newly rehabilitated Lucky Queen portal	Wernecke Road
Portal pad	
New mine water management	
New P-AML waste rock storage facility(ies)	

The Government of Yukon requires financial security in the form of a letter of credit to cover potential liabilities associated with the cost of reclamation and closure. As part of QML-0009, the Government of Yukon currently holds $4,172,850 in security for the Bellekeno, Lucky Queen, and Onek operations, including the mill area and DSTF. This amount was set in January 2013, following a third party review of Alexco's costs. Alexco has estimated that the costs for reclaiming this area would be on the order of $3,910,000.

Additional closure costs may be incurred if the effectiveness of the current closure concepts cannot be demonstrated. For example, active water treatment may be required at Bellekeno if passive bio reactors are not capable of meeting the discharge criteria. A fullscale pilot bio reactor has operated successfully at Galkneo 900 to support the long term water management and treatment assumptions in the closure plan. The ongoing monitoring programs will be critical for ensuring that there is sufficient information available to support final closure plans for these production areas.

The reclamation and closure plan will be updated to incorporate Flame & Moth and it will include the associated DSTF expansion, mine portal closure, any new waste rock disposal area or storage facility (as required) and water treatment (if required). The incremental costs associated with these facilities are likely to be on the order of $600,000. It is anticipated that a modest credit may be possible given that Onek is no longer part of the production plans.

21 Capital and Operating Costs

21.1 Capital Cost Estimate

Capital costs have been estimated in 2013 Canadian dollars on a quarterly basis for the period from January 1, 2014 to the end of the planned plant feed schedule in mid-2020. In Q1 2015, all production will be sourced from the Bellekeno mine. Flame & Moth will begin producing plant feed material in Q2 2015 while Lucky Queen production starts Q4 2016.

For the two new mine start-ups, SRK considers commercial production to begin in the quarter that 70% of the planned production rate is achieved. This defines the following pre-production periods:

- Q2 2014 through Q3 2015 for the Flame & Moth mine;
- Q2 2016 through Q2 2017 for the Lucky Queen mine.

Capital cost estimation work was undertaken as follows:

- Mine capital by SRK, representing more than 90% of the total estimate;
- Mill, site services, and health and safety capital by Alexco with review by SRK.

SRK considers the accuracy of capital cost estimate components to be at a scoping level.

21.1.1 Capital Cost Summary

Table 21-1 shows the LoM estimate of total capital. It is important to note that initial capital is distributed in time as defined by the pre-production periods described above. It is not all front end loaded in the cash flow model.

Table 21-1: Capital Cost Summary

Area	Capital Costs ($M)		
	Initial	Sustaining	Total
Bellekeno Mine		$5.2	$5.2
Lucky Queen Mine	$9.9	$9.2	$19.0
Flame & Moth Mine	$29.3	$11.0	$40.2
Mill		$2.2	$2.2
Site Services		$0.9	$0.9
Health & Safety		$0.5	$0.5
Contingency	$6.1	$2.2	$8.3
Total Capital	**$45.3**	**$31.1**	**$76.4**

The following report sections provide details on the capital costs shown in the summary above.

21.1.2 Bellekeno Mine

Bellekeno mine capital includes $4.2 M for lateral development (738 m) and $0.8 M for mining equipment. It also includes a small amount of unspecified sustaining capital.

21.1.3 Lucky Queen Mine

Lucky Queen mine capital includes $11.3 M for lateral development (2,242 m) and $1.4 M for raising (216 m of Alimak ventilation/escape raise). It also includes $3.0 M for mining equipment, $0.5 M for project capital (power supply upgrade, and raise collar surface preparation), $2.7 M capitalized operating costs (11,000 tonnes mined during pre-production), and unspecified sustaining capital.

21.1.4 Flame & Moth Mine Capital

Flame & Moth mine capital is shown in Table 21-2. Flame & Moth mine will contribute 370 tpd to plant feed when it is in full operation.

Capitalized underground development work includes 3,556 m of lateral development and 369 m of raising (197 m raise bored 3.0 m diameter fresh air raise plus other ventilation raising).

Flame & Moth equipment capital includes mining equipment purchased directly ($3.2 M before contingency) as well as equipment procured on a lease to own basis. Leased equipment amounts to $9.6 M before contingency, on terms including 25% down ($2.4 M before contingency), and 7.0% annual interest rate over four years.

Table 21-2: Flame & Moth Mine Capital

Flame & Moth Mine Capital Item	Cost $M
UG Development	$16.7
Equipment Fleet	$5.6
Equipment Lease	$1.7
UG Construction	$4.4
Surface Facilities	$1.7
Definition Drilling	$2.6
Capitalized Operating	$3.4
Reclamation Security	$0.6
Sustaining	$3.4
Sub-total	**$40.2**
Contingency	$6.6
Total Capital	**$46.8**

Underground construction includes:

- Main sump and area sumps;
- Small maintenance shop;
- Fuel storage;
- Underground booster fans;
- Auxiliary ventilation fans;
- Explosives storage;

- Refuge stations;
- Underground electrical distribution.

Surface facilities include:

- Office trailer;
- Mine dry trailer;
- Maintenance shop (set up cost only);
- Water treatment plant;
- Fuel storage;
- Settling pond;
- Air compressors;
- Mine air heater;
- Main ventilation fans.

Definition drilling includes 11,980 m of HQ underground core drilling for deposit definition.

Capitalized operating costs cover 26,000 t mined during pre-production.

21.1.5 Mill facility

Mill capital includes $1.5 M for expanding the DSTF, $0.5 M for installing a second ball mill that has already been purchased, and unspecified sustaining capital at $45,000 per year.

21.1.6 Site Services and Health and Safety

The site services capital includes unspecified sustaining capital of $37,500 per quarter which is intended mainly for purchasing critical spares and components for maintaining and upgrading the surface infrastructure and site services fleet of heavy equipment.

The health and safety capital includes unspecified sustaining capital at $21,875 per quarter which is intended mainly for purchasing mine rescue, fire fighting, first aid and industrial hygiene equipment.

21.2 Operating Cost Estimate

21.2.1 Site Operating Cost Summary

Site operating costs have been estimated in 2013 dollars based on SRK's review of Alexco's 2012 and 2013 operating budgets and on actual reported operating costs for 2011 and 2012. SRK's operating cost estimates reflect Alexco's ongoing and planned initiatives aimed at reducing the site unit operating cost.

These initiatives include:

- Future mine operations including development and production are planned as owner operated (instead of contractor) using Alexco's own equipment and workforce;
- Direct purchasing of new and used equipment for Lucky Queen and Flame & Moth instead of paying contractor monthly rental costs;
- Establishing long term supply contracts with suppliers and eliminating dependence on a contractor to supply basic materials such as ground support, explosives and other materials;
- Upgrading the mill facility to ensure that it can reliably process 400 tpd.

Table 21-3 shows the LoM site operating cost estimate. It is based on LoM plant feed of 807 kt as shown in the economic model.

Table 21-3: LoM Site Operating Cost Summary

Area	LoM Site Opex ($M)	Unit Cost ($/tonne)
Mine	$123.9	$154
Mill	$56.1	$70
G&A	$23.7	$29
LoM Total Site	**$203.8**	**$253**

21.2.2 Mine Operating Cost Estimates

SRK's operating cost estimates for the individual mines are shown in Table 21-4. Tonnes shown in the table exclude tonnes mined during pre-production for Lucky Queen and Flame & Moth. The Flame & Moth mine operating cost includes $7.5 M for equipment lease payments, equivalent to $13.29/t.

Table 21-4: Individual Mine Operating Cost Estimates

Mine	Individual Mine Opex ($M)	Operating Period kt	Mine Unit Cost ($/tonne)
Bellekeno Mine	$12.3	85.7	$143.11
Lucky Queen	$29.1	118	$247.51
Flame & Moth	$82.6	567	$145.74
Subtotal Mines	**$123.9**	**770**	**$160.99**

21.2.3 Bellekeno Mine Operating Cost Estimate

Table 21-5 shows an estimate of Bellekeno mine's operating cost breakdown for 2015. The costs are broken down in the same manner as the 2013 budget with some additional details.

Table 21-5: Bellekeno Mine Operating Cost Details

Area/Function	Unit Cost($/t)
Operational Indirects	$18.96
C&F Stoping & Lateral Development	$36.68
Stoping LH	$27.03
Backfill - Rockfill	$0.27
Backfill - Cemented Tailings	$7.53
Truck Haulage	$6.30
Mine General	$10.51
Mine Maintenance	$16.58
Energy	$16.00
Environmental	$3.25
Total Unit Operating Cost	**$143.11**

The Bellekeno mine operating costs were estimated from Alexco's Bellekeno mine 2013 budget costs. To estimate the various operating cost components, capitalized costs were removed and the remaining line items factored to account for the expected changes over the LoM. Several items were broken out of the original data to better represent the future production profile. The most significant was that the stoping category was broken into cut and fill stoping (which includes development on vein for longhole production) and longhole stoping as the cost structure of these two methods is quite different.

The results were benchmarked against historic cost data from the Bellekeno mine and other data sources.

21.2.4 Lucky Queen Mine Operating Cost Estimate

Table 21-6 shows an estimate of Lucky Queen mine's typical operating cost breakdown over the life of mine from mid-2017 to mid-2020. The costs are broken down in the same manner as the 2013 budget with some additional details.

Table 21-6: Lucky Queen Mine Operating Cost Details

Area/Function	Unit Cost ($/t)
Operational Indirects	$23.19
Lateral Development	$19.03
C&F Stoping	$121.57
Backfill - Cemented Rockfill	$26.76
Truck Haulage	$8.81
Mine General	$14.07
Mine Maintenance	$15.81
Energy	$16.00
Environmental	$2.28
Total Unit Operating Cost	**$247.51**

The Lucky Queen mine operating costs were estimated from the Bellekeno mine costs presented above by adjusting to account for the differences in mining methods, distance from mill, internal haulage distances, and other limiting factors such as equipment sizes and productivities.

Adjustments were made to the estimate to account for:

- Lucky Queen is all mechanized cut and fill with a much flatter dip than encountered at Bellekeno;
- The existing 500 level access drift is too small for standard haulage trucks or larger LHDs for waste development.

21.2.5 Flame & Moth Mine Operating Cost Estimate

Table 21-7 shows the Flame & Moth operating cost estimate for a production rate of 320 tpd.

Table 21-7: Flame & Moth Mine Operating Cost Details

Area/Function	Unit Cost ($/t)
Alexco Mine Supervision	$8.92
Safety & Training	$2.47
Lateral Development	$11.89
Stoping	$31.55
Truck Haulage	$11.03
Backfilling	$13.81
Mine Services	$10.22
Surface	$0.53
Maintenance Supervision	$5.38
Mine Maintenance	$17.69
Technical Services	$9.52
Energy	$9.44
Equipment Lease Cost	$13.29
Total Unit Operating Cost	**$145.74**

The Flame & Moth mine operating cost was estimated by factoring the actual Bellekeno mine operating cost from Q4 2012. The breakdown of cost by function is based on an SRK cost model prepared for Bellekeno with adjustments made to account for:

- Better stoping productivity for Flame & Moth due to thicker veins being mined;
- No separate surface trucks required to haul vein material to the mill for Flame & Moth;
- Reduced operating development per tonne at Flame & Moth compared to Bellekeno;
- Extra costs at Flame & Moth for leased equipment;
- Higher production rate at Flame & Moth compared to Bellekeno.

21.2.6 Mill Facility

Alexco provided SRK with the actual mill operating cost for Q4 2012. During that quarter, the mill throughput was 26,777 t (291 tpd), which represented the highest mill throughput since start-up. SRK reviewed the mill cost details and made assumptions regarding fixed and variable operating costs as shown in Table 21-8 in order to prepare a factored mill operating cost estimate for a 400 tpd throughput rate.

Table 21-8: Estimated Mill Operating Cost at 400 TPD

Mill Cost Item	Fixed or Variable	Actual Q4 2012 291 TPD Cost ($ 000)	Factored Quarterly 400 TPD Cost ($ 000)	400 TPD Unit Cost ($/t)
Crushing & Conveying	V	$22.2	$30.5	$0.85
Grinding	V	$72.8	$100.1	$2.78
Floatation	V	$148.6	$204.3	$5.67
Dewatering	V	$79.4	$109.1	$3.03
DSTF Management	F	$25.2	$25.2	$0.70
Assay Lab	F	$15.9	$15.9	$0.44
Mill General	F	$522.3	$522.3	$14.51
Electricity	V	$262.3	$360.5	$10.01
Fuels	F	$179.4	$179.4	$4.98
Labour Costs	F	$954.8	$954.8	$26.52
Total Mill Operating		**$2,283**	**$2,502**	**$69.50**

21.2.7 General and Administration

Table 21-9 shows SRK's estimate for the project's general and administration operating costs per quarter at 400 tpd.

Alexco prepares a separate general and administration site cost, (G&A) and then allocates it to operating departments on a percentage basis. SRK reorganized the G&A costs in order to report a separate G&A cost, and also mine and mill costs without G&A allocations.

SRK's G&A cost estimate is based on both Alexco's 2013 budget and on actual costs for Q4 2012. SRK selected a cost between these two sources that was comparatively about 10% different. The G&A operating cost estimate is factored for 400 tpd based on the assumption that 20% of the costs are variable.

Table 21-9: Estimated Site G&A Cost per Quarter at 400 TPD

G&A Operating Cost Item	Cost/Qtr 400 TPD Cost ($ 000)
Materials & Supplies	$49
Vehicle Oper. & Maint.	$85
Labour	$228
Travel	$25
Electricity & Fuels	$62
Camp	$264
Site Environmental	$60
Business Services	$113
Other Items	$52
Total G&A Items	**$938**

22 Economic Analysis

22.1 Input and Assumptions

22.1.1 Inferred Mineral Resources

This PEA is preliminary in nature. The "potentially mineable tonnes" disclosed in the mine plans are partly derived from Inferred mineral resources by the application of a cut-off net smelter return (NSR) value ($/t), and dilution and mining recovery factors. Inferred mineral resources are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that this PEA will be realized.

SRK estimates that Inferred mineral resources form the basis of 6% of the "potentially mineable tonnes" included in the plant feed schedule of this PEA.

22.1.2 Input Parameters

Input parameters to the economic analysis include:

- The terms of the Silver Purchase Agreement;
- Economic analysis based on the period from January 1, 2014 to mid-2020;
- Three deposits included in plant feed: Bellekeno, Lucky Queen, and Flame & Moth;
- LoM plant feed of 807 kt with average metal grades of 745 gpt silver, 2.69% lead, 4.67% zinc, and 0.40 gpt gold;
- Plant feed schedule as shown in Table 16-27 with an average plant feed rate of 406 tpd;
- Average NSR value of plant feed of $419/t using metal prices and exchange rate listed below;
- Metal prices of US$24.00/oz silver, US$0.95/t lead, US$0.85/t zinc, and US$1300/oz gold,;
- Exchange rate of US$0.96/C$1.00;
- Metallurgical recoveries based on actual mill performance and testwork results;
- Smelter terms for lead and zinc concentrates based on off-take agreements between Alexco and Glencore Ltd. of Stamford, CT, USA;
- Payable silver 16.8 million ounces;
- LoM revenue of $338 million;
- An LoM average site operating cost of $253/t processed comprised of $154/t mining, $70/t milling, and $29/t G&A;
- Capital costs totalling $76 M, equivalent to $95/t processed;
- The Government of Yukon currently holds $4,172,850 in security for the Bellekeno, Lucky Queen, and Onek operations, including the mill area and DSTF. This security offsets Alexco's estimated closure cost of $3,910,000, and neither of these amounts are included in the economic analysis. In the future, Alexco will be required to increase the security by an as yet undetermined amount to cover the planned operations for Flame & Moth. SRK estimates a cost in the order of $600,000 that has been included in the economic analysis.

22.2 Economic Model and Results

The EKHSD project economic model is shown in Table 22-1.

Indicative economic results on an after tax basis are:

- Net cash contribution of $41.4 million;
- Internal rate of return (IRR) of 38.2%;
- NPV(5%) of $29.6 million;
- Payback period is 3.5 years from January 1, 2014.

Federal and territorial royalties and taxes applicable to the mine are shown in the table.

Table 22-1: EKHSD project Economic Model

Plant Feed	**Units** **ktonne**	**2014**	**2015** **130.8**	**2016** **148.3**	**2017** **146.4**	**2018** **151.3**	**2019** **151.4**	**2020** **78.6**	**2021**	**2022**	**Total** **806.9**
Metal Grades											
Silver	gpt		674	740	762	811	747	707			745
Gold	gpt		0.21	0.47	0.47	0.44	0.37	0.40			0.40
Lead	%		4.71	2.99	2.22	2.11	1.85	2.38			2.69
Zinc	%		5.11	5.65	4.76	4.05	3.72	4.95			4.67
Metal Prices											
Silver	US$/oz		$24.00	$24.00	$24.00	$24.00	$24.00	$24.00			
Gold	US$/oz		$1,300	$1,300	$1,300	$1,300	$1,300	$1,300			
Lead	US$/lb		$0.95	$0.95	$0.95	$0.95	$0.95	$0.95			
Zinc	US$/lb		$0.85	$0.85	$0.85	$0.85	$0.85	$0.85			
Revenue (NSR)	**US$ M**		**$50.2**	**$60.7**	**$59.9**	**$64.9**	**$58.9**	**$29.8**			**$324.4**
Exchange Rate			0.96	0.96	0.96	0.96	0.96	0.96			
Revenue (NSR)	**CDN$ M**		**$52.2**	**$63.2**	**$62.4**	**$67.6**	**$61.4**	**$31.0**			**$337.9**
Gov't of Canada Royalty	CDN$ M		$0.47	$0.95	$0.94	$1.01	$0.64				$4.0
Operating Costs											
Mining	CDN$ M		$17.1	$20.1	$22.6	$26.2	$24.9	$13.1			$123.9
Milling	CDN$ M		$9.1	$10.3	$10.2	$10.5	$10.5	$5.5			$56.1
General & Administration	CDN$ M	$3.0	$3.7	$3.8	$3.8	$3.8	$3.8	$2.0			$23.7
Total Site Operating Cost	**CDN$ M**	**$3.0**	**$29.9**	**$34.2**	**$36.5**	**$40.5**	**$39.2**	**$20.5**			**$203.8**
Capital Costs											
Bellekeno	CDN$ M	$1.35	$3.81								$5.2
Lucky Queen	CDN$ M			$4.28	$6.87	$3.33	$4.56				$19.0
Flame and Moth	CDN$ M	$9.12	$28.04	$3.56	$3.25	$1.78	$0.85	$0.20			$46.8
Subtotal Mining	CDN$ M	$10.46	$31.85	$7.85	$10.12	$5.11	$5.41	$0.20			$71.0
Milling	CDN$ M	$0.38	$0.69	$0.21	$0.32	$0.26	$0.27	$0.05			$2.2
Site Services, H&S	CDN$ M	$0.12	$0.24	$0.24	$0.24	$0.24	$0.24	$0.12			$1.4
Contingency	CDN$ M	$0.15	$0.23	$0.26	$0.81	$0.14	$0.14	$0.04			$1.8
Total Capital Cost	**CDN$ M**	**$11.1**	**$33.0**	**$8.6**	**$11.49**	**$5.75**	**$6.05**	**$0.40**			**$76.4**
Net Cash Contribution Pre-Tax	CDN$ M	($14.08)	($11.10)	$19.51	$13.47	$20.37	$15.50	$10.09			**$53.7**
Pre-Tax Cash Flow From Operations	CDN$ M	($3.0)	$21.9	$28.1	$25.0	$26.1	$21.6	$10.5			$130.1
Income Taxes											
Federal	CDN$ M					($2.19)	($2.39)	($1.09)	$0.29	$0.21	-$5.2
Territorial	CDN$ M					($2.19)	($2.39)	($1.09)	$0.29	$0.21	-$5.2
Yukon Mine Royalty Tax	CDN$ M		($0.21)	($0.75)	($0.51)	($0.50)	($0.37)	($0.12)			-$2.5
Terminal value of CDE pool	CDN$ M									$0.50	$0.5
Total Taxes	**CDN$ M**		**($0.21)**	**($0.75)**	**($0.51)**	**($4.87)**	**($5.15)**	**($2.31)**	**$0.59**	**$0.91**	**-$12.3**
Net Cash Flow from Operations	CDN$ M	($3.0)	$21.7	$27.3	$24.5	$21.2	$16.4	$8.2	$0.6	$0.9	$117.8
Capital Cost	CDN$ M	$11.1	$33.0	$8.6	$11.49	$5.75	$6.05	$0.40			$76.4
Net Cash Flow	**CDN$ M**	**($14.08)**	**($11.31)**	**$18.76**	**$12.96**	**$15.50**	**$10.34**	**$7.78**	**$0.59**	**$0.91**	**$41.4**
IRR	%	38.2%									
NPV(5%)	CDN$ M	$29.6									

22.3 Sensitivities

Table 22-2 shows the sensitivity of the after tax net cash flow to changes in selected cash flow model input parameters. For the inputs evaluated, the order of importance is as follows:

- Metal grades - economic results most sensitive;
- Metal prices;
- Operating costs;
- Capital costs - economic results least sensitive.

Table 22-2: Sensitivity Analyses – After Tax Net Cash Flow

Change	Net Cash Flow after tax ($ million)			
	Metal Prices	Metal Grades	Operating Costs	Capital Costs
20%	$91.5	$92.1	$13.0	$26.2
15%	$79.2	$79.7	$21.2	$30.0
10%	$66.8	$67.1	$28.0	$33.8
5%	$54.2	$54.3	$34.7	$37.6
Base Case	$41.4	$41.4	$41.4	$41.4
-5%	$28.6	$28.6	$48.1	$45.3
-10%	$15.0	$15.1	$54.8	$49.1
-15%	($4.1)	($3.9)	$61.4	$52.9
-20%	($23.2)	($22.8)	$68.0	$56.7

22.4 Impact of Silver Purchase Agreement

22.4.1 Silver Purchase Agreement Impact

The indicative economic results shown above in section 22.2 include the impact of the Silver Purchase Agreement between Alexco and Silver Wheaton whereby 25% of all future silver production from Keno Hill silver district properties owned or controlled by Alexco at the time of the consummation of the Silver Purchase Agreement will be delivered to Silver Wheaton in exchange for a payment of US$3.90/oz.

A base silver price of US$24.00/oz is used in the PEA economic model. The price differential between the base price and the Silver Purchase Agreement price is US$20.10/oz. Payable ounces of silver attributed to Silver Wheaton under this agreement amount to 4.2 million ounces representing an undiscounted LoM revenue reduction of C$88 million for Alexco.

If this additional revenue is included in the economic model, the after tax net present value at 5% discounting (NPV_5) increases from $29.6 to $75.9 million.

22.4.2 SRK Comments

SRK provides this information so that readers may better understand the context of the indicative economic results generated by the EKHSD project, in particular the significance of the Silver Purchase Agreement. These results should not be considered as a sensitivity exercise as the Silver Purchase Agreement is an executed legal agreement between the parties.

22.5 Economic Analysis of Individual Mines

Table 22-3 shows a comparison of the three mines on the basis of pre-tax net cash contribution. The analysis is annual starting on January 1, 2014 as in Table 22-1.

Table 22-3: Analysis of Individual Mine Indicative Pre-Tax Economic Results

Pre-Tax Cash Flow Item ($M)	Bellekeno	Lucky Queen	Flame & Moth	Total ($M)
NSR Value of Metals	$34.7	$71.7	$232	**$337.9**
Operating Costs:				
Mine	$12.3	$29.1	$82.6	**$123.9**
Mill	$6.0	$8.9	$41.2	**$56.1**
G&A	$2.5	$3.8	$17.4	**$23.7**
Total Operating Cost	$20.7	$41.8	$141.2	**$203.8**
Mine Capital Costs	$5.2	$19.0	$46.8	**$71.0**
Allocated Capital Costs	$1.1	$0.7	$3.6	**$5.4**
Government Royalty	$0.3	$0.8	$3.0	**$4.0**
Net Cash Contribution	**$7.5**	**$9.3**	**$37.0**	**$53.7**

22.6 Potential Opportunity for Extended Mine Life

To minimize potential ground water inflows, the Flame & Moth mine design includes a 30 m (vertical) crown pillar and 20 m wide pillars that bracket the Mill fault. The PEA production plan assumes that a 50% pillar mining recovery will be achieved. The non-recoverable pillar tonnes, excluded from the PEA production plan, amount to 66 kt with average metal grades of 604 gpt silver, 2.40% lead, 6.38% zinc, and 0.51gpt gold.

Alexco is conducting preliminary hydrogeology fieldwork and assessment at the time of writing (late November 2013) and the early indications are that groundwater conditions are more favourable than originally anticipated.

There is a potential opportunity to extend the PEA LoM production plan that is based on mining 807 kt over 5.5 years. Mining the Flame & Moth pillars to a 95% mining recovery would add 66 kt to production tonnage and roughly six months to the mine life. During this six-month period, additional tonnage could be mined from Lucky Queen mine (12 kt with average metal grades of 1035 gpt silver, 2.53% lead, 1.12% zinc, and 0.11 gpt gold).

The impact on pre-tax indicative economics would be an increase in the net cash contribution from $53.7 million (Table 22-3) to $62.5 million. Additional hydrogeological and geotechnical evaluation is recommended to investigate this potential opportunity.

23 Adjacent Properties

There are no adjacent properties considered relevant to this technical report.

24 Other Relevant Data and Information

24.1 Risks

24.1.1 Geology and Mineral Resources

- At Lucky Queen, high-grade silver-bearing vein material is confined by hydrothermal vein minerals and highly deformed fault rocks. The vein location has been determined by Alexco drill hole data, historical drill hole data, and geologic mapping conducted by UKHM. Historical drift and stope mapping is considered by Alexco to be accurate and representative, however, field verification of the mapping could not be performed by Alexco geologists because of the inaccessibility of the underground workings;
- Additional definition drilling will be required prior to mining in order to properly locate the mineralized veins.

24.1.2 Mine Geotechnical and Hydrogeology

- Assessments of ground conditions at Lucky Queen and Flame & Moth are based solely on core review and have not considered the impact of wet conditions on the rock mass whereas assessments at Bellekeno have benefitted from Alexco's current mining experience and achievements;
- As the overall level of extraction increases at the Bellekeno mine, it is likely that some stress induced failures will be encountered. These may impact the mining schedule and the cost of mining;
- There is a possibility of significant water inflow to the planned Flame & Moth underground workings. The hydrogeological context and potential water ingress from faulting, overburden materials, and surface water features represents a potential risk to the project;
- Poor ground conditions associated with a weak and wet rock mass, could increase Flame & Moth mining costs and reduce planned extraction.

24.1.3 Mining

Risks common to all underground mines in the production plan:

- The LoM plan is based upon "potential mineable tonnes" that include a portion of Inferred mineral resources. Inferred mineral resources are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves;
- Encountering areas of unexpectedly adverse ground conditions can cause:
  - Short term loss of production or reduced productivity;
  - Potential for unexpected additional costs to control ground such as reconditioning costs, increased amounts of spilling and increased amounts of shotcrete;
  - Excessive amounts of shotcrete reporting to mill can impact mill recoveries;
  - Increased external dilution;
  - Loss of potential mineable tonnes due to excessive overbreak and dilution.

- Alexco must build up a skilled underground workforce to achieve the planned development and production ramp up in 2014 and 2015. There is a risk that some contractor support could be needed, increasing operating costs.
- There is a risk that certain planned longhole mining areas in the LoM plan may have to be mined by mechanized cut and fill methods or left in place due to severe ground conditions, which would negatively impact operating costs and productivity.

24.1.4 Processing

- The LoM production plan used in this study indicates significant blending of different sources and a wide range of head grades. Estimates of the mill facility performance are based on metallurgical testwork conducted on unblended samples of grades much higher and lower than the production plan averages. Consequently, there is uncertainty in these plant performance estimates;
- No assessment of ball mill grindability has been done for Lucky Queen or Flame & Moth material. If the hardness of these deposits is significantly higher than that measured during the study conducted by Starkey & Associates in February 2013, there is a risk that design capacity will not be achieved even with the additional ball mill capacity currently planned for Q1 2015. The result will either be a coarser flotation feed grind size and/or lower mill throughput;
- A potential processing-related risk is the production of zinc concentrate, especially for Flame & Moth material. The current production plan indicates that 73% of the mill feed will be sourced from Flame & Moth. To date, one composite sample from Flame & Moth has been tested and it indicated that the current mill facility flowsheet (without any regrinding) could result in poor zinc flotation performance. Additional testwork is warranted to determine if a regrinding capacity should be installed prior to the Flame & Moth deposit coming into production significantly in 2016.

24.1.5 Environmental and Permitting

- There is potential for additional water treatment costs at closure, for water from the Bellekeno workings. It is not clear whether the current closure plan includes sufficient provision for long-term maintenance and operations of water treatment. Passive water treatment systems typically require periodic addition of a carbon source (e.g., ethanol) and oversight to ensure that they are working effectively. Additionally, passive water treatment systems are not always effective at removing metals to discharge levels;
- There is considerable uncertainty associated with the cost of ongoing dust, vibration, noise, and traffic management. These costs should be reviewed on a regular basis;
- For Flame & Moth, there is limited information on the geochemical characteristics of waste rock and tailings. Further characterization is needed to determine whether the management systems used at Bellekeno will be appropriate for this site;
- There is also considerable uncertainty related to the potential for groundwater inflows to the Flame & Moth underground mine. In addition to the potential impacts to mining operations resulting from excess groundwater inflows, there may be additional costs related to management and treatment of mine water if the rates of inflow are high;
- Development of the Flame & Moth deposit as well as expansion of the DSTF from the currently permitted size of 322,000 t to 850,000 t will require additional permitting and possibly environmental assessment. The timelines and outcomes of this process will depend on the quality and completeness of the application, as well appropriate consultation with First Nations and the local community. However, given that this is an expansion of existing operations, and previous authorizations have gone smoothly, significant delays are not anticipated.

24.1.6 Economic Assessment

- Project economic results will be significantly impacted by a 15% drop in metal prices below those used in this PEA. Table 22-2 indicates a negative cash flow under such a scenario. SRK notes that the sensitivity results do not account for any mitigation measures that could be implemented by Alexco;
- The EKHSD project has relatively high fixed costs. It is in a remote location with a long cold winter, and the project must support these associated logistical costs. Operations at the site itself are spread out over a large area (242 square kilometres total property area), accessed by a network of roads that must be maintained year round (Figure 4-2 and Figure 18-1). Examples of key road distances are Flat Creek camp to mill facility 13.5 km, mill facility to Bellekeno mine and Lucky Queen mine 4.7 km and 8.0 km, respectively;
- The economic viability of the project depends on maintaining a certain minimum tonnes processed per day to reduce the site unit operating cost. The site unit costs are directly linked to the mine planning cut-off NSR and quantity of mineral resources that can economically be included in the mine plan;
- The challenge and risk for the project is to maintain the necessary plant throughput from multiple mines that are characterized by narrow vein mining in locally poor ground conditions.

24.2 Opportunities

24.2.1 Geology and Mineral Resources

- There are approximately 30 known deposits in the area, many of which have been subject to small scale mining operation over the last century. There is good potential to develop additional mineral resources by expanding the exploration programs to the unexplored deposits;
- Drilling on the Flame & Moth deposit in 2013 identified additional mineralization along strike to the southwest that has the potential to add mineral resource with infill drilling. Exploration drilling in the vicinity of the Flame & Moth deposit demonstrates the potential occurrence of additional mineralized vein structures;
- The Lucky Queen vein structure has a strike length, defined by drilling, of approximately 650 m and is open along strike to both the northeast and southwest with reported thicknesses of a few centimetres to several metres. In all likeliness, additional drilling along the structure will identify additional mineralization.

24.2.2 Mine Geotechnical and Hydrogeology

- With good extraction sequencing, excavation monitoring, and tactical support at the Bellekeno mine the impacts of increased stress levels on schedule and mining cost can be managed;
- Depending on the impact of hydrogeology on the Flame & Moth mine plan, there may be an opportunity to achieve more than the 50% planned extraction of the barrier pillars along the Mill fault and within crown pillar areas.

24.2.3 Mining

- Actual mining experience at Bellekeno mine has yielded more tonnage at a similar grade than predicted by previous versions of the underground mine plan (based on the same resource block model) such that the currently planned mine life could be extended if the trend continues;

- It is possible that the East zone at the Bellekeno mine could be brought into production if economic conditions were to improve sufficiently;
- The Flame & Moth underground mine plan should be optimized based on the results of any additional metallurgical test results and further hydrogeology and mine geotechnical assessment. There may be an opportunity to increase the potentially mineable tonnes;
- The Flame & Moth mining shapes are sensitive to the selection of cut-off criteria, and higher metal prices would increase the potentially mineable tonnes;
- In each of the three deposits there are some potentially mineable tonnes that were excluded from the PEA production plan for various reasons. This excluded tonnage amounts to 163 kt with average metal grades of 566 gpt silver, 2.92% lead, 3.64% zinc, and 0.07 gpt gold, representing a potential future mining opportunity.

24.2.4 Processing

- Further metallurgical testing should be performed to increase the confidence in the project economics. Testing blended samples representative of the LoM production plan blends and grades may result in better flotation results than the ones estimated in this report;
- Grindability testwork will allow for a more accurate estimate of future plant throughput to be made. The current changes suggested for the grinding circuit are based exclusively on current mill conditions. Hardness tests on Lucky Queen and Flame & Moth samples may reveal better grindability than the current expectation. Better ball mill grindability has the potential to decrease power consumption, improve mill throughput, achieve finer flotation feed size and, therefore, higher recoveries and concentrate grades.

24.2.5 Economic Assessment

- The project is sensitive to higher metal prices. A 20% increase in prices compared to study prices (silver price of US$28.80/oz for example) would increase estimated after tax net cash flow by roughly 2.2 times (Table 22-2);
- Within the Keno Hill silver district, Alexco has identified several high-grade silver exploration/development targets that represent a pipeline of potential projects. If successful in advancing any of these targets (former silver producing mines) to production, it may be possible to sustain a nominal plant feed rate of 400 tpd beyond 2020 (Table 16-27), thus improving the project economics.

25 Interpretation and Conclusions

25.1.1 Geology and Mineral Resources

- Exploration by Alexco on the Lucky Queen and Flame & Moth deposits has resulted in the identification of significant mineral resources that will provide additional feed to Alexco's mill facility;
- The databases used to estimate the Bellekeno mine updated mineral resource and the Flame & Moth updated mineral resource were audited by SRK. SRK is of the opinion that the current drilling information is sufficiently reliable to interpret with confidence the boundaries of the polymetallic mineralization and that the assay data are sufficiently reliable to support mineral resource estimation;
- In the opinion of SRK, the resource evaluations reported herein are a reasonable representation of the global polymetallic mineral resources in the Bellekeno and Lucky Queen mines and the Flame & Moth deposit given the current level of sampling.

25.1.2 Mine Geotechnical and Hydrogeology

- The Keno Hill silver district is known for high grade silver deposits and challenging ground conditions that limit the mining methods to fully supported methods with limited spans such as cut and fill or very small scale longhole;
- The Bellekeno mine has been in production for close to three years. In that time, a great deal of effort has been put into understanding the structural context of the deposit and learning how the ground behaves in the 99 and Southwest zones and the best means of controlling the ground. The operation has been successful in controlling the ground to date;
- Based on geotechnical assessment and experience at the Bellekeno mine, Alexco has developed detailed standards for ground support in development and production headings;
- In all mining areas, weak, wet ground conditions will result in elevated mining risk. Areas exhibiting these conditions will need to be exposed early and dewatered;
- The Flame & Moth deposit is situated below the floor of a valley. The hydrogeological context indicates the potential for water ingress from faulting, overburden materials, and surface water features.

25.1.3 Mining

Overall Mine Plan

- Operations at the EKHSD project were temporarily suspended on August 31, 2013. Alexco intends to resume site production activities on January 1, 2015;
- Applicable underground mining methods for the three deposits included in the production plan include mechanized cut and fill, drift and fill where spans are greater than 7 m, and small scale longhole stoping;
- NSR estimates were used as a measure of resource block value since the targeted mineralization includes four economic metals (silver, lead, zinc, and gold) in two concentrates;
- All three deposits in the mine plan exhibit good vein continuity after the application of cut-off NSR values;
- Nominal planned production rates for the deposits are Bellekeno mine - 250 tpd, Lucky Queen - 100 tpd, and Flame & Moth - 370 tpd;

- SRK has identified LoM potentially mineable tonnes totalling 807 kt with average metal grades of 745 gpt silver, 2.69% lead, 4.67% zinc, and 0.40 gpt gold, and an average NSR value of $419/t;
- The average percentage of Inferred mineral resources in the LoM plan is about 6%;
- Estimated average external dilution by deposit is Bellekeno - 19%, Lucky Queen - 44%, and Flame & Moth - 15%;
- The LoM production schedule from January 1, 2015 forward averages 406 tpd through to mid-2020;
- The peak waste development advance rate planned of 12.8 m/day occurs in Q1 2015 with 1,148 m scheduled;
- The EKHSD project achieves a LoM ratio of 76 tonnes/lateral waste metre.

Bellekeno

- The Bellekeno deposit was being mined by underground methods including mechanized cut and fill and small scale longitudinal retreat longhole incorporating full backfilling;
- Bellekeno potentially mineable tonnes, 11% of the LoM plant feed, are estimated at 86 kt with average metal grades of 660 gpt silver, 6.47% lead, and 4.15% zinc, and NSR value of $405/t.

Lucky Queen

- The Lucky Queen deposit requires the use of mechanized cut and fill methods in order to extract the mineral resource due to the average 45° dip of the deposit. Cemented rockfill is planned to provide adequate support to the hangingwall;
- Lucky Queen potentially mineable tonnes, which account for 16% of the LoM plant feed, are estimated at 129 kt with average metal grades of 1,054 gpt silver, 2.35% lead, 1.47% zinc, and 0.12 gpt gold, and NSR value of $557/t;
- The project is expected to be able to reach +70% of its planned production rate in Q3 2017, approximately one year after mine development resumes.

Flame & Moth

- A previous unpublished trade-off study by SRK, commissioned by Alexco, determined that Flame & Moth should be mined by underground mining methods (open pit was found less attractive);
- The Flame & Moth deposit can be mined by underground methods incorporating full backfilling without causing surface disturbance that could put the mill at risk;
- Flame & Moth potentially mineable tonnes, 73% of the LoM plant feed, are estimated at 593 kt with average metal grades of 690 gpt silver, 2.18% lead, 5.44% zinc, and 0.52 gpt gold, and an average NSR value of $391/t;
- A pre-production period of six quarters (1.5 years) from portal construction is required to get the project up to +70% of its planned production rate. One of the main drivers of this result is the planned main ramp advance rate of 4 metres per day;
- Flame & Moth mineable tonnes are sensitive to metal prices. Boundaries of mining shapes are mostly located in areas of gradational resource block value (as opposed to sharp geologic contacts).

25.1.4 Processing

- An additional ball mill for the mill facility is planned for Q1 2015 to address the issue of grinding circuit limitations. This additional mill power may result in a coarser flotation feed size at the higher throughput and possibly under harder feed conditions from the two new deposits;

- Testwork suggests that zinc performance (both recovery and concentrate grade) may be sensitive to regrinding, which currently is not part of the flowsheet. In particular, the single Flame & Moth sample tested to date demonstrated sensitivity to regrinding. The addition of regrind milling might be necessary to achieve acceptable zinc concentrate grade when Flame & Moth represents a significant proportion of the mill feed;
- The relationships used in this report to estimate grades and recoveries to the two concentrates need to be verified with additional data. This includes testwork on a range of blends from all three deposits that reflect the latest production plan;
- Estimates for lead recovery to lead concentrate and zinc recovery to zinc concentrate should be considered accurate to ±5% absolute; perhaps even broader, considering the lack of information available to date. As inputs to a technical economic model, a range of likely recoveries and grades should be used to test their influence on the overall project economics.

25.1.5 Environmental and Permitting

- Discharges from both the historical underground mine workings and areas that are currently under development contain elevated concentrations of zinc and sometimes cadmium. Water management is, therefore, a key consideration at this site, with active treatment required throughout operations. Alexco has proposed converting the current systems into passive treatment systems at closure;
- The tailings and portions of the waste rock are a potential source of metal leaching. The tailings are currently stored in the DSTF, where they will be covered at closure. This facility can be expanded to accommodate future production;
- The Government of Yukon currently holds $4.2 million in financial security to cover the potential costs of addressing environmental liabilities at this site. Additional financial security will be required to cover the potential costs of additional liabilities from these sites – principally the expanded DSTF and additional waste rock storage areas;
- All of the regulatory approvals required for mining activities associated with the Bellekeno and Lucky Queen deposits are currently in place;
- The required expansion of the DSTF and the addition of the Flame & Moth deposit development will require further review and approvals, which are expected to take one to one and a half years from the time of submission to approval.

25.1.6 Economic Assessment

This PEA is preliminary in nature. Approximately 6% of the “potentially mineable tonnes” disclosed in the mine plans are derived from Inferred mineral resources by the application of a cut-off NSR value ($/t), and dilution and mining recovery factors. Inferred mineral resources are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that this PEA will be realized.

Inputs to the economic assessment included:

- The terms of the Silver Purchase Agreement;
- LoM plant feed of 807 kt averaging 745 gpt silver, 2.69% lead, and 4.67% zinc, and 0.40 gpt gold;
- Metal prices of US$24.00/oz silver, US$0.95/t lead, and US$0.85/t zinc, and US$1300/oz gold;
- Exchange rate of US$0.96/C$1.00;
- Metallurgical recoveries based on actual mill performance and testwork results;
- Smelter terms for lead and zinc concentrates based on existing off-take agreements;
- Average NSR value of plant feed of $419/t;

- An LoM average site operating cost of $253/t processed comprised of $154/t mining, $70/t milling, and $29/t G&A;
- Capital costs totalling $76 M, equivalent to $95/t processed.

Indicative economic results on an after tax basis are:

- Net cash contribution of $41.4 million;
- IRR of 38.2%;
- NPV(5%) of $29.6 million;
- Payback period is 3.5 years from January 1, 2014.

26 Recommendations

26.1.1 Mine Geotechnical and Hydrogeology

- SRK's mine design recommendations are described in report Section 16.4.6. They include span limits for man entry headings, non-entry stope design, and the design of geotechnical pillars. These recommendations have been taken into account in the PEA mine designs;
- SRK's ground support recommendations are described in report Section 16.4.8. They include support recommendations for waste development headings and production headings driven on vein. In each case, they are based on previously defined "ground classes". Implementation of these recommendations will be part of the planned mine operating costs;
- Mining sequences, monitoring, and tactical support requirements will need to be evaluated at the Bellekeno mine as extraction levels increase. An estimated budget for this work is $40,000;
- Additional hydrogeological and geotechnical evaluation needs to be undertaken at Flame & Moth to fully assess the impact of the hydrogeology on the proposed mining plan. An estimated budget for this work is $450,000 to $550,000 depending on the amount of drilling done in the field;
- For Flame & Moth, a system of barrier pillars will need to be designed along the Mill fault and below the overburden areas to minimize the potential for water inflow. (This has already been incorporated in the Flame & Moth mine design).

26.1.2 Mining

- The Lucky Queen underground mine plan should be optimized based on the results of additional metallurgical test results and increased understanding of the geology and geotechnical conditions resulting from sill drifting on vein. An estimated budget for this work is $75,000;
- The Flame & Moth underground mine plan should be optimized based on the results of additional metallurgical test results and the results of the 2013 fieldwork related to hydrogeology and mine geotechnical assessments. An estimated budget for this work is $75,000.

26.1.3 Processing

- Further metallurgical testing and mineralogical analysis is recommended on additional samples representing the blends of deposits and expected grades shown in the LoM production plan. These testwork results can be used to better estimate the recovery and grades of both lead and zinc concentrates;
- Additional testwork should also include ball mill grindability, flotation performance, and a range of samples to measure variability. The flotation conditions for Flame & Moth zinc concentrate production need to be optimized. Testing of additional samples for settling and geochemical characteristics is also warranted;
- SRK estimates the cost for such a metallurgical program to be $250,000 to $500,000, depending on the number of samples tested.

26.1.4 Environmental and Permitting

- Alexco has already initiated investigations on groundwater conditions at Flame & Moth, and geochemical characterization of waste rock from Flame & Moth. These studies will be important for developing appropriate waste and water management plans for these areas;
- Additional geochemical sampling and testing of both N-AML and P-AML rock from all of the production areas would provide a more robust data set for use in updating future closure plans for these areas.

27 References

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APPENDIX A

Mineral Tenure Information

Claim Label	Quartz Claim	Grant Number	Lease Number	Owner	Staking Date	Recorded Date	Expiry Date
ADONAIS	97139828	55477	OM00013	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/24/1947	12/15/2017
ALBERTA L	97138699	80178	NM00499	Elsa Reclamation & Development Company Ltd. - 100%	12/7/1956	12/13/1956	11/26/2025
Alex 400	97360450	YC48507		Alexco Keno Hill Mining Corp. - 100%	5/24/2006	6/2/2006	12/31/2016
Alex 403	97144510	YC48509		Alexco Keno Hill Mining Corp. - 100%	5/24/2006	6/2/2006	12/31/2016
Alex 404	97301362	YC48510		Alexco Keno Hill Mining Corp. - 100%	5/24/2006	6/2/2006	12/31/2016
ANDY	97139100	81223	NM00651	Elsa Reclamation & Development Company Ltd. - 100%	6/21/1962	6/26/1962	3/12/2031
ANTHONY	97139991	12909	NM00642	Elsa Reclamation & Development Company Ltd. - 100%	10/13/1919	12/17/1919	3/24/2030
APEX FR.	97139488	56443	OM00022	Elsa Reclamation & Development Company Ltd. - 100%	7/11/1947	7/15/1947	12/15/2017
APOLLO	97139827	55476	OM00014	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/23/1947	12/15/2017
ARETHUSA	97139825	55474	OM00016	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/23/1947	12/15/2017
ARTEMIS	97139826	55475	OM00015	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/23/1947	12/15/2017
BALTO	97139815	55429	NM00533	Alexco Keno Hill Mining Corp. - 100%	5/25/1946	6/6/1946	11/2/2027
BLACK CAP	97139986	12869	NM00175	Elsa Reclamation & Development Company Ltd. - 100%	9/27/1919	11/12/1919	11/19/2022
BLACK MAGGIE	97300890	13480	4161	Elsa Reclamation & Development Company Ltd. - 100%	8/13/1920	10/13/1920	9/3/2016
Blue	97280044	YC01993		Alexco Exploration Canada Corp. - 100%	9/9/1999	9/10/1999	9/10/2014
Blue Fr. 2	97354149	YC90545		Alexco Exploration Canada Corp. - 100%	9/17/2011	9/20/2011	9/20/2012
Blue Fr. 3	97261505	YC90546		Alexco Exploration Canada Corp. - 100%	9/17/2011	9/20/2011	9/20/2012
BRISTOL	97286371	59316	NM00287	Elsa Reclamation & Development Company Ltd. - 100%	7/11/1949	7/19/1949	6/27/2024
BUCKO	97383397	59795	NM00572	Elsa Reclamation & Development Company Ltd. - 100%	9/29/1950	10/2/1950	11/2/2027
Bulldozer 1	253554353	YA39498		Elsa Reclamation & Development Company Ltd. - 100%	4/3/1979	4/4/1979	12/31/2021
BULLDOZER F 2	253387318	YC90503		Alexco Exploration Canada Corp. - 100%	8/26/2012	8/27/2012	12/31/2021
Bunk	97140042	83133	NM00656	Elsa Reclamation & Development Company Ltd. - 100%	8/12/1963	8/13/1963	3/12/2031
BUNKER	97272597	59534	NM00543	Alexco Keno Hill Mining Corp. - 100%	3/18/1950	4/1/1950	11/2/2027
BUNKER NO. 1	97139251	59535	NM00544	Alexco Keno Hill Mining Corp. - 100%	3/18/1950	4/1/1950	11/2/2027
BUNNY	97139643	13058	NM00035	Elsa Reclamation & Development Company Ltd. - 100%	4/3/1920	5/11/1920	4/25/2020
CAT	97230534	62236	NM00403	Elsa Reclamation & Development Company Ltd. - 100%	8/25/1952	8/27/1952	6/12/2025
CATHY	97139101	81226	NM00653	Elsa Reclamation & Development Company Ltd. - 100%	6/20/1962	6/26/1962	3/12/2031
CATHY FRACTION	97140211	83012	NM00594	Elsa Reclamation & Development Company Ltd. - 100%	6/29/1963	7/9/1963	11/2/2027
CHANCE	97319385	55120	OM00020	Elsa Reclamation & Development Company Ltd. - 100%	11/5/1938	11/28/1938	12/15/2017
CHARITY	97138377	59796	NM00573	Elsa Reclamation & Development Company Ltd. - 100%	9/29/1950	10/2/1950	11/2/2027
CORA	97300932	55480	NM00031	Elsa Reclamation & Development Company Ltd. - 100%	8/26/1946	1/24/1947	2/11/2020
CORA	97319354	56473	NM00601	Elsa Reclamation & Development Company Ltd. - 100%	8/11/1947	8/25/1947	7/22/2028
CROESUS	97304978	55420	NM00564	Elsa Reclamation & Development Company Ltd. - 100%	5/22/1946	5/27/1946	11/2/2027
CUB	97356448	13418	NM00372	Elsa Reclamation & Development Company Ltd. - 100%	7/26/1920	9/25/1920	5/10/2025
DAVID	97233582	16097	NM00531	Alexco Keno Hill Mining Corp. - 100%	11/14/1925	12/8/1925	11/2/2027
DE CHUCK	97139420	59367	NM00176	Elsa Reclamation & Development Company Ltd. - 100%	7/21/1949	7/25/1949	11/19/2022
DOE	97267900	55333	OM00018	Elsa Reclamation & Development Company Ltd. - 100%	5/23/1945	10/16/1945	12/15/2017
DORA	97374826	59692	NM00200	Alexco Keno Hill Mining Corp. - 100%	9/11/1950	9/19/1950	7/29/2023
DOT	97290828	61021	NM00574	Elsa Reclamation & Development Company Ltd. - 100%	10/26/1950	10/27/1950	11/2/2027
DUDE	97138423	59932	NM00548	Alexco Keno Hill Mining Corp. - 100%	10/5/1950	10/11/1950	11/2/2027
DUNCAN 1	97138626	59468	NM00367	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	4/30/2025
DUNCAN 2	97271006	59469	NM00368	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	4/30/2025
DUNCAN 3	97309713	59470	NM00369	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	4/30/2025

Claim Label	Quartz Claim	Grant Number	Lease Number	Owner	Staking Date	Recorded Date	Expiry Date
EDITH-CAVELL 8	97139612	59485	NM00597	Elsa Reclamation & Development Company Ltd. - 100%	9/3/1949	9/6/1949	11/26/2027
EDITH-CAVELL 9	97337733	59670	NM00386	Elsa Reclamation & Development Company Ltd. - 100%	8/5/1950	8/16/1950	5/22/2025
ENDYMION	97374799	55473	OM00017	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/23/1947	12/15/2017
EUREKA	97139162	14327	OM00025	Elsa Reclamation & Development Company Ltd. - 100%	8/21/1921	10/11/1921	12/15/2017
EVY	97138765	61916	NM00554	Alexco Keno Hill Mining Corp. - 100%	8/16/1951	8/29/1951	11/2/2027
EVY	97267111	59519	NM00542	Alexco Keno Hill Mining Corp. - 100%	11/24/1949	11/30/1949	11/2/2027
EXTENSION	97292441	16087	OM00024	Elsa Reclamation & Development Company Ltd. - 100%	10/19/1925	11/24/1925	12/15/2017
FAIR FRACTION	97139127	62944	NM00474	Elsa Reclamation & Development Company Ltd. - 100%	12/30/1955	1/6/1956	11/26/2025
FALLOT	97138428	61725	NM00525	Elsa Reclamation & Development Company Ltd. - 100%	7/9/1951	7/16/1951	11/1/2026
FALLS 1	97139425	59437	NM00510	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 10	97138551	59446	NM00519	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 11	97374862	59447	NM00520	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/1/2026
FALLS 12	97344872	59448	NM00521	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/1/2026
FALLS 13	97138552	59449	NM00522	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/1/2026
FALLS 14	97138553	59450	NM00523	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/1/2026
FALLS 15	97341777	59451	NM00524	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/1/2026
FALLS 2	97139426	59438	NM00511	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 3	97337732	59439	NM00512	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 4	97384708	59440	NM00513	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 5	97139427	59441	NM00514	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 6	97139428	59442	NM00515	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FALLS 9	97138550	59445	NM00518	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	11/1/2026
FLAME	97140214	38643	4175	Elsa Reclamation & Development Company Ltd. - 100%	10/13/1929	11/13/1929	11/29/2016
FOX	97289396	61877	NM00553	Alexco Keno Hill Mining Corp. - 100%	8/13/1951	8/15/1951	11/2/2027
FOX	97363461	55592	NM00539	Alexco Keno Hill Mining Corp. - 100%	10/12/1946	3/28/1947	11/2/2027
FRANCES 3	97249000	55599	NM00261	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
FRANCES 4	97263705	55600	NM00262	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
FRANCES 5	97139480	56401	NM00263	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
FRANCES 6	97139481	56402	NM00264	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
FRANCES 7	97337772	56403	NM00265	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
FRANCES 8	97139482	56404	NM00266	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	1/9/2024
Galena	97140413	YA77506		Elsa Reclamation & Development Company Ltd. - 100%	6/6/1984	6/13/1984	12/31/2013
GLORIA FRACTION	97140069	84616	OM00003	Elsa Reclamation & Development Company Ltd. - 100%	8/6/1965	8/24/1965	10/8/2017
GRETA	97139619	55593	NM00540	Alexco Keno Hill Mining Corp. - 100%	10/16/1946	3/28/1947	11/2/2027
GROUSE	97287914	61600	NM00551	Alexco Keno Hill Mining Corp. - 100%	5/13/1951	5/25/1951	11/2/2027
HECLA	97233581	55582	NM00565	Elsa Reclamation & Development Company Ltd. - 100%	10/24/1946	3/20/1947	11/2/2027
HESPERIDES	97139829	55478	OM00012	Elsa Reclamation & Development Company Ltd. - 100%	8/31/1946	1/24/1947	12/15/2017
HIGHLANDER	97139646	13072	NM00034	Elsa Reclamation & Development Company Ltd. - 100%	4/3/1920	6/4/1920	4/25/2020
INCA	97319425	59385	NM00272	Elsa Reclamation & Development Company Ltd. - 100%	7/23/1949	7/29/1949	1/18/2024
JACK	97270813	61744	NM00398	Elsa Reclamation & Development Company Ltd. - 100%	7/14/1951	7/20/1951	6/12/2025
JEAN FRACTIONAL	97301085	84626	OM00005	Elsa Reclamation & Development Company Ltd. - 100%	8/20/1965	8/26/1965	10/8/2017
JIB NO. 2	97309687	61598	NM00549	Alexco Keno Hill Mining Corp. - 100%	5/16/1951	5/25/1951	11/2/2027
JUNE	97308120	62992	NM00614	Elsa Reclamation & Development Company Ltd. - 100%	6/24/1956	7/11/1956	8/21/2029
K 103	97366716	YC56155		Alexco Keno Hill Mining Corp. - 100%	6/21/2007	6/22/2007	12/31/2012

Claim Label	Quartz Claim	Grant Number	Lease Number	Owner	Staking Date	Recorded Date	Expiry Date
K 104	97322969	YC56156		Alexco Keno Hill Mining Corp. - 100%	6/21/2007	6/22/2007	12/31/2012
K 105	97149986	YC56157		Alexco Keno Hill Mining Corp. - 100%	6/21/2007	6/22/2007	12/31/2012
K 106	97230678	YC56158		Alexco Keno Hill Mining Corp. - 100%	6/21/2007	6/22/2007	12/31/2012
K 28	97144852	YC42576		Alexco Keno Hill Mining Corp. - 100%	12/3/2005	12/15/2005	12/15/2012
K 30	97366552	YC42578		Alexco Keno Hill Mining Corp. - 100%	12/3/2005	12/15/2005	12/15/2012
K 32	97269536	YC42580		Alexco Keno Hill Mining Corp. - 100%	12/3/2005	12/15/2005	12/15/2012
K 80	253668268	YC42628		Alexco Keno Hill Mining Corp. - 100%	12/5/2005	12/15/2005	12/15/2017
K 81	253479187	YC42629		Alexco Keno Hill Mining Corp. - 100%	12/2/2005	12/15/2005	12/15/2017
K 82	97245188	YC42630		Alexco Keno Hill Mining Corp. - 100%	12/2/2005	12/15/2005	12/15/2012
K 84	97144506	YC42632		Alexco Keno Hill Mining Corp. - 100%	12/2/2005	12/15/2005	12/15/2012
K 88	97301800	YC56115		Alexco Keno Hill Mining Corp. - 100%	6/13/2007	6/13/2007	12/31/2012
K 97	97146732	YC56124		Alexco Keno Hill Mining Corp. - 100%	6/14/2007	6/15/2007	12/15/2013
K 98	97146733	YC56125		Alexco Keno Hill Mining Corp. - 100%	6/14/2007	6/15/2007	12/15/2013
K Fr. 109	253574012	YC90502		Alexco Exploration Canada Corp. - 100%	8/19/2012	9/10/2012	9/10/2018
K Fr. 110	253427226	YC90501		Alexco Exploration Canada Corp. - 100%	8/19/2012	9/10/2012	9/10/2018
KARIN	97249040	62248	NM00526	Elsa Reclamation & Development Company Ltd. - 100%	9/4/1952	9/5/1952	11/1/2026
KIJO	97139487	56419	NM00088	Elsa Reclamation & Development Company Ltd. - 100%	5/31/1947	6/10/1947	8/20/2021
LAKOTA	97139693	13222	NM00635	Elsa Reclamation & Development Company Ltd. - 100%	6/7/1920	7/9/1920	12/31/2029
LE BLANC	97139134	62977	NM00650	Elsa Reclamation & Development Company Ltd. - 100%	6/10/1956	6/21/1956	3/12/2031
Lem 1	97282859	YA17395	NM00638	Alexco Keno Hill Mining Corp. - 100%	11/4/1977	11/14/1977	2/23/2030
Lem 10	97139537	YA17404		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 11	97139538	YA17405		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 2	97282858	YA17396	NM00639	Alexco Keno Hill Mining Corp. - 100%	11/4/1977	11/14/1977	2/23/2030
Lem 3	97320138	YA17397	NM00640	Alexco Keno Hill Mining Corp. - 100%	11/4/1977	11/14/1977	2/23/2030
Lem 4	97139507	YA17398		Alexco Keno Hill Mining Corp. - 100%	11/4/1977	11/14/1977	11/14/2012
Lem 5	97139508	YA17399		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 6	97139509	YA17400		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 7	97267852	YA17401		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 8	97139510	YA17402		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
Lem 9	97139511	YA17403		Alexco Keno Hill Mining Corp. - 100%	11/10/1977	11/14/1977	11/14/2012
LOUIS 1	97139483	56405	NM00433	Elsa Reclamation & Development Company Ltd. - 100%	3/29/1947	4/18/1947	11/26/2025
LOUIS 2	97346575	56406	NM00596	Elsa Reclamation & Development Company Ltd. - 100%	3/22/1947	4/18/1947	11/26/2027
LOUIS 3	97139484	56407	NM00434	Elsa Reclamation & Development Company Ltd. - 100%	3/22/1947	4/18/1947	11/26/2025
LOUIS 4	97139485	56408	NM00435	Elsa Reclamation & Development Company Ltd. - 100%	3/22/1947	4/18/1947	11/26/2025
LUCKY QUEEN	97300889	13021	4067	Elsa Reclamation & Development Company Ltd. - 100%	2/18/1920	5/4/1920	2/17/2014
LUNA	97306639	13586	NM00637	Elsa Reclamation & Development Company Ltd. - 100%	9/9/1920	11/12/1920	12/31/2029
MARIE ELENA	97138372	56530	NM00508	Elsa Reclamation & Development Company Ltd. - 100%	6/11/1948	6/17/1948	11/1/2026
MATHOLE	97139995	12937	4163	Elsa Reclamation & Development Company Ltd. - 100%	10/12/1919	1/3/1920	9/7/2016
MATTAGAMI	97319353	59255	NM00271	Elsa Reclamation & Development Company Ltd. - 100%	6/1/1949	6/3/1949	1/18/2024
MAYO	97362071	12919	4113	Elsa Reclamation & Development Company Ltd. - 100%	9/9/1919	12/22/1919	12/21/2015
MIKE	97306614	59764	NM00571	Elsa Reclamation & Development Company Ltd. - 100%	9/21/1950	9/26/1950	11/2/2027
MIKE	97356297	56590	NM00568	Elsa Reclamation & Development Company Ltd. - 100%	8/12/1948	8/18/1948	11/2/2027
Mo	97139102	81227	NM00654	Elsa Reclamation & Development Company Ltd. - 100%	6/20/1962	6/26/1962	3/12/2031
MONARCH	97366328	55443	NM00432	Elsa Reclamation & Development Company Ltd. - 100%	7/22/1946	8/26/1946	11/26/2025

Claim Label	Quartz Claim	Grant Number	Lease Number	Owner	Staking Date	Recorded Date	Expiry Date
MOTH	97140213	38642	4176	Elsa Reclamation & Development Company Ltd. - 100%	10/10/1929	11/13/1929	12/8/2016
NAPOLEON	97380455	12880	NM00033	Elsa Reclamation & Development Company Ltd. - 100%	9/16/1919	11/28/1919	3/13/2020
NIP FRACTION	97140208	83004	NM00591	Elsa Reclamation & Development Company Ltd. - 100%	6/10/1963	6/12/1963	11/2/2027
NM	97138769	62235	NM00576	Elsa Reclamation & Development Company Ltd. - 100%	8/26/1952	8/27/1952	11/2/2027
NOD FR.	97226383	16170	OM00023	Elsa Reclamation & Development Company Ltd. - 100%	6/13/1926	7/13/1926	12/15/2017
NORTH FRACTION	97140209	83010	NM00592	Elsa Reclamation & Development Company Ltd. - 100%	6/24/1963	6/25/1963	11/2/2027
NORTH STAR	97244848	13415	NM00173	Elsa Reclamation & Development Company Ltd. - 100%	7/24/1920	9/25/1920	11/13/2022
OK FRACTION	97341763	13094	NM00556	Elsa Reclamation & Development Company Ltd. - 100%	4/18/1920	6/9/1920	11/2/2027
OVERTIME 1	97138686	56581	NM00187	Elsa Reclamation & Development Company Ltd. - 100%	8/7/1948	8/13/1948	2/9/2023
OVERTIME 13	97138687	56583	NM00439	Elsa Reclamation & Development Company Ltd. - 100%	8/7/1948	8/13/1948	11/26/2025
OVERTIME 14	97263747	56584	NM00440	Elsa Reclamation & Development Company Ltd. - 100%	8/7/1948	8/13/1948	11/26/2025
OVERTIME 15	97138688	56585	NM00441	Elsa Reclamation & Development Company Ltd. - 100%	8/9/1948	8/13/1948	11/26/2025
OVERTIME 16	97138689	56586	NM00442	Elsa Reclamation & Development Company Ltd. - 100%	8/9/1948	8/13/1948	11/26/2025
OVERTIME 17	97326533	59453	NM00445	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/26/2025
OVERTIME 18	97252118	59454	NM00446	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/26/2025
OVERTIME 19	97138555	59455	NM00447	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/26/2025
OVERTIME 2	97269469	56582	NM00188	Elsa Reclamation & Development Company Ltd. - 100%	8/7/1948	8/13/1948	2/9/2023
OVERTIME 20	97138556	59456	NM00448	Elsa Reclamation & Development Company Ltd. - 100%	8/17/1949	8/19/1949	11/26/2025
PEARL	97263658	55206	NM00562	Elsa Reclamation & Development Company Ltd. - 100%	8/14/1941	10/30/1941	11/2/2027
PRINCESS FRACTI	97337671	62558	NM00473	Elsa Reclamation & Development Company Ltd. - 100%	10/10/1954	10/27/1954	11/26/2025
PUEBLO	97139424	59387	NM00569	Elsa Reclamation & Development Company Ltd. - 100%	7/21/1949	7/29/1949	11/2/2027
QUAIL	97226316	59275	NM00541	Alexco Keno Hill Mining Corp. - 100%	6/13/1949	6/22/1949	11/2/2027
QUAIL FRACTION	97138378	59824	NM00547	Alexco Keno Hill Mining Corp. - 100%	9/22/1950	10/2/1950	11/2/2027
RAM	97139647	13073	NM00042	Elsa Reclamation & Development Company Ltd. - 100%	4/10/1920	6/4/1920	10/17/2020
REVENGE FRACTIO	97140133	84617	2231	Elsa Reclamation & Development Company Ltd. - 100%	8/6/1965	8/24/1965	10/8/2017
ROCK	97356327	59683	NM00546	Alexco Keno Hill Mining Corp. - 100%	9/11/1950	9/19/1950	11/2/2027
ROSEMARY	97138817	55271	NM00529	Elsa Reclamation & Development Company Ltd. - 100%	7/1/1943	11/9/1943	11/9/2026
ROY	97263641	13709	NM00558	Elsa Reclamation & Development Company Ltd. - 100%	4/12/1921	5/28/1921	11/2/2027
SAM	97139124	55327	2221	Elsa Reclamation & Development Company Ltd. - 100%	4/10/1945	10/16/1945	12/15/2017
SCOT	97139105	13591	NM00557	Elsa Reclamation & Development Company Ltd. - 100%	1/6/1921	2/18/1921	11/2/2027
SHEPHERD	97139994	12931	NM00177	Elsa Reclamation & Development Company Ltd. - 100%	10/15/1919	12/31/1919	11/19/2022
SILVER FR.	97338516	38730	2223	Elsa Reclamation & Development Company Ltd. - 100%	8/20/1931	9/16/1931	12/15/2017
SIWASH	97323397	12915	NM00040	Elsa Reclamation & Development Company Ltd. - 100%	9/22/1919	12/19/1919	8/13/2020
SLOPE 2	97366326	59436	NM00249	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SOL	97139820	55446	NM00536	Alexco Keno Hill Mining Corp. - 100%	8/20/1946	8/21/1946	11/2/2027
SOLOMAN	97250612	55445	NM00535	Alexco Keno Hill Mining Corp. - 100%	8/16/1946	8/16/1946	11/2/2027
SPOT	97140065	38813	NM00160	Elsa Reclamation & Development Company Ltd. - 100%	10/8/1934	11/12/1934	6/2/2022
STONE	97235245	13035	NM00503	Elsa Reclamation & Development Company Ltd. - 100%	3/18/1920	5/6/1920	11/1/2026
STONE FRACTION	97140220	83023	NM00595	Elsa Reclamation & Development Company Ltd. - 100%	7/15/1963	7/16/1963	11/2/2027
SUDDO 1	97381834	59457	NM00250	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 10	97138624	59466	NM00259	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 11	97138625	59467	NM00260	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 2	97301036	59458	NM00251	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/18/1949	12/19/2023
SUDDO 3	97263732	59459	NM00252	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023

Claim Label	Quartz Claim	Grant Number	Lease Number	Owner	Staking Date	Recorded Date	Expiry Date
SUDDO 4	97267919	59460	NM00253	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 5	97286391	59461	NM00254	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 6	97226352	59462	NM00255	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUDDO 8	97319386	59464	NM00257	Elsa Reclamation & Development Company Ltd. - 100%	8/16/1949	8/19/1949	12/19/2023
SUNRISE	97139816	55433	NM00534	Alexco Keno Hill Mining Corp. - 100%	6/15/1946	6/20/1946	11/2/2027
SURPLOMB 2	97140068	84580	2228	Elsa Reclamation & Development Company Ltd. - 100%	7/7/1965	7/14/1965	10/8/2017
SURPLOMB 3	97380414	84581	2229	Elsa Reclamation & Development Company Ltd. - 100%	7/10/1965	7/14/1965	10/8/2017
SUSY Q.	97236684	81225	NM00652	Elsa Reclamation & Development Company Ltd. - 100%	6/15/1962	6/26/1962	3/12/2031
TECH	97270963	83132	NM00623	Elsa Reclamation & Development Company Ltd. - 100%	8/6/1963	8/13/1963	2/28/2030
TESS	97140207	84628	2233	Elsa Reclamation & Development Company Ltd. - 100%	8/27/1965	9/9/1965	10/8/2017
THUNDER BIRD	97347885	55520	NM00538	Alexco Keno Hill Mining Corp. - 100%	9/15/1946	2/4/1947	11/2/2027
TOO GOOD	97232172	16079	4076	Elsa Reclamation & Development Company Ltd. - 100%	9/12/1925	11/29/1925	6/11/2014
TOPOLO	97226292	56504	NM00093	Elsa Reclamation & Development Company Ltd. - 100%	9/15/1947	9/26/1947	8/22/2021
TUNDRA	97245574	12838	NM00043	Elsa Reclamation & Development Company Ltd. - 100%	9/6/1919	10/27/1919	11/1/2020
UNCLE SAM	97139993	12923	4068	Elsa Reclamation & Development Company Ltd. - 100%	10/12/1919	12/26/1919	3/12/2014
VIOLA	97347873	38723	NM00560	Elsa Reclamation & Development Company Ltd. - 100%	7/27/1931	8/14/1931	11/2/2027
WANDERER	97138637	55361	NM00161	Elsa Reclamation & Development Company Ltd. - 100%	7/4/1945	10/25/1945	6/2/2022
WEATHER FRACTIO	97255197	62945	NM00475	Elsa Reclamation & Development Company Ltd. - 100%	12/30/1955	1/6/1956	11/26/2025
WHIPSAW	97139107	14081	OM00011	Elsa Reclamation & Development Company Ltd. - 100%	6/11/1921	7/23/1921	12/15/2017
WILDCAT	97139814	55426	NM00532	Alexco Keno Hill Mining Corp. - 100%	5/25/1946	6/3/1946	11/2/2027
WILLOW	97139954	55519	NM00537	Alexco Keno Hill Mining Corp. - 100%	9/5/1946	2/4/1947	11/2/2027
YUKON	97138369	56515	NM00096	Elsa Reclamation & Development Company Ltd. - 100%	4/15/1948	4/19/1948	8/22/2021

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Yukon, Canada," dated November 15, 2013.

I, Dr. Gilles Arseneau, residing in North Vancouver, British Columbia do hereby certify that:

1) I am an Associate Consultant with the firm of SRK Consulting (Canada) Inc. (SRK) with an office at Suite 2200, 1066 West Hastings Street, Vancouver, British Columbia, Canada;

1) I graduated with B.Sc. in Geology from the University of New Brunswick, 1979; a M.Sc. in Geology from the University of Western Ontario, 1984 and a Ph.D. in Geology from the Colorado School of Mines, 1995, I have been involved with exploration projects and consulting covering a wide range of mineral including deposits similar to Bellekeno in Canada and Mexico. I have over ten years of experience in resource estimation using Gemcom software;

2) I am a member of the Association of Professional Engineers and Geoscientists of British Columbia;

3) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);

4) My prior involvement with the project consists of resource estimation for the Flame & Moth, Lucky Queen and Bermingham deposits in 2011 and 2012;

5) I have personally visited the Bellekeno project site from May 7 and 8, 2012 and July 26 to 28, 2010;

6) I have read National Instrument 43-101 and the definition of Qualified Person set out in the Instrument and certify that by virtue of my education, affiliation to a professional association, and past relevant work experience, I fulfill the requirements to be a Qualified Person for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;

7) I, as a Qualified Person, am independent of the issuer as defined in National Instrument 43-101;

8) I am responsible for report Sections 5, 6.2, 6.3, 7.3.2, 8, 9.2, 10.2.3, 10.2.4, 10.3, 11.1.1, 11.2, 11.3, 12.2, 14.12.2 and I co-authored Sections 1, 11.1.2, 12.1, 14.1 to 14.11, 24, 25 and 26 and have reviewed the technical report;

9) SRK was retained by Alexco to compile an updated preliminary economic assessment report for the EKHSD project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, SRK's review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;

10) That, as of the date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;

11) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical report.

Signed and sealed by,

Vancouver, Canada
November 15, 2013

Dr. Gilles Arseneau, P. Geo.
Associate Consultant

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District, - Phase 2, Yukon, effective date Nov 15, 2013.

I, Laura Battison, residing in Campbell River, British Columbia do hereby certify that:

1) I was the Senior Mine Geologist at Alexco Resource Corporation, (Alexco) with an office at the Keno Hill Project, Bellekeno Mine; PO Box 7, Elsa Yukon, Y0B 1J0.
2) I am a graduate of Laurentian University with a Hons B.Sc in Geology 1998, and have practiced my profession continuously since 1998. My work has involved exploration and underground production geology, development and management of diamond drilling programs, as well as geologic interpretation, data verification, and supervision for the past 14 years across a variety of deposits.
3) I am a Professional Geologist registered with the Association of Professional Engineers and Geologists of BC (APEGBC); Registration number 36367.
4) I have not had any prior involvement with the project prior to my employment with Alexco, beginning August 2011.
5) I have personally worked at the EKHSD from August 2011 to August 2013;
6) I have read National Instrument 43-101 and the definition of "qualified person" set out in the Instrument and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
7) I am responsible for sections sections 6.1, 7.3.1, 9.1, 10.2.1, 10.2.2, and co-authored sections 12.1 and have reviewed the technical report;
8) That, as of the effective date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;

Signed and sealed by,

Campbell River, Canada
Nov 28, 2013

Laura Battison, P.Geo
Geologist

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District Project – Phase 2, Yukon, Canada", effective date November 15, 2013.

I, Adrian Dance, residing in West Vancouver, British Columbia do hereby certify that:

1) I am a Principal Consultant with the firm of SRK Consulting (Canada) Inc. ("SRK") with an office at Suite 2200-1066 West Hastings Street, Vancouver, BC, Canada;
9) I am a graduate of the University of British Columbia in 1987 where I obtained a Bachelor of Applied Science and a graduate of the University of Queensland in 1992 where I obtained a Doctorate. I have practiced my profession continuously since 1992 including eight years as a consultant and have experience working in a number of base metal flotation operations around the world;
10) I am a Professional Engineer registered with the Association of Professional Engineers & Geoscientists of British Columbia, license number 37151;
11) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);
12) I have not had any prior involvement with the project;
13) have not visited the subject property, but relied on site visits conducted by co-authors of this technical report: Stephen Taylor, Ken Reipas, Gilles Arseneau, Bruce Murphy, Kelly Sexsmith and David Farrow over the period 2010 to 2013;
14) I have read National Instrument 43-101 and the definition of "qualified person" set out in the Instrument and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
15) I, as a qualified person, am independent of the issuer as defined in National Instrument 43-101;
16) I am responsible for report Sections 13, and 17 and co-authored Section 1, 24, 25 and 26 and have reviewed the technical report;
17) SRK was retained by Alexco to compile an Updated Preliminary Economic Assessment Report for the Bellekeno Silver Project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, our review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;
18) That, as of the effective date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;
19) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Signed and sealed by,

Vancouver, Canada
November 15, 2013

Adrian Dance, PEng
Principal Consultant

CERTIFICATE OF QUALIFIED PERSON

Certificate of David Farrow

I, David Farrow, of Vancouver, British Columbia, Canada, do hereby certify that as a co-author of this "Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District Project – Phase 2, Yukon, Canada", effective date July 15, 2013"), make the following statements:

1) I am a Geologist with GeoStrat Consulting Services Inc of 40-4055 Indian River Drive, North Vancouver, British Columbia, V7G 2R7, Canada

2) I am a graduate of the University of the Witwatersrand, Johannesburg, South Africa (GDE (Geostatistics) 1998) and the University of Cape Town, Cape Town, South Africa (B.Sc.(Hons) 1982).

3) I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (License # 33860). I am also a member in good standing of The South African Council for Natural Science Professions (License # 400074/87).

4) I have practiced my profession continuously since graduation.

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.

6) My relevant experience with respect to Bellekeno includes over 30 years in exploration, mining geology and grade estimation in Canada and southern Africa.

7) I am responsible for the preparation of section 14.3.1, 14.3.3, 14.4.1, 14.4.3, 14.5.1, 14.5.3, 14.6.1, 14.6.3, 14.7.1, 14.7.3, 14.8.1, 14.8.2, 14.8.3, 14.8.4, 14.8.6, 14.9.1, 14.9.3, 14.10.1, 14.10.3, 14.11.1, 14.11.3, 14.12.1, 14.12.3, 14.13.1, 14.13.2. and co–authored sections 1, 12 and 25 of the Technical Report. I visited the Property that is the subject of this report in October 2011.

8) I have had prior involvement with the property that is the subject of the Technical Report, co-authoring a report for Alexco Resource Corporation on the Flame and Moth Deposit, (Farrow and McOnie 2013).

9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of this Technical Report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

10) I am independent of Alexco Resource Corporation as defined by Section 1.5 of the Instrument.

11) I have read NI 43-101 and Form 43-101F1 and the sections for which I am responsible in the Technical Report have been prepared in compliance with NI 43-101 and Form 43-101F1.

Dated this 27th day of November 2013, at North Vancouver, British Columbia, Canada.
"Original Signed and sealed"

David Farrow, Pr,Sci.Nat, P.Geo.

CERTIFICATE OF QUALIFIED PERSON

Certificate of Alan McOnie

I, Alan McOnie, of Katikati, New Zealand, as a co-author of this **"**Updated Preliminary Economic Assessment for the Eastern Keno Hill Silver District – Phase 2, Yukon**"** dated November 15th 2013 (the "Technical Report"), do hereby certify:

1) I am Vice President, Exploration of Alexco Resource Corp. of 1150 – 200 Granville Street, Vancouver, British Columbia, Canada, V6C 1S4.
2) I graduated with a Bachelor of Science (Hons) degree in geology from the University of Otago, Dunedin, New Zealand in 1969, and a Master of Science degree in geology from the University ofToronto, Ontario, Canada in 1971.
3) I am a Fellow of the Australasian Institute of Mining and Metallurgy, Member 226668.
4) I have practiced my profession as a geologist for over 35 years.
5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
6) I am responsible for sections 4.1, 4.2, 6.3, 7.1 to 7.3, 7.3.3, 9.3, 10.1, 10.2, 10.2.5, 10.2.6, and co-authored section 11.1.2 of the Technical Report. I have visited the Properties that are the subject of this Technical Report on multiple occasions between 2007 and 2010 as consulting geologist, and between 2011 and 2013 in connection with my management of the exploration programs, drilling, core logging and sampling procedures conducted on the Flame & Moth Property in each of those years.
7) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of this Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
8) I have read NI 43-101 and Form 43-101F1 and the sections for which I am responsible in the Technical Report have been prepared in compliance with NI 43-101 and Form 43-101F1.

Signed and dated this 27th day of November 2013, at Katikati, New Zealand.

Alan McOnie, BSc (Hons), MSc, FAusIMM.

CERTIFICATE OF AUTHOR

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Yukon, Canada," dated November 15, 2013.

I, Bruce Murphy, FSAIMM, do hereby certify that:

1) I am currently employed as a Principal Consultant by SRK Consulting (Canada) Inc. With an office at Suite 2200 – 1066 West Hastings Street Vancouver, BC, V6E 3X2,Canada;
2) I am a graduate of University of the Witwatersrand, Johannesburg, South Africa with a M.Sc. degree in Mining Engineering. I have practiced my profession continuously since graduation (1989) working in the rock engineering field on operating mines till 2002 and then in the consulting field;
3) I am a Fellow of the South African Institute of Mining and Metallurgy (FSAIMM);
4) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);
5) The previous involvement I have had with the Bellekeno property was a baseline assessment, prior to the site being transferred from Government to Alexco Resource Corp, geotechnical related contributions to the report "Bellekeno Project - Updated Preliminary Economic Assessment Technical Report," dated December 4, 2009;
6) I have personally visited the Bellekeno project site from March 7 to 11, 2013;
7) I have read National Instrument 43-101 and the definition of Qualified Person set out in the Instrument and certify that by virtue of my education, affiliation to a professional association, and past relevant work experience, I fulfill the requirements to be a Qualified Person for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
8) I, as a Qualified Person, am independent of the issuer as defined in National Instrument 43-101;
9) I am responsible for report Sections 16.2, 16.3, 16.4, and co-authored Sections 1, 24, 25, and 26;
10) SRK was retained by Alexco to compile an updated preliminary economic assessment report for the EKHSD project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, SRK's review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;
11) That, as of the date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;
12) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical report

Signed and sealed by,

Vancouver, Canada
November 15, 2013

Bruce Murphy, FSAIMM
Principal Consultant

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Yukon, Canada," dated November 15, 2013.

I, Ken Reipas, residing at 43 Deverell Street, Whitby, Ontario do hereby certify that:

1) I am a Principal Mining Engineer with the firm of SRK Consulting (Canada) Inc. (SRK) with an office at Suite 1300, 151 Yonge Street, Toronto, Ontario, Canada;

20) I am a graduate of Queen's University with a BSc in Mining Engineering in 1981, and have practiced my profession continuously since 1981. My work has involved mine planning and mine supervision/operations for 16 years, and consulting on underground projects in several countries since 1997;

21) I am a Professional Engineer registered with the Professional Engineers of Ontario (PEO);

22) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);

23) My prior involvement with the project consists of underground mining related contributions to the report "Bellekeno Project - Updated Preliminary Economic Assessment Technical Report," dated December 2, 2009;

24) I have personally visited the Bellekeno project site from March 7 to 13, 2013;

25) I have read National Instrument 43-101 and the definition of Qualified Person set out in the Instrument and certify that by virtue of my education, affiliation to a professional association, and past relevant work experience, I fulfill the requirements to be a Qualified Person for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;

26) I, as a Qualified Person, am independent of the issuer as defined in National Instrument 43-101;

27) I am responsible for report Sections 2, 3, 14.14, 15, 16.1, 16.6, 16.9, 18, 19, 22, 23 and I co-authored Sections 1, 16.10, 21, 24, 25 and 26 and have reviewed the technical report;

28) SRK was retained by Alexco to compile an updated preliminary economic assessment report for the EKHSD project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, SRK's review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;

29) That, as of the date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;

30) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical report.

Signed and sealed by,

Toronto, Canada
November 15, 2013

Ken Reipas, PEng
Principal Mine Engineer

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Keno Hill, Yukon, Canada", dated November 15, 2013.

I, Kelly Sexsmith, residing in Vancouver, British Columbia do hereby certify that:

1) I am a Principal Geochemist with the firm of SRK Consulting (Canada) Inc. (SRK) with an office at Suite 2200, 1066 West Hastings Street, Vancouver, British Columbia, Canada;
31) I am a graduate of the University of British Columbia with a B.Sc in Geology in 1990, and of the Colorado School of Mines with an M.S. in Environmental Science in 1996, and have practiced my profession continuously between 1991 and 1994, and then 1997 and present. My work has involved geochemical characterization, monitoring and management of mine wastes in Canada and Internationally for the duration of my career;
32) I am a Professional Geologist registered with both the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) and the Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS);
33) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);
34) I have no prior involvement with this project;
35) I have personally visited the Bellekeno project site from July 27-28, 2012;
36) I have read National Instrument 43-101 and the definition of "qualified person" set out in the Instrument and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
37) I, as a qualified person, am independent of the issuer as defined in National Instrument 43-101;
38) I am responsible for report sections 4.3, 4.4, 20 except 20.4.3, and co-authored sections 1, 20.4.3, 24, 25, and 26;
39) SRK was retained by Alexco to compile an updated preliminary economic assessment report for the EKHSD project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, our review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;
40) That, as of the effective date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;
41) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Signed and sealed by,

Vancouver, Canada
November 15, 2013

Kelly Sexsmith, P.Geo
Principal Geochemist

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Yukon, Canada," dated November 15, 2013.

I, Stephen Taylor residing at 1352 Hastings Crescent, Sudbury, Ontario do hereby certify that:

1) I am a Principal Mining Engineer with the firm of SRK Consulting (Canada) Inc. (SRK) with an office at Suite 101, 1984 Regent Street South, Sudbury, Ontario, Canada;
2) I am a graduate of Laurentian University in Sudbury, Ontario with a B.Eng in Mining Engineering in 1992 and I also obtained an M.Sc (Mining Engineering) from the University of Nevada-Reno, Mackay School of Mines in 1995. I have practiced my profession continuously since 1995. My work has involved mine planning and mine supervision/operations for 15 years, and consulting on underground projects in several countries since 2010.
3) I am a Professional Engineer registered with the Professional Engineers of Ontario (PEO#90365834);
4) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);
5) I have had no prior involvement with the project prior to 2012;
6) I have personally visited the Bellekeno project site from June 25 to 27, 2012;
7) I have read National Instrument 43-101 and the definition of Qualified Person set out in the Instrument and certify that by virtue of my education, affiliation to a professional association, and past relevant work experience, I fulfill the requirements to be a Qualified Person for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
8) I, as a Qualified Person, am independent of the issuer as defined in National Instrument 43-101;
9) I am responsible for report Sections 16.5, 16.7, 16.8 and I co-authored Sections 1, 16.10, 21, 24, 25 and 26 and have reviewed the technical report;
10) SRK was retained by Alexco to compile an updated preliminary economic assessment report for the EKHSD project in accordance with NI 43-101 and Form 43-101F1 guidelines. The preceding report is based on a site visit, SRK's review of project files and contributions of other consultants retained by Alexco and discussions with Alexco personnel;
11) That, as of the date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;
12) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical report.

Signed and sealed by,

Sudbury, Canada
November 15, 2013

Stephen Taylor, PEng
Principal Mine Engineer

CERTIFICATE AND CONSENT

To accompany the report entitled: "Updated Preliminary Economic Assessment for the EKHSD Project – Phase 2, Yukon, Canada," dated November 15, 2013.

I, James Richard Trimble, residing at 17 Cedar Crescent, Whitehorse, Yukon do hereby certify that:

1) I am a Principal Consultant with the firm of EBA Engineering Consultants Ltd. (EBA) with an office at 61 Wasson Place, Whitehorse, Yukon, Canada;
2) I am a graduate of Queen's University with an MSc in Civil Engineering in 1977, and have practiced my profession continuously since 1977. My work has involved geotechnical and permafrost engineering for numerous mine sites in Canada since that time;
3) I am a Professional Engineer registered with the Professional Engineers of Yukon, Northwest Territories and Nunavut, Alberta and British Columbia;
4) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the subject property or securities of Alexco Resource Corp. (Alexco);
5) My prior involvement with the project site consists of numerous geotechnical investigations and design for numerous structures at the site;
6) I have personally visited the Bellekeno project site on several occasions from 2007 to present;
7) I have read National Instrument 43-101 and the definition of Qualified Person set out in the Instrument and certify that by virtue of my education, affiliation to a professional association, and past relevant work experience, I fulfill the requirements to be a Qualified Person for the purposes of National Instrument 43-101 and this technical report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1;
8) I, as a Qualified Person, am independent of the issuer as defined in National Instrument 43-101;
9) I am responsible for report Section 20.4.3 and have reviewed the technical report;
10) EBA was retained by Alexco to complete a site investigation program and prepare a design report on a Dry Stack Tailings Facility (DSTF) at the site – an expansion of the area previously designed by EBA and currently in use;
11) That, as of the date of this certificate, to the best of my knowledge, information and belief, this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading;
12) I consent to the filing of this technical report and extracts from, or any summary of, the technical report with any stock exchange or other regulatory authority, and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical report.

Signed and sealed by,

J Richard Trimble, P.Eng.
Whitehorse, YT, Canada