MINE DEVELOPMENT ASSOCIATES

MINE ENGINEERING SERVICES

Amended Technical Report on the Salave Gold Project, Asturias Region, Spain

Prepared for

Black Dragon Gold Corp.
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Amended Report Date: January 31, 2017
Effective Date of Report: October 7, 2016

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1.0 SUMMARY

Mine Development Associates ("MDA") has prepared this Technical Report on the Salave gold project, located in Asturias, Spain, at the request of Black Dragon Gold Corporation ("Black Dragon"), a Canadian company listed on the TSX Venture and Frankfurt exchanges. The Salave project is 100% controlled by Exploraciones Mineras del Cantábrico S.L. ("EMC"), a wholly owned subsidiary of Black Dragon. The purpose of this report is to amend the "Updated Technical Report on the Salave Gold Deposit, Asturias Region, Spain", dated October 31, 2016 and prepared by MDA for Astur Gold Corp. ("Astur"). Astur Gold changed their name to Black Dragon.

This report has been prepared in accordance with the disclosure and reporting requirements set forth in the Canadian Securities Administrators' National Instrument 43-101 ("NI 43-101"), Companion Policy 43-101CP, and Form 43-101F1, as well as with the Canadian Institute of Mining, Metallurgy and Petroleum's "CIM Definition Standards - For Mineral Resources and Reserves, Definitions and Guidelines" ("CIM Standards") adopted by the CIM Council on May 10, 2014. JORC standards for reporting mineral resources are similar to the NI-43-101 reporting standards.

1.1 Property Description and Location

The Salave gold project is located on the northern coast of Spain along the Bay of Biscay, approximately two kilometers east of the village of Tapia de Casariego in the western part of the Principality of Asturias. The Salave property consists of five mining concessions, extensions of three of the concessions with what is referred to as "*demasia* ground," and an investigation permit that total approximately 3,427 hectares. The registered owner of the mining concessions and the investigation permit is Black Dragon's wholly owned subsidiary EMC.

Black Dragon's Salave project is envisioned to be developed by underground mining. The resource lies within an area in which environmental restrictions on surface activity other than recreation and farming would necessitate special permitting.

1.2 Exploration and Mining History

Gold mining in the vicinity of Salave and other areas in Asturias dates to the Romans in the first century AD, and possibly even earlier to the Celts. Production from Salave by the Romans has been variously estimated at two to six million tonnes of material with recovery of an estimated 5,000 to 7,000 kilograms of gold. Mining by the Romans was done by open-pit methods, excavating the near-surface material to depths averaging 30 meters. Underground mining to extract molybdenum from quartz veins was attempted in the 1940s, but MDA has no information on production, if any, from this effort.

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Modern exploration of the Salave area for gold began in the mid-1960s. Systematic testing of the gold zones began with work by IMEBESA, a subsidiary of Northgate Exploration Limited, in 1970, with subsequent exploration by Rio Tinto Patiño S.A. ("Rio Tinto"); Gold Fields Española S.A. ("Gold Fields"); Anglo American Corporation of South Africa Limited and related Charter Consolidated P.L.C. (collectively referred to as "Anglo"); Oromet Joint Venture ("Oromet"); Empresa Minera Newmont Inc. y Compañía, S.C., a partnership held by two wholly owned subsidiaries of Newmont Mining Corporation (collectively called "Newmont"); San Diego Gold Minery, S.A., a subsidiary of Lyndex Explorations Ltd. ("Lyndex"); and Rio Narcea Gold Mines, Ltd. ("Rio Narcea"). From IMEBESA's drilling in 1970-1971 through that of Rio Narcea in 2004-2005, at least 325 core holes and 139 percussion/reverse circulation ("RC") holes were drilled on the property; this historic drilling totaled 65,965.5 meters. Note that this total includes some holes that were lost prior to reaching target depth.

Astur acquired the Salave property in 2010. December 2011 through December 2013, Astur drilled 10 geotechnical core holes totaling 589 meters to establish geotechnical characteristics of the rock and 10 infill core holes totaling 3,031 meters for exploration. Astur also contracted for a structural analysis to assist in modeling of the mineralization.

1.3 Geology and Mineralization

The Salave gold deposit is located within the northwestern portion of the Hercynian Iberian Massif, in which rocks of Late Proterozoic to Carboniferous age were deformed, often metamorphosed, and intruded in Late Devonian to Carboniferous time. The Salave area lies in the transition between unmetamorphosed foreland areas to the east and the more internal zones of the Hercynian orogen to the west. In the Salave area, a nearly continuous series of Cambro-Ordovician to Carboniferous clastic siliceous and carbonate rocks approximately 11,000 meters thick has undergone complex compressional deformation, with – from west to east – stacked recumbent folds verging toward the east, thrusts, and then large open folds with sub-vertical axial planes located farther to the east. Hercynian magmatism took place during the waning stages of the Hercynian collision, producing syntectonic monzogranites and leucogranites and post-tectonic granodiorite-monzogranite intrusions with some leucogranite. The post-tectonic intrusions are mainly responsible for the Salave gold deposit and the gold-copper deposits of El Valle-Boinas and Carlés, as well as other gold prospects in the northern Iberian Peninsula.

The Salave area is dominated by a thick sequence of Upper Cambrian to Ordovician arenaceous to argillaceous metasedimentary units with quartzite, greywacke, and black graphitic and pyritic schist and slate as important members of the succession. These metasedimentary rocks strike northeast and generally dip west. The Salave deposit lies in the Mondoñedo nappe, which consists of low- to medium-grade metasedimentary rocks that were folded by east-verging recumbent structures during the first phase of Hercynian deformation and then thrust several tens of kilometers toward the east during the second deformation phase. The north-northeast-trending Mondoñedo thrust passes just east of the Salave project. The metasedimentary rocks in this area are intruded by three west-northwest-trending plutons that range in composition from gabbro to granodiorite.

Most of the Salave project area is covered by Quaternary marine sediments ranging from a few centimeters to over 70 meters thick. West of the Mondoñedo thrust, and within the Salave property, the area is underlain by quartzite, sandstone, argillite, shale, and greywacke of the Cambro-Ordovician Los Cabos Series that have been metamorphosed to slate, arenite, quartzite, and graphitic slates. The Salave deposit is underlain by granodiorite, which is a small part of the Porcia Intrusive Complex that extends approximately four kilometers, from Rio Porcia to Represas Playa just east of Tapia. The granodiorite crops out in the western part of the complex. The igneous rocks in the Salave area are directly related to the mineralization and comprise several stocks and dikes whose ages range from 330 to 287 Ma. The morphology of the local coastline reflects northwest- and northeast-trending systems of fractures and faults, which also appear to be significant in localizing mineralization. Oxidation is not intensive at Salave and extends for a few meters below the surface, except along larger faults and structural zones where it can locally exceed 200 meters vertically.

The Salave gold deposit is hosted mainly by the Salave granodiorite at its western boundary, close to the contact with the Los Cabos Series. The mineralized units occur within an area approximately 400 meters wide, 500 meters long, and at least 350 meters deep. Gold mineralization occurs in a series of stacked, north- to north-northwest-trending, gently west-dipping irregular lenses related to faults and fracture zones that are parallel to the contact of the intrusive and metasedimentary rocks. The fault/fracture zones appear to be related to one or more vertical structures, at least some of which contain high-grade mineralization, which probably acted as conduits for hydrothermal solutions. The dimensions of the individual, relatively flat-lying mineralized zones range from 50 meters to 300 meters in length, 10 meters to 150 meters in width, and five meters to 60 meters in thickness, with an average thickness on the order of 20 meters. The gold mineralization occurs with intense albite and muscovite (phengite) alteration (also identified as sericite alteration by some authors). Gold occurs both disseminated and in veins and is primarily associated with acicular disseminated arsenopyrite and variable amounts of pyrite and stibnite.

1.4 Drilling and Sampling

The bulk of the drilling was completed prior to NI 43-101 reporting regulations. Most of the drilling campaigns prior to Rio Narcea did not have the rigorous quality control assurances that current drill programs are required to have. Some of the original data could not be verified using original assay certificates, but were instead verified using the data from extensive metallurgical testing on about six tonnes of mineralized core intervals and several twin-hole comparisons. All of the metallurgical-test average grades indicate equal or higher grades compared to the original drill-hole assay grades, confirming that the drill-hole assays are of adequate confidence to be used in the estimation and classification of the current mineral resources.

Nine companies have drilled the Salave property from 1970 through 2013. Those companies are IMEBESA, Rio Tinto, Gold Fields, Anglo, Oromet, Newmont, Lyndex, Rio Narcea, and Astur. The database used by MDA contains 342 core holes, and 29 RC or percussion holes with a total of 64,926 meters of drilling. These 371 holes include some holes drilled outside the current property boundary. Fifteen of the core holes were geotechnical holes; two RC holes were hydrologic holes; one RC hole was drilled as a possible shaft location; and the remaining holes were exploration holes. Of the 371 holes in the database, 10 resource core holes and 10 geotechnical holes were drilled by Astur.

Data from the IMEBESA drill holes were not used in the resource estimation due to check-assaying issues pointed out by Rio Tinto and Gold Fields and because drill-hole locations could not be verified. Down-hole survey data were not available for the Rio Tinto holes and were limited for the Gold Fields holes.

Rio Tinto's gold analyses were performed by their lab at Huelva, with duplicate samples also analyzed by the Huelva lab and check assaying for 10 samples performed by Anglo American's laboratory in Salisbury, Rhodesia.

Gold Fields analyses were performed by their Little Daugh laboratory with a 50-gram split analyzed for gold by atomic absorption. For every tenth sample, a 200-gram split was sent to Imperial Chemical Industries ("I.C.I."), a custom laboratory, for gold analysis by neutron activation. Gold Fields also used "control samples" for quality assurance/quality control ("QA/QC").

Anglo's gold analyses were performed by fire assay at their Anglo American Research Laboratory in South Africa, with the exception of their 1984 holes, whose samples were analyzed at the Charter Laboratory in England.

Newmont's samples were analyzed for gold by one-assay-ton fire assay at three different laboratories: Caleb Brett in England, X-Ray Assay Labs ("XRAL") in Canada, or Rocky Mountain Geochemical in the U.S. Newmont's QA/QC consisted of use of analytical reference standards and check assaying by Newmont Metallurgical Services.

Lyndex's gold analyses were performed by XRAL using fire assay. Check assaying was done on 15 of the Lyndex samples by an unnamed independent laboratory.

Rio Narcea sent their samples to their laboratory at the El Valle mine for analysis. One 50-gram or two 30-gram samples were used for fire assay. For geochemical analysis or when lower detection was required, gold was analyzed by atomic absorption. QA/QC measures used by Rio Narcea for the Salave drill holes included an on-going recheck program at an independent laboratory, combined with monitoring of the El Valle mine assay laboratory by close monitoring of the assay results from standards, blanks, and re-assaying of original pulps.

Astur used ALS as their principal laboratory for gold analyses. Gold was analyzed by atomic absorption, but for samples with assays over 10 g Au/t, the sample was re-analyzed with a gravimetric finish. Astur's QA/QC program included the use of blanks, certified reference materials, core duplicates, and analysis of pulp reject and check sample splits at a third-party commercial laboratory.

1.5 Metallurgical Testing and Mineral Processing

Early metallurgical test work on the Salave deposit was initiated by IMEBESA in 1971. Since then, additional work has been conducted by all of the operators. The Salave mineralization is refractory, and gold extraction by cyanidation of finely ground material has been found to be poor. Cyanidation tests on flotation concentrates after pressure leaching with oxygen at elevated temperature or after bacterial oxidation have also been investigated. Results indicate either process was found to improve gold recovery by cyanidation.

Bench-scale and pilot testing were completed in 2005 and 2006 to evaluate flotation and concentrate oxidation processes. Ausenco Ltd. summarized the conclusions that included:

- Variability tests showed that gold recovery is not significantly affected by gold head grade.

- At a primary grind of 106 microns, the samples showed consistently high gold recovery (over 95%) by flotation at a neutral pH to a rougher concentrate containing six to seven percent of the sample feed weight.
- Pressure-oxidation treatment of the concentrates yielded gold recovery from the concentrates of over 98%. Additional testing was recommended.
- Bacterial oxidation treatment of the concentrate yielded gold recovery from the concentrate of over 97%. Additional testing was recommended.
- Pressure oxidation was the most appropriate technology considering gold recovery, reagent consumption, and the residue stability.
- Stockpile storage of mined materials for prolonged periods of time was not recommended, based on documentation of aging and associated metal loss that included a 3.3% gold-recovery loss between core samples collected over a 20-year period.

In 2013, ALS Metallurgy Kamloops ("ALS-Met") completed comminution testing, flotation flow sheet development testing, limited grind and flotation optimization testing, aging testing, and locked cycle testing on available 2005-vintage core samples from the Salave deposit to confirm the information from the 2006 work. ALS-Met concluded that:

- Batch flotation testing results indicated that gold recovery by flotation from six composites tested ranged from 88 to 95 percent into a cleaner concentrate assaying between 68 and 299 g Au/t.
- Locked cycle flotation testing results on three master composites indicated that gold recovery ranged from 85 to 91 percent to a cleaner concentrate that graded 86 to 156 g Au/t.
- Limited testing indicated that primary grinding finer than 106 microns did not significantly improve flotation response.
- Overall gold recovery from tests that included gravity and flotation was not higher than that from tests using only flotation.

The concentrates from the locked cycle tests were assayed for deleterious elements. Arsenic content ranged from 9.5 to 21.8 percent. Antimony ranged from 1.5 to 2.8 percent. Both arsenic and antimony are well above the concentration considered marketable to traditional concentrate buyers. Astur is exploring other alternatives, including joint ventures with or marketing to mine operators who produce and process similar concentrates. Fluorine content of the concentrate produced from one composite was also high at 170 g/t.

1.6 Mineral Resource Estimate

The mineral resources at the Salave project were estimated by determining statistical and geological criteria to aid in modeling of gold mineral domains, interpreting gold mineral-domain polygons on cross sections, rectifying mineral-domain interpretations on northeast-looking long sections, analyzing the model geostatistically, interpolating grades into a three-dimensional block model, and undertaking various checks and re-interpolation runs until optimal results were generated. Arsenic was modeled in addition to gold, due to potential penalties associated with the processing of arsenic-rich gold concentrates. The arsenic was modeled independently of gold, but in an identical manner. All modeling of the Salave project resources was performed using GEOVIA Surpac™ mining software.

The Salave project block-diluted resources are tabulated using a cutoff grade of 2.0 g Au/t in Table 1.1. The cutoff was chosen to capture mineralization that is potentially available to underground mining, sulfide concentration, and gold recovery using off-site processing of the sulfide concentrate. The cutoff grade was selected based on a gold price of $1,300 per ounce, a gold recovery of 92%, a mining cost of $50 per tonne, a processing cost of $18/tonne, and a G & A cost of $6/tonne. These costs and metal recovery equate to a total calculated cutoff grade of 1.92 grams Au/t, which was rounded up to 2.0 grams Au/t.

Table 1.1 Salave Project Gold Resources, 2.0 g Au/t Cutoff

Measured			Indicated			Measured + Indicated		
Tonnes	g Au/t	oz Au	Tonnes	g Au/t	oz Au	Tonnes	g Au/t	oz Au
514,000	5.87	97,000	6,008,000	4.39	847,000	6,522,000	4.51	944,000

Inferred		
Tonnes	g Au/t	oz Au
1,078,000	3.05	106,000

Note: Rounding may cause apparent discrepancies

Model blocks meeting the resource cutoff of 2 g Au/t were inspected three dimensionally and found to occur in groups of sufficient size and continuity to meet the requirement of having reasonable prospects for eventual economic extraction.

The resources are located beneath a 40-meter surface crown pillar. The material in the crown pillar is not included in the resource. The resource is open to the west and additional drilling is required to define the entire deposit.

The block model and estimated resources are current as of the Effective Date of this report.

1.7 Conclusions and Recommendations

MDA's Qualified Person ("QP") Mr. Neil Prenn verified the Salave project database used in the resource estimation and visited the project site. Mr. Prenn believes that the data provided by Astur (now Black Dragon) are generally an accurate and reasonable representation of the Salave project.

Although the Salave area was mined for gold by the Romans in the first century AD, drilling by IMEBESA, a subsidiary of Northgate Exploration Ltd., in 1970-1971 was the first modern exploration conducted at the property to identify gold mineralization. Through Astur's drilling in September 2013, nine companies have drilled at least 345 core holes and 130 percussion-RC holes on and near the current Salave project.

The gold mineralization at Salave occurs in a series of stacked, north- to north-northwest-trending, generally shallowly west-dipping, irregular lenses related to faults and fracture zones that are parallel to the contact of intrusive and metasedimentary rocks. The dimensions of the individual mineralized zones range from 50 meters to 300 meters in length, 10 meters to 150 meters in width, and five meters to 60 meters in thickness, with an average thickness on the order of 20 meters. The mineralized zones occur within an area approximately 400 meters wide, 500 meters long, and at least 350 meters deep. Gold occurs both disseminated and in veins and is primarily associated with acicular disseminated arsenopyrite, variable amounts of pyrite and stibnite, and intense albite and muscovite alteration.

In 2013 Asturs's wholly owned subsidiary Exploraciones Mineras del Cantábrico S.A. ("EMC") initiated a feasibility study and completed an initial Environmental Impact Asessment ("EIA") for the Salave gold project in May of 2012. In December 2012, Astur received a positive environmental impact assessment for an underground mine and access decline components of its development plan. In December of 2013, EMC resubmitted an Amended EIA which included additional environmental studies to permit flotation and tailings facilities.

On December 19, 2014, Astur received a negative decision on the Amended EIA from the Commission for Environmental Affairs of the Principality of Asturias ("CAMA") for the Company's development proposal of the Salave gold deposit. Influenced by this decision, the Ministry of Economy and Employment of the Principality of Asturias (the "Ministry"), issued a resolution dated February 10, 2015 denying the proposed underground mine submitted by EMC for its Salave Gold Project ("Salave").

In April of 2015, EMC filed a lawsuit before the Asturias Superior Court of Justice ("the Court"), challenging the resolution of the Ministry of Economy and Employment of the Principality of Asturias and subsequently filed a Statement of Claim before the Court on November 10, 2105. The Statement of Claim requests that the Court revoke the Resolution by the Ministry that denied the proposed development of Salave and includes a petition to recover all costs incurred by EMC on the project since May 2010.

MDA recommends that the originally proposed decline proceed to allow the establishment of underground drill stations to continue to drill the deposit. Although Black Dragon feels there are sufficient measured and indicated resources to proceed to feasibility, the deposit remains open to the west, and some areas need additional infill drilling. Most of this drilling is not possible from the surface due to land and permitting issues. Creating underground access will require time and expense, as it will be necessary to establish the decline access and drill level. Drilling can start after about 18 to 24 months of underground development. The decline would also provide valuable geotechnical and hydrogeological information for the deposit. The plan for the proposed portal and decline had reached an advanced stage and was suitable for underground mining (5 meters x 5.5 meters). It remains Black Dragon's intent to proceed with the planned decline, pending the outcome of the Court's decision and a positive outcome for a planned Feasibility Study.

Table 1.2 shows the estimated cost for the decline and portal.

Table 1.2 Estimated Cost of Underground Access and Development Drilling

Item	Meters	Estimated Cost
Decline	2,500	$10,000,000
Drifts and Drill Stations	1,185	$2,500,000
Ramps	180	$500,000
Vent Raise	400	$800,000
Drilling & Assaying	7,500	$1,500,000
Owners Costs	Lump Sum	$2,000,000
Subtotals		$17,300,000
Contingency		$1,800,000
Totals		**$19,100,000**

2.0 INTRODUCTION AND TERMS OF REFERENCE

Mine Development Associates ("MDA") has prepared this amended Technical Report on the Salave gold project, located in Asturias, Spain, at the request of Black Dragon Gold Corporation ("Black Dragon"), a Canadian company listed on the TSX Venture and Frankfurt exchanges. Black Dragon was formerly known as Astur Gold Corp. ("Astur"), prior to the change in name announced by Astur on October 14, 2016. The Salave project is 100% controlled by Exploraciones Mineras del Cantábrico S.L. ("EMC"), a wholly owned subsidiary of Black Dragon.

This report and resource estimation have been prepared in accordance with the disclosure and reporting requirements set forth in the Canadian Securities Administrators' National Instrument 43-101 ("NI 43-101"), Companion Policy 43-101CP, and Form 43-101F1, as well as with the Canadian Institute of Mining, Metallurgy and Petroleum's "CIM Definition Standards For Mineral Resources and Reserves, Definitions and Guidelines" ("CIM Standards") of May 10, 2014. The names Astur and Black Dragon are used interchangeably in this report, unless specifically refering to the time period subsequent to October 14, 2016.

2.1 Project Scope and Terms of Reference

The purpose of this report is to amend the Technical Report titled "*Updated Technical Report on the Salave Gold Project Asturia Region, Spain*" dated October 31, 2016 ("2016 Technical Report") prepared for Astur by MDA (Prenn, 2016). The 2016 Technical Report provided an update on the permitting status of the Salave gold project since the completion of the previous Technical Report on the Salave gold deposit dated March 10, 2014 ("2014 Technical Report") prepared by MDA (Prenn, 2014). The 2014 Technical Report included a technical summary in support of a then updated resource for the Salave gold project that envisioned potential underground extraction, rather than open-pit, or a combination of open-pit and underground mining. The mineral resources reported herein were estimated and classified under the supervision of Mr. Neil Prenn, Principal Engineer for MDA. Mr. Prenn is a qualified person under NI 43-101 and has no affiliation with Black Dragon or any of its subsidiaries except that of independent consultant/client relationship.

Since the 2014 Technical Report was issued, the decision to deny Astur's permit to mine by the Ministry of Economy and Employment of the Principality of Asturias (the "Ministry") is a new risk to the project if negotiations with the Ministry are not successful. The 2014 Technical Report also included a review of the pertinent technical reports and data provided to MDA by Astur relative to the general setting, geology, project history, exploration activities and results, methodology, quality assurance, interpretations, drilling programs, and metallurgy of the Salave deposit. The author's mandate at that time was to comment on substantive public or private documents and technical information listed in Section 27.0.

For the completion of this report, Mr. Prenn has utilized the data and information provided by Astur and Black Dragon, including the supporting data for the estimation of the mineral resources. Mr. Prenn has reviewed the available data, made two site visits, and has made judgments about the general reliability of the underlying data. Where deemed either inadequate or unreliable, the data were either eliminated from use or procedures were modified to account for lack of confidence in that specific information. In addition, MDA has made use of information from references listed in Section 27.0.

In this report, the terms "MDA" and "Mr. Prenn" are used interchangeably to refer to MDA's Qualified Person for all but Section 1.5, Section 7, Section 8 and Section 13. Michael M. Gustin, Senior Geologist for MDA and a Qualified Person under NI 43-101, supervised the preparation of, and takes responsibility for, Section 7 and Section 8 of this report.

Section 13.0 (Mineral Processing and Metallurgical Testing) has been prepared by Allen Anderson, P. E. and President of Allen R. Anderson Metallurgical Engineer Inc., and by Craig A. Smith, an independent metallurgical and process design consultant with Metal Edge Solutions. Mr. Anderson is a qualified person under NI 43-101 and has no affiliation with Black Dragon or any of its subsidiaries except that of independent consultant/client relationship.

The authors acknowledge the contributions to this report of Robert Fraser of R. J. Fraser Mineral Exploration Inc., consultant to Astur, who provided valuable information on Astur's drilling program and current interpretations of the mineralization at Salave.

Roscoe Postle Associates Inc. and its successor company, Scott Wilson Roscoe Postle Associates Inc., collectively referred to as "RPA" in this report, prepared Technical Reports in 2004 and 2010 for the Salave project (Agnerian, 2004; Agnerian, 2010). In 2011 Golder Associates Global Ibérica S.L.U. ("Golder") prepared a Technical Report describing a Preliminary Economic Assessment of the Salave gold project (Tenorio, 2011), which was subsequently amended (Tenorio *et al.*, 2013).

The current resource estimate reported herein differs from those prepared by RPA and Golder because it is based on potential underground extraction, which leads to the use of a higher-grade resource cutoff than the previous estimates that applied cutoffs appropriate for open-pit mining for most of the resource. An additional difference with the RPA and Golder estimates is that all material from the surface to a depth of 40 meters is specifically excluded from the current resources due to the necessity to maintain a surficial crown pillar in a potential underground operation.

Mr. Prenn visited the Salave project on September 16 to 20, 2013, and again on November 27 to 28, 2013. These visits included inspection of the surface site and review of drill core. During the first visit, one drill was operating and one drill was set up to begin drilling the 10 exploration drill holes that Astur completed. Mr. Anderson and Mr. Smith did not visit the project.

MDA has made use almost entirely of data and information derived from work done by Astur and its predecessor operators of the Salave project. MDA has made such independent investigations as deemed necessary in the professional judgment of the lead author to be able to reasonably present the conclusions discussed herein.

The Effective Date of this Technical Report and the mineral resource estimate is October 7, 2016.

2.2 Frequently Used Acronyms, Abbreviations, Definitions, and Units of Measure

In this report, measurements are generally reported in metric units.

Currency Unless otherwise indicated, all references to dollars ($) in this report refer to currency of the United States.

Frequently used acronyms and abbreviations

Ag	silver
As	arsenic
Au	gold
B	boron
C	carbon
cm	centimeters
core	diamond core-drilling method
Cu	copper
^{o}C	degrees centigrade
dm	decimeter
g/t	grams per tonne
ha	hectares
ICP	inductively coupled plasma analytical method
kg	kilograms
km	kilometers
kPa	kilopascal
kWh	kilowatt hour
l	liter
m	meters
Ma	million years old
Mo	molybdenum
mm	millimeters
µm	micron
NSR	net smelter return
oz	ounce
ppm	parts per million
QA/QC	quality assurance and quality control
RC	reverse-circulation drilling method
RMR	rock mass rating
RQD	rock-quality designation
S	sulfur
Sb	antimony
sec	second
t	metric tonne or tonnes
W	tungsten
Zn	zinc

3.0 RELIANCE ON OTHER EXPERTS

The authors are not experts in legal matters, such as the assessment of the legal validity of mining concessions, private lands, mineral rights, and property agreements in Spain. The authors did not conduct any investigations of the environmental, permitting, or social-economic issues associated with the Salave project, and the authors are not not experts with respect to these issues.

The authors have fully relied on information provided by Black Dragon as to the legal status of Black Dragon, and related companies, as well as current legal title of the mining concessions comprising the Salave project, the terms of property agreements, the existence of applicable royalty obligations, and information concerning environmental issues and permitting. Sections 4.1, 4.2, 4.3, and 4.4 are based on information provided by Black Dragon, and the authors offer no professional opinions regarding the provided information.

The authors have fully relied on Sr. Francisco Ruiz Allén, who holds a Masters degree in Environmental Engineering and Management from the University of Oviedo, and who is an Associate and Administrator with Consultoría Geológica, S.L. ("Congeo"), for the information on environmental liabilities and permitting summarized in Sections 4.5. Congeo provides technical assistance and support in mineral resources, environmental management, and permitting (mining) in Spain.

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4.0 PROPERTY DESCRIPTION AND LOCATION

The authors are not experts in land, legal, environmental, and permitting matters. Sections 4.1, 4.2, 4.3, and 4.4 are based fully on information provided by Black Dragon. Section 4.5 has been prepared by Sr. Francisco Ruiz Allén with Congeo. The authors present this information to fulfill reporting requirements of NI 43-101 and express no opinion regarding the legal or environmental status of the Salave project.

4.1 Location

The Salave gold project is located on the northern coast of Spain along the Bay of Biscay, approximately two kilometers east of the village of Tapia de Casariego ("Tapia") in the western part of the Principality of Asturias (Figure 4.1). The project is located between the villages of Salave and Mántaras within the municipality of Tapia. The center of the property is located at approximately 668,500E and 4,825,900 N (UTM-29, European datum 1950).

4.2 Mineral Tenure in Spain

In general terms, the investigation and development of mineral deposits and other geological resources in Spain is regulated by the Spanish Mining Act 22/1973 (21 July) ("the Mining Act"), the Royal Decree 2857/1978 (25 August) approving the regime for the regulation of mining, and the Royal Decree 975/2009 (12 June) (15 October) on extractive mining activities, waste management, and the protection and restoration of areas affected by mining activities.

The Mining Act divides all sub-surface material into the following groups:

- quarried material used for simple crushing, screening and washing by the construction industry (for example, sand, gravel and roadstone, ornamental rocks and slates, clays for refractories and limestone for cement and lime);
- underground water, geothermal sources, mining residuals, and underground structures;
- all other mineral materials and geological resources (section C); and
- coal, lignite, and oil shale.

The Salave gold project falls under Section C in this classification.

In order to explore, investigate, and exploit geological resources of Section C, the Mining Act provides for the following categories of mining rights:

a) Exploration Permit: granted for one year and renewable for another period of one year;
b) Investigation Permit: granted for three years and renewable for equal periods of three years each; and
c) Mining Concession: granted for 30 years and renewable for equal periods up to a maximum of 90 years.

Black Dragon currently has an Exploration Permit, an Investigation Permit, and a Mining Consession for the property. An exploration permit allows its holder to carry out aerial surveys, studies, or other techniques that do not affect the soil. It also grants its holder priority status to obtain investigation permits or mining concessions within the perimeter granted.

Figure 4.1 Location of the Salave Project

An investigation permit vests in its holder the right to carry out, within the indicated perimeter and for a specific term (a maximum of three years), studies and work aimed at demonstrating and defining one or several Section C resources and the right, once defined, to be granted a permit for mining them. The term of an investigation permit may be renewed by the Regional Ministry of Economy and Employment for three years and, exceptionally, for successive periods.

Rights to develop Section C resources are granted by the Regional Ministry of Economy and Employment by means of a mining concession, according to the form, requirements, and conditions established in the Mining Act. A mining concession entitles its holder to develop all the Section C resources located within the concession area, except those already reserved by the State. In general terms, the concession shall always be granted for a specific area, measured in whole mining grids. No more than one mining concession for Section C resources may be granted for the same plot of land. Concessions can be renewed for an additional 30-year period to a maximum of 90 years from the date the concessions was granted with approval by the mining authorities. Renewals of title must be requested prior to three years before the expiration date.

Boundaries of the concessions are determined by ground-surveyed points, and there is a legal record of the boundaries.

Under Spanish regulations, ownership of the land is independent of ownership of the mineral rights.

4.3 Land Area

The Salave property, as currently configured under the Mining Act, consists of five mining concessions that cover an area of 433.02 hectares, extensions of three of the concessions with *demasia* ground described below that encompass approximately 228.95 hectares, and an investigation permit that covers an additional 2,765 hectares for a total area of 3,426.97 hectares (Table 4.1); part of the area covered by the concessions lies in the Bay of Biscay.

Figure 4.2 shows the Salave mining concessions, the *demasia*, and the investigation permit area. The registered owner of the five mining concessions, the *demasia*, and the investigation permit is Exploraciones Mineras del Cantábrico S.L., a Spanish exploration company and wholly owned subsidiary of Black Dragon, that was formerly called Exploraciones Mineras del Cantábrico S.A. (collectively called "ECM" in this report). The concessions are granted for gold, silver, molybdenum, antimony, arsenic, iron, copper, strontium, titanium, and cesium.

Because the perimeters of the concessions were defined and surveyed before the 1973 Mining Law, effective control can incorporate "*demasia*" ground, defined as the area beyond the limit of the concessions and to the limit of the affected mining square. The mining square is a polygon of 20" in latitude and 20" in longitude, increasing from 0", referred to the Greenwich meridian. As shown on Table 4.1 and Figure 4.2, three of the mining concessions have additional *demasia* ground.

There are no holding costs on the land owned by Black Dragon.

4.3.1 Surface Rights

The following information on surface rights currently controlled by Black Dragon was taken from López-Cancio Valdés (2013) with additional information provided by Black Dragon.

Black Dragon owns approximately 10 hectares in eight contiguous parcels covering much of the resource area. This land is used for pasture, forest, and scrubland. Figure 4.3 shows the land owned by EMC.

Table 4.1 Mining Concessions and Permits of the Salave Property

Concession Name	Registration Number	Area (ha)	Date Granted	Expiration Date
Dos Amigos	24.371	41.99	Sept. 10, 1941	Oct. 10, 2045
Salave	25.380	67.98	April 10, 1945	Oct. 10, 2045
Figueras *Demasia*	29.500	212.02 92.55*	Jan. 25, 1977	Jan. 25, 2037
Ampliación de Figueras *Demasia*	29.969	10.99 68.85*	Nov. 9, 1988	Nov. 9, 2018
Segunda Ampliación de Figueras *Demasia*	29.820	100.04 67.55*	Sept. 16, 1981	Sept. 16, 2041
Subtotal		*661.97*		
Investigation Permit Name	**Registration Number**	**Area (ha)**	**Date Granted**	**Expiration Date**
Salave	30.812	2,765	Feb. 18, 2014	Feb. 18, 2017
Total		*3,426.97*		

** Areas of the demasia have been calculated by MDA from data received from Astur. Remaining areas are from data provided by Astur.*

Figure 4.2 Salave Mining Consession Map

(from Astur, 2016)

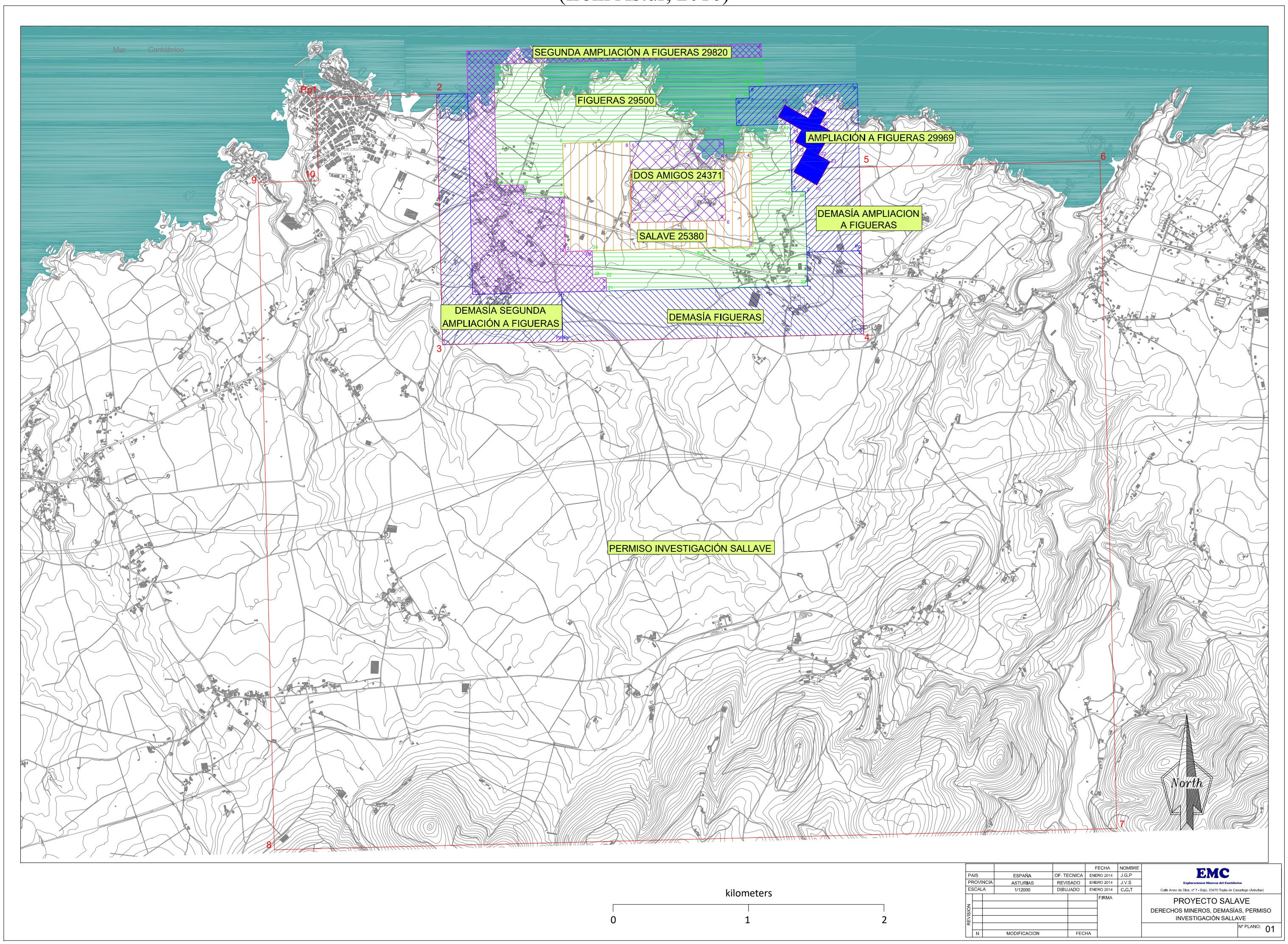


Figure 4.3 Land Owned by EMC
(from Astur, 2016)

4.4 Agreements and Encumbrances

4.4.1 Agreements for Acquisition of EMC by Astur Gold Corp.

The terms of the agreements whereby Astur, now Black Dragon, acquired EMC included:

- Up-front cash payments totaling 1.1 million euros were made to Rio Narcea Gold Mines, Ltd. ("Rio Narcea"), wholly owned subsidiary of Lundin Mining Corporation ("Lundin"), and to the holders of the remaining shares of EMC;
- An additional cash payment of 20 million euros is payable to Rio Narcea within 180 days of receipt by EMC of all necessary permits, licenses, and approvals to construct and operate an open pit on the property that allows for the production of at least 800,000 ounces of gold;
- Issuance of 5,296,688 common shares of Astur was made to Rio Narcea; and
- Issuance of 500,000 common shares of Astur was made to a third party.

In addition, an agreement with Rio Narcea established that any judgments or money awarded to EMC as a result of the litigation against the regional government of Asturias directly pertaining to the original application by Rio Narcea to construct and operate an open pit mine, will be aggregated and shared 50% by Rio Narcea and 50% by EMC, after a deduction of the upfront payment of 500,000 euros to Rio Narcea as well as litigation and court-related costs incurred by Astur between April 13, 2010 and the time of settlement or final judgment in the lawsuit. This lawsuit was subsequently rejected by the courts.

4.4.2 Royalties

As per an agreement among EMC, Rio Narcea, and John Patrick Sheridan dated March 9, 2004, and subsequently amended on February 4, 2015 to assign the rights of John Patrick Sheridan to SPG Royalties Inc. ("SPG") and include Astur, the following are outstanding obligations of EMC and Astur to SPG in the end-of-lease contract:

- $5 million to SPG within 10 days of acquiring all requisite surface rights and permits for development of the deposit;
- $5 million to SPG within 10 days after commencement of commercial production of gold;
- $5 million to SPG within 10 days after reaching an accumulated production of 200,000 ounces of gold;
- $5 million to SPG within 10 days after reaching an accumulated production of 400,000 ounces of gold;
- $5 million to SPG within 10 days after reaching an accumulated production of 800,000 ounces of gold; and
- A net smelter return ("SPG NSR") royalty of 5% on gold produced and sold when cumulative gold production exceeds 800,000 ounces must be paid to SPG. Astur has the option to reduce the SPG NSR royalty from 5% to 2.5% by making a payment of $5 million.

On July 12 of 2016, Astur announced that it had entered into an option agreement with Lionsbridge Pty Limited and RMB[1] Australia Holdings Limited ("RMBAH"). The agreement will be facilitated by Lionsbridge, under which RMBAH has granted Astur an option to repay a secured debt facility owed by Astur to RMBAH (currently US$8.77 million) in consideration for a cash payment of US$3,000,000, a 2% net smelter return ("RMB NSR") royalty on the first 800,000 ounces of gold produced from the Salave Project. Certain additional consideration to a maximum of U.S $6,000,000 will be owed to RMBAH if, over a three year period, Astur enters into any sale, merger or joint venture involving the Salave Project where the Salave Project is valued in excess of US$10,000,000, plus reimbursement of certain expenses. The RMB NSR may be repurchased by Astur at any time until the earlier of (a) receipt of primary environmental approvals for the Salave Project or (b) December 31, 2017 for a cash payment of US$3.0 million. If Astur wished to repurchase the RMB NSR before December 31, 2016, it may have done so for a cash payment of US$2.0 million. Under the Option Agreement, RMBAH granted Lionsbridge the exclusive right until 6 November 2016 to fulfill the terms of the option agreement.

There are no other royalties on the Salave project.

4.5 Environmental Permitting and Liabilities

The following information on Environmental Permitting and Liabilities has been provided by Sr. Francisco Ruiz Allén of Congeo (see Section 3.0).

Previous attempts to permit an open-pit mine at Salave have not been successful. Black Dragon's Salave project is now envisioned to be developed by underground mining. The seacoast land-use planning in Asturias (Plan de Ordenación del Litoral de Asturias ("POLA")) does not allow any surface activity other than recreation and farming in a stretch of about 500 meters from the coast. Exceptionally, and by reasons of public utility, social interest, and having no other alternative, the Government's Council of Asturias can grant a permit for an activity not allowed in the POLA area. A favorable report prior to the activity from the Commission on Urban and Territory Planning of Asturias ("CUOTA") is necessary.

In Salave, the limits of the area affected by the POLA are the sea to the north and highway N634 to the south. The Roman open pit and the Salave mineral resource lie within the POLA area. An open pit was seen as unacceptable by the Asturian government in the past. The current project is envisioned to be developed underground, with the proposed portal and treatment facilities to be located a couple of kilometers south of the POLA area. Only the ventilation and emergency shafts will be located within the POLA, as there is no alternative.

4.5.1 Environmental Studies and Issues

4.5.1.1 Baseline Studies and Impact Assessments

Two environmental impact studies ("EIA") have been completed to date by Astur. The first was completed in 2012, with an updated EIA and mine plan submitted to the mining authorities in May 2012. The latest EIA was submitted in December 2013 and is in compliance with the requirements of

[1] Astur Gold, (2016), *Astur gold announces significant strategic changes to the company including restructure of debt, interim financing and changes in board and management*, (Press Release)

Spanish Law 21/2013 of 9 December regarding environmental assessment. Baseline environmental and socio-economic studies have been completed to support these environmental impact assessments:

- Hydrology-hydrogeology:
  - Hydrogeological Study. FRASA Ingenieros Consultores. September 2004.
  - Hydrogeological Study. University of Oviedo. March 2005.
  - Hydrological and Hydrogeological Study and computer simulation of groundwater flow model. University of Oviedo. May 2012.
  - Hydrological characterization of the Anguileiro river basin and the mining project of Salave. University of Oviedo. August 2013.
    - Climate, hydrology, hydrogeology;
    - Pumping tests;
    - Computer simulation of the Anguileiro River basin; and
    - Computer simulation of the Silva Lakes basin
- Water quality and ecosystems:
  - Ecological status survey of the aquatic ecosystems in the Anguileiro River and tributaries. Congeo/Biosfera. February 2012.
  - Study on otter (*Lutra Lutra*) and amphibian in the Silva Lakes, Anguileiro River and tributaries. February 2012.
  - Impact assessment of a discharge from mine dewatering wells to the Silva Lakes. Congeo. June 2013.
  - Costal dynamics, biotic media and sediment analysis in the Anguileiro River estuary. Congeo/Biofera. June 2013.
  - Initial evaluation and prediction of mine water quality for the Salave project, Spain. SRK Consulting. August 2013.
  - Impact assessment study of the post-closure stage in the Salave Project (Asturias). Amphos21. June 2014.
  - Assessment of surface water and groundwater pollution plumes in case of deterioration of the liner below the floatation tailings dry-stack in post-closure. Amphos21. June 2014.

- Air quality:
  - Computer model of dust impact during construction and operation of the Salave project. NOVOTEC/METEOSIM. March 2012.
  - Noise and vibrations impact by the Salave mine project. Congeo/ACUSMED. November 2011.
- Mine waste:
  - Waste rock characterization - Phase I. Scott Wilson Mining. May 2005.
  - Waste rock characterization - Phase II. Scott Wilson Mining. November 2005.
  - Float tails characterization. Scott Wilson Mining. November 2005.
  - Waste Management Plan. Reclamation Project. May 2012.
  - Report on static test work on flotation tailings and blends, and characterization of water quality after oxidation of flotation and core samples. AGQ Mining & Bioenergy. August 2013.
  - Report on static and flotation test work on mineralized material samples. August 2013.
  - Characterization of toxicity of the flotation tailings of the Salave project. Tecnoambiente. September 2013.

- Others:
  - Taxonomical identity of the *Genista gr Anglica* (*Fabaceae*) that grow in the Northwest of the Principality of Asturias, and proposal for its management. University of Oviedo. September 2013.
  - Study on the alternatives for an underwater discharge pipe for the Salave project. PAYMACOTAS. July 2013.

In addition, an Environmental risk assessment, not linked to any specific permit, will have to be carried out according to European Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage, which was transposed to the Spanish legislation as Ley 26/2007 on environmental liability.

4.5.1.2 Protected Natural Areas

Natura 2000 is the network of natural areas protected across the European Union created under Directive 92/43/EEC of the Council, on 21 May 1992, on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) in order to safeguard the most important natural areas in Europe.

The Salave project does not occupy any protected area. The Silva Lakes area is near a zone forming part of the Natura 2000 and Asturian Network of Protected Areas: Penarronda-Barayo (SCI: ES1200017, SPA: ES0000317), which corresponds to the coastal line. The proposed portal and the facilities for mineralized material extraction and treatment are 2.7 kilometers away from the protected site. Four or five ventilation shafts are projected around the Silva Lakes area, lying several hundred meters away from the protected area.

4.5.1.3 Waste and Tailings Disposal

Waste and tailings disposal is regulated by the European Directive 2006/21/EC on the management of waste from extractive industries. This Directive was completed with the following Decisions (a decision is directly mandatory to the member States):

- 2009/337/EC: Commission Decision of 20 April 2009 on the definition of the criteria for the classification of waste facilities in accordance with Annex III of Directive 2006/21/EC.
- 2009/359/EC: Commission Decision of 30 April 2009 completing the definition of inert waste in implementation of Article 22(1)(f) of Directive 2006/21/EC.
- 2009/360/EC: Commission Decision of 30 April 2009 completing the technical requirements for waste characterization laid down by Directive 2006/21/EC.

Spain has incorporated the Directive as the Real Decreto 975/2009 on the management of waste from extractive industries and the rehabilitation of the areas altered by mining activities. This regulation sets what studies are required for the construction and permitting of the facilities for disposal of mine waste and processing tailings.

The Reclamation Project and its Mine Waste Management Plan of 2012 have followed the requirements of the RD 975/2009, but will need to be updated based on a final approved development plan for the project.

There is also the European Commission Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities (EU 2009). The Environmental Impact Studies of 2012 and 2013 included a specific chapter on the application of the Best Available Techniques to the Salave project.

4.5.1.4 Mine Waste Dumps

A Construction Project is required covering the following items:

- Location selection;
- Seismology;
- Geotechnical;
- Hydrological and Hydrogeological; and
- Monitoring.

The Exploitation Project and the Reclamation Plan, along with the Environmental Impact Studies, included the conceptual design of the mine waste dumps. There were specific chapters on the issues above.

Once the Declaration of Impact Assessment ("DIA") and the Exploitation Permit are granted, a detailed waste dump project will have to be submitted to the authorities for their approval.

4.5.1.5 Tailings Disposal

Some studies describing tailings disposal will require additional information beyond that required for waste dumps. Those studies are:

- Construction Project;
    - Location selection;
    - Seismology;
    - Geotechnical;
    - Hydrological and Hydrogeological;
    - Operational and post-closure monitoring; and
- Closure Project.

The Exploitation Project and the Reclamation Plan, along with the Environmental Impact Studies, included the conceptual design of the tailings management facility ("TMF"). There were specific chapters on the issues above.

Once the DIA and the Exploitation Permit are granted, a detailed TMF project will have to be submitted to the authorities for their approval.

4.5.1.6 Site Monitoring

European and Spanish regulations require that the Environmental Impact Assessment includes a Site Monitoring Plan focused on different aspects of the environment: surface and ground waters, fauna and flora, habitat, cultural-archeological heritage, mining wastes, tailings and process water. This was included in the documentation submitted to the authorities.

The Site Monitoring Plan will be approved and/or modified by the environmental authorities in the DIA that will be granted.

4.5.2 Water Management

A comprehensive water management plan must be developed. A water management plan will have many components, and the details will vary from site to site but will include the following:

- Site water balance;
- Water management practices;
- Water treatment and discharge facilities; and
- Approach to maintaining the water management plan.

Astur commissioned specific environmental studies to assess the current environment status and the future impact by the mine project. SRK Consulting undertook the initial predictive modeling of the mine water quality for the Salave project.

Humidity cell test work on mine waste was carried out at the AGQ Mining & Bioenergy laboratories in Seville, Spain, under the supervision of Astur and SRK Consulting. Humidity cell test work on tailings was conducted by ALS in Vancouver, B.C.

The Salave project will not discharge process water during operation. Modeling and water balance calculations have shown that storm water from the mill site and TMF will supply the majority of water necessary for process make-up water. The balance will be available from ground water from the underground mine. The excess of run-off water and underground drainage will need a discharge permit.

4.5.3 Project Permitting Requirements

The project is subject to legislation in Asturias, Spain, and the European Union (“EU”). EU regulations are directly enforceable by law, and EU directives are integrated into regulations in each member state.

Astur received environmental approval to develop the underground mine and its auxiliary facilities, as authorized in their Declaration of Impact Assessment (“DIA”) in December 2013. The DIA excluded the treatment facilities.

In December of 2013, EMC resubmitted an Amended EIA which included additional environmental studies to permit flotation and tailings facilities.

On December 19, 2014, Astur received a negative decision on the Amended EIA from the Commission for Environmental Affairs of the Principality of Asturias (“CAMA”) for the Astur’s development proposal of the Salave gold deposit. Influenced by this decision, the Ministry of Economy and Employment of the Principality of Asturias (the “Ministry”), issued a resolution dated February 10, 2015 denying the proposed underground mine submitted by EMC for the Salave gold project.

In April of 2015, EMC filed a lawsuit before the Asturias Superior Court of Justice (“the Court”), challenging the resolution of the Ministry of Economy and Employment of the Principality of Asturias and subsequently filed a Statement of Claim before the Court on November 10, 2105. The Statement of Claim requests that the Court revoke the Resolution by the Ministry that denied the proposed development of Salave and includes a petition to recover all costs incurred by EMC on the project since May 2010.

Black Dragon is also appealing the negative decision on the amended EIA from the Commission for Environmental Affairs of the Principality of Asturias (“CAMA”) for the Company’s development proposal of the Salave gold deposit before the Asturias Superior Court of Justice, with a decision pending.

Pending the resolution of Black Dragon’s permitting issues, the normal course of permitting of the proposed development plan for Salave requires a number of permits to be obtained specific to areas of mining, municipal works, construction, waste management, air emissions, and water use, management and discharges.

The overall permitting requirements are outlined in Table 4.2; additional required permits and the status of all permits are listed in Table 4.3.

Table 4.2 Overall Permitting Requirements for the Salave Project

Permit	Authority	Applies to
DIA (Declaration of environmental impact. Environmental approval)	Regional Ministry of Environment	The project as a whole (mine + plant + TMF + auxiliaries)
Administrative Mining Project Authorization	Regional Ministry of Industry	The project as a whole (Mine + plant + TMF + auxiliaries)
Land use authorization and Urban license	Regional Ministry of Environment and Municipality	The project as a whole (Mine + plant + TMF + auxiliaries)
Specific construction permits	Mining Authorities and municipality licenses	TMF, waste dump, electrical, reagents handling, fuel deposits, etc.

Table 4.3 Additional Permits and Permit Status

Permit	Applies to	Authority	Status
ENVIRONMENTAL ISSUES			
Environmental approval (DIA)	Whole project	Regional Ministry of Environment	Declined in February of 2015, Black Dragon appealing the decision before the Asturias Superior Court of Justice, decision pending

Permit	Applies to	Authority	Status
ENVIRONMENTAL LICENCES and ADMINISTRATIVE PERMITS			
Urban license	Whole project	Municipality. It is the final step after DIA, Administrative Mining Project and Land Use Authorization	Pending
SUBSTANTIVE PERMITS			
Administrative Mining Project Authorization	Whole project	Regional Ministry of Industry	Declined in February of 2015, Black Dragon appealing the decision before the Asturias Superior Court of Justice, decision pending
URBANISM			
Specific permit for facilities on the regulated coastline	Ventilation shafts	Regional Government Council	Pending
Land use authorization	Whole project	Commission on Urban and Territory Planning of Asturias (CUOTA)	Pending
Construction Permit	Any facility on surface	Municipality	The application along with the project must be submitted after mining permit is granted
OTHERS			
Authorization for hazardous wastes (oils, grease…)	Mine Plant	Regional Ministry of Environment	The application must be submitted after mining permit is granted
Water discharge permit	Mine	Confederación Hidrográfica del Cantábrico (CHC) Water Ministry	The application must be submitted after mining permit is granted
Water utilization	For premises and treatment plant	Confederación Hidrográfica del Cantábrico (CHC) Water Ministry	The application must be submitted after mining permit is granted

4.5.4 Mine Closure Requirements

A conceptual mine closure was included in the reclamation plan and the environmental impact study. The reclamation plan included a draft plan for closure of the facilities. The TMF and waste dump construction projects will also have to include a specific plan for closure.

The mining permit will set the financial security for the reclamation. It will be based on the area of disturbance and will be updated annually. The security also takes into account the closure costs for the plant and TMF that were calculated in the reclamation plan.

4.5.5 Environmental Liabilities

There are no known environmental liabilities or pending legal actions for environmental liabilities in the Salave project area. The Silva Lakes area has drained through an adit since Roman times. That adit was built by the Romans to drain the open pit. In August 2015, the Fund for Wildlife Protection Spain ("FAPAS") announced the results of studies that have been conducted in the area surrounding the Salave Lagoons which overlie the Salave orebody. The sampling conducted by FAPAS has identified concentrations of arsenic as high as 700 mg/kilogram ("ppm") in the soil surrounding the Salave Lagoons and is recommending that the Principality of Asturias declare the area as a contaminated zone with potential risks to farming activities in the area of Tapia de Casariego. The principal source of the contamination in the Salave Lagoons area is the naturally occurring arsenic-bearing rocks that host the Salave orebody. Mining and extraction of the Salave orebody could present an opportunity to remove the source of the arsenic contamination with best practices to the improvement of the current environment. These findings from FAPAS support the water studies conducted by EMC and its consultants predicting that water quality discharged from the proposed Salave mining operation would be substantially cleaner than the water currently in the Salave Lagoons.

The facilities on surface will lie to the south of the existing freeway, in an area of pine tree plantations and grasslands on natural soils, with no deposits of waste.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

This section is taken from Prenn (2014; 2016), which summarized information presented by Agnerian (2004, 2010), Tenorio (2011; Tenorio *et al.*, 2013), Crump and Suarez (1977), Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C. (1982), and other references as cited. Neil Prenn has reviewed this information and believes this summary accurately represents the Salave property.

5.1 Access to Property

Access to the Salave project is by paved Highway N634 from Oviedo, the capital of Asturias, which is located approximately 140 kilometers east of the property. The deposit is less than one kilometer from the highway via unpaved roads. N634 also passes through Tapia, two kilometers west of the Salave property. There is direct access to the property by boat. The nearest airport is Aeropuerto de Asturias near Aviles, approximately 87 kilometers east of Salave via highway A8.

Figure 5.1 shows the geography of the Salave region. Note the location of the Salave deposit, shown with the green crossed shovels, northwest of the village of Salave; iron mines are shown by red crossed shovels. Figure 5.2 is an aerial view of the area immediately surrounding the Salave deposit.

5.2 Physiography

The Salave area is characterized by a coastal peneplain forming an east-west strip generally three kilometers to four kilometers wide, with relief ranging from 10 meters to 50 meters. It is backed to the south by the Cantabrian Range, a mountainous area that extends along the entire northern coastline of Spain. The peneplain slopes gently to the north from the foot of the mountains and terminates abruptly at the coast. An escarpment along the coastline (Figure 5.3) has a height of about 40 meters in the east, diminishing to about 20 meters in the west at Rio de Ribadeo, the estuary of the Rio Eo. The coastal plain is well drained and is incised by shallow valleys occupied by the estuary of the Rio Eo and numerous other rivers and streams which flow from the mountains to the south. Tenorio (2011) noted that the location of facilities and development of open-pit mining is prohibited within 100 meters and 500 meters of the coastline by national and regional planning regulations, respectively.

The land around Salave is used for agriculture and forestry. The high rainfall, humidity, and mild temperatures favor a vigorous growth of vegetation. Small areas of the original oak and birch forest remain in some mountain valleys to the south, but for the most part, these have been replaced with faster growing species, such as pine and eucalyptus. The frequent plantations of eucalyptus, alternating with green meadows, are an outstanding feature of the countryside. The Salave project is locally covered by thick vegetation and woodland. Wildlife in the area includes deer, rabbits, various migratory birds, and various species of fish.

Outcrops are common along the coastline, and occasional outcrops of Middle Ordovician grey to black shale and quartzite are present at the old Roman open pit on the property, as well as along road cuts on Highway N634. Overburden thickness ranges up to 12 meters. Overburden consists of unconsolidated conglomerate with pebbles and boulders of metasedimentary and granitic rocks in a matrix of limonitic sand and clay.

Figure 5.1 Geography of the Salave Area
(from Rodriguez Terente, 2007)

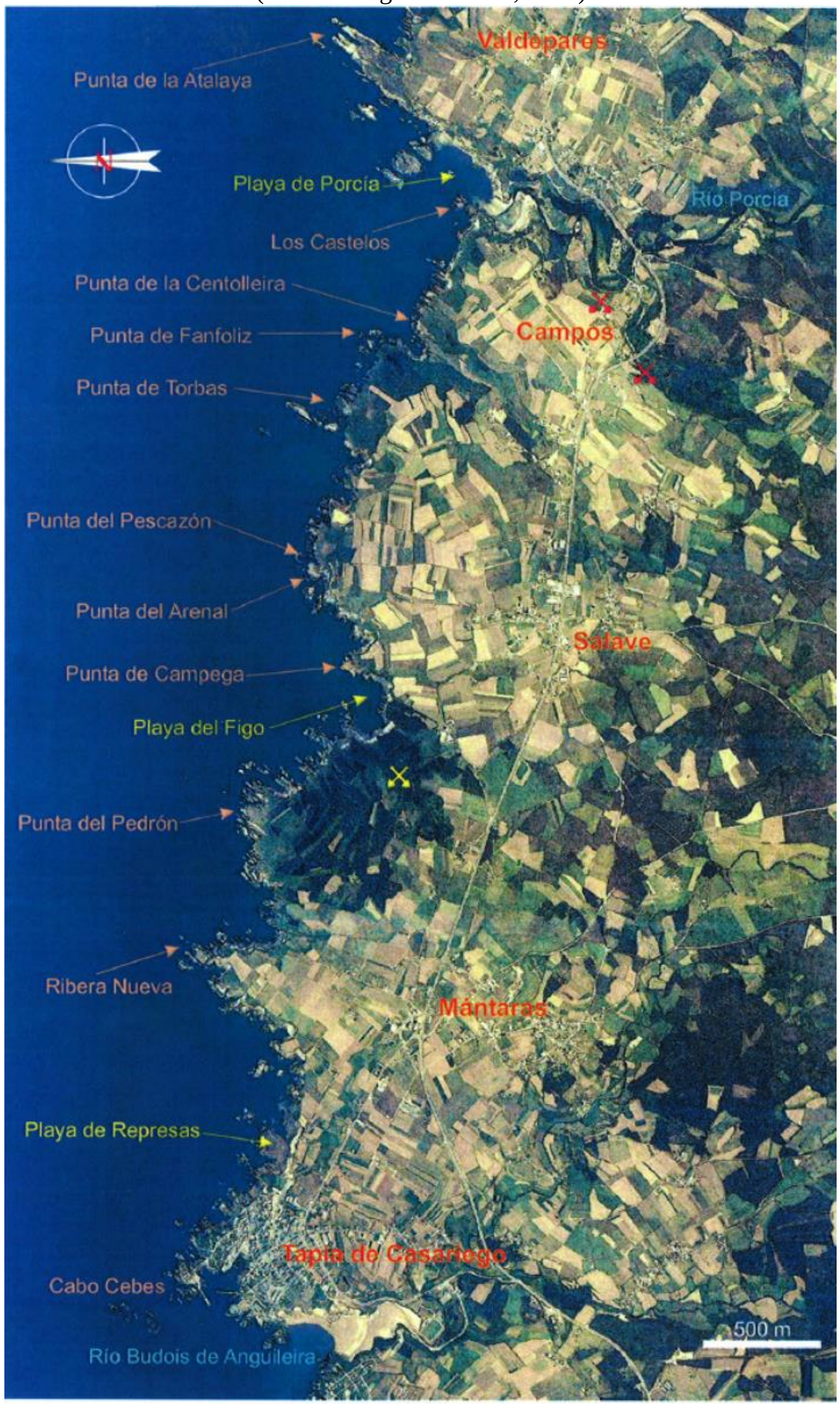


Figure 5.2 Aerial View of the Salave Project

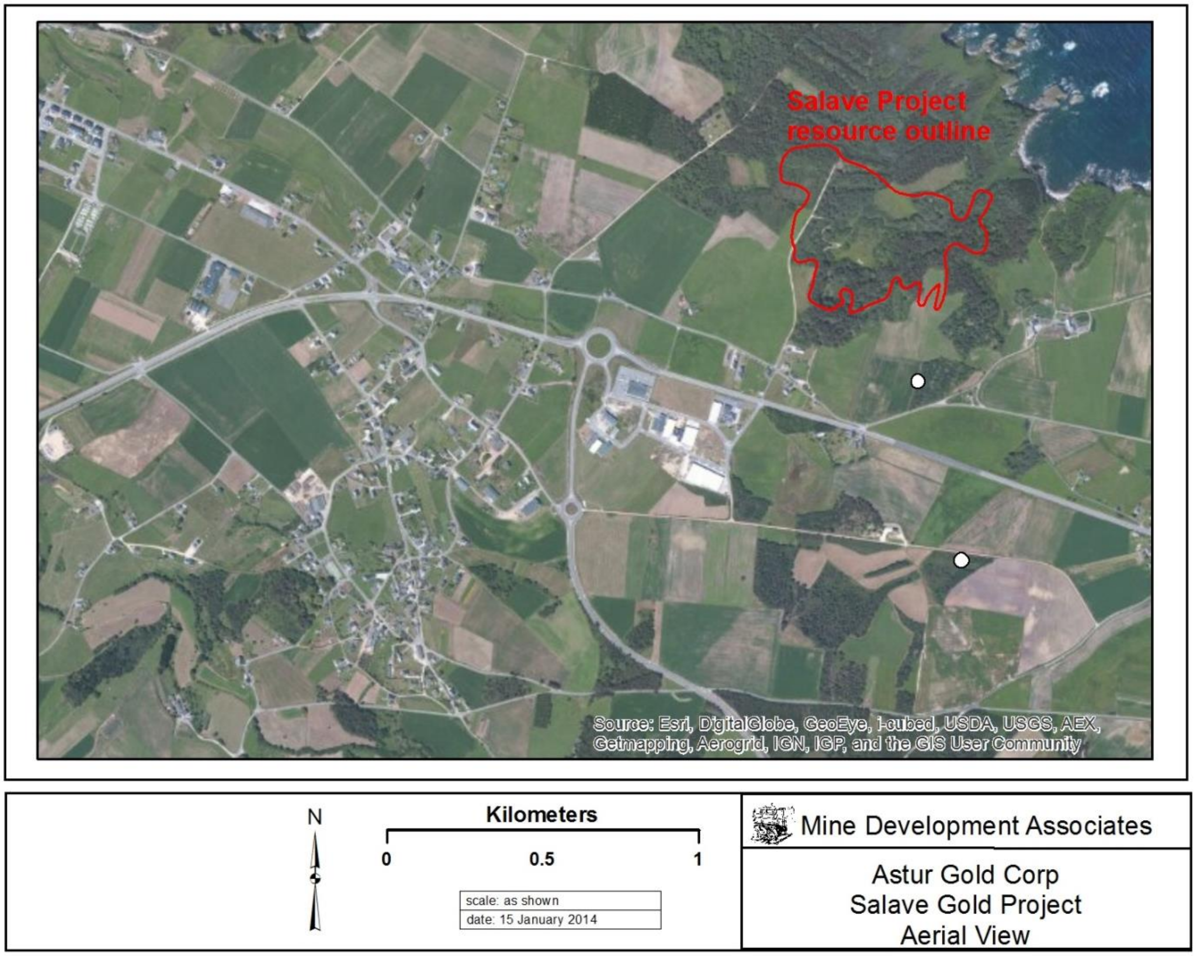


Figure 5.3 View at the Coast of the Salave Project Area

The water table lies about 15 meters below the surface at Salave (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982). The surface terrain is not thought likely to cause problems in the design and emplacement of foundations for buildings and heavy equipment (Agnerian, 2010). In terms of seismic activity, the area is considered to be stable (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982).

5.3 Climate

The Salave project area has a moderate Mediterranean-type climate with an average daily temperature of approximately 20°C in the summer and around 15°C in the winter. It is situated within the zone of highest rainfall in Spain, extending along the northern coast and the northern and western slopes of the Cantabrian Range. Annual rainfall averages 1,115 millimeters within a range from about 700 millimeters to 1,500 millimeters. Snowfall is rare along the coast but is more frequent to the south at high elevations. The wettest months are from October to May, but thunderstorms may occur most frequently in May and June. Strong winds are frequent during the fall and spring, gusting up to 115 km/hour from the west-northwest.

Mining and exploration can be conducted year round.

5.4 Local Resources and Infrastructure

The village of Tapia lies about two kilometers west of the Salave project, and the city of Oviedo lies about 140 kilometers east of the project. Oviedo has a population of approximately 226,000, and Tapia, a population of about 4,000 (2012 population, Instituto Nacional de Estadistica).

Logistical support, in terms of power and telephone lines, is available at Tapia, which is linked to the Asturias power grid. Tenorio (2011) reported that there is an existing network of power lines that enters the property and is connected to the national network.

Mining equipment is available at Oviedo. A rail line transects the property, and shipping facilities are available at the port of Ribadeo, some 10 kilometers west of Tapia within the Province of Galicia. Infrastructure is excellent for mining activities since the area has a long history of coal mining. Other mines in the region include El Valle gold mine, some 100 kilometers east of Tapia, which is currently owned by Orvana Minerals Corp.

Water is available from wells near the property and from the Porcia River, 2.5 kilometers east of Salave.

Black Dragon does not have the necessary surface land for all future facilities but plans to purchase, lease, or use an expropriation process to obtain the necessary lands.

6.0 HISTORY

This section is taken from Prenn (2014; 2016), which summarized information from Valdés Suárez (2012), Tenorio (2011; Tenorio *et al.*, 2013), Agnerian (2004, 2010), Rodriguez Terente (2007), Campos de Orellana Pardesa (2001a), Harris (1979), Crump and Suarez (1977), Müller (1971), Hillebrand (1969), and other references as cited. Neil Prenn has reviewed this information and believes this summary accurately represents the Salave property.

6.1 Exploration and Mining History

Gold mining in the vicinity of Salave and other areas in Asturias dates to the Romans in the first century AD, and possibly even earlier to the Celts. Old Roman open pits are present at Salave and near El Valle, about 100 kilometers east of Tapia. At Salave, the Romans mined the oxidized part of the Salave deposit (Figure 6.1) in the vicinity of “Los Lagos,” those parts of the ancient Roman open pit that are presently covered by shallow ponds. The Romans developed aqueducts to transport water to the mine and completed a drainage tunnel to the ocean to drain water from the pit that was mined. Section 6.3 describes what is known about production by the Romans.

In the 1940s, underground mining was attempted by the family of the land holders at the time to extract molybdenum from quartz veins, as indicated by the presence of a small exploration shaft at the far northeast corner of the Roman pits and three exploration adits driven from the beaches. MDA has no information on production, if any, from this effort.

Mount Wright Iron Mines, Climax Molybdenum Company, and Newmont Mining Corp. examined the Salave property in the mid-1960s, and Cominco Ltd. conducted a geophysical survey in 1967. Systematic testing of the gold zones at Salave began with work by IMEBESA, a subsidiary of Northgate Exploration Limited, in 1970. From IMEBESA’s drilling in 1970-1971 through that of Rio Narcea in 2004-2005, 303 core holes and 139 percussion/reverse circulation (“RC”) holes were drilled on the property (Table 6.1). There was no further drilling until Astur acquired the property in 2010.

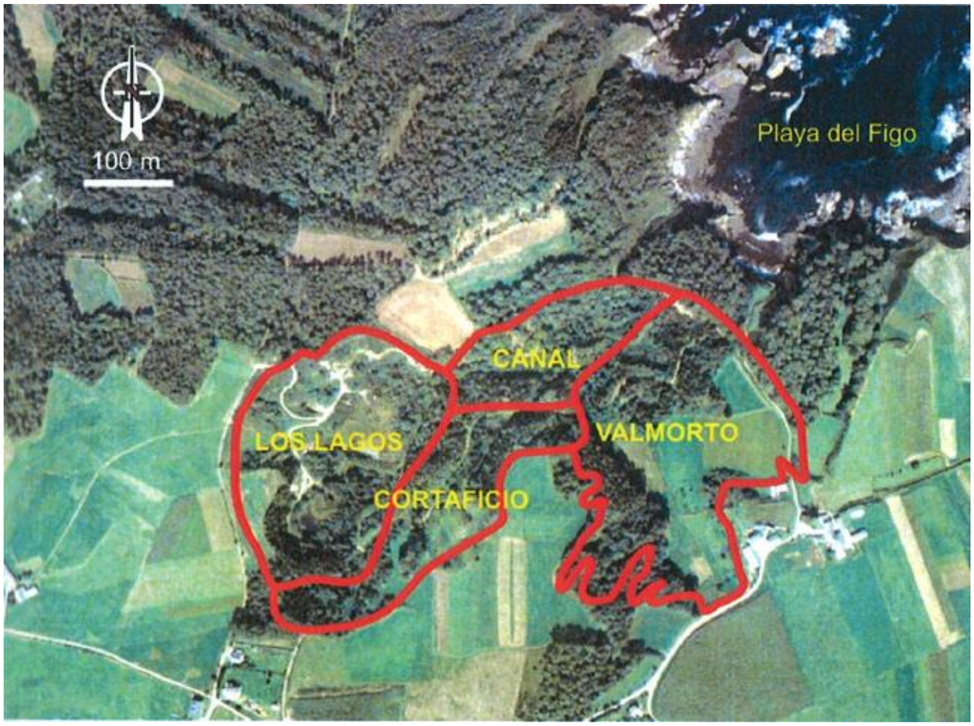
Table 6.1 Drilling at the Salave Gold Project from 1970 to 2005
(from Prenn (2014) and references therein)

Dates	Company	Core Holes		Percussion/RC Holes		Total Drill Holes	
		Number	(m)	Number	(m)	Number	(m)
1970-1971	IMEBESA	34	7,026.4			34	7,026.4
1971-1972	Rio Tinto	10	2,014.0			10	2,014.0
1976	Gold Fields	8	1,855.0			8	1,855.0
1981-1988	Anglo*	99	15,412.1	26 (perc.)	116.0	125	15,528.1
1981-1988	Anglo*	22	1,080.5			22	1,080.5
1988	Oromet	20	503.0			20	503.0
1990-1991	Newmont	32	5,873.6	2 (RC)	202.5	34	6,076.1
1996-1997	Lyndex	23	9,077.7	109 (RC)	5,333.0	132	14,410.7
2004-2005	Rio Narcea	77	17,331.8	2 (RC)	140.0	79	17,471.8
Total		**325**	**60,174.0**	**139**	**5,791.5**	**464**	**65,965.5**

* *The database used by MDA shows 99 Anglo core holes totaling 15,412.14 meters. Previous references reviewed by MDA indicate Anglo drilled 97 core holes totaling 14,886 meters; see text for discussion of a possible cause of the apparent discrepancy. Anglo drilled an additional 22 FM- series core holes totaling 1,080.45 meters that are in the database used by MDA and are included here although they appear to be just off the southeast corner of the present Salave property.*

Figure 6.1 Roman Excavation at Salave

(from Rodriguez Terente, 2007, adapted from Maldonado, 2006)



6.1.1 Cominco Ltd. 1967

Cominco Ltd. ("Cominco"), through its Spanish subsidiary Exminesa, conducted an induced polarization ("IP") survey over the Salave area in 1967 (Hillebrand, 1969, citing a report by George D. Tikkanen dated September 20, 1967 that MDA has not seen); although more recent references date Cominco's survey as 1964, Hillebrand's 1967 date is used here because Hillebrand's description was closest to the time of Cominco's work. Four northwest-trending IP lines were surveyed, spaced 120 meters apart with 50-meter dipoles, using a McPhar model 650 unit; the total length of line surveyed appears to have been approximately three kilometers (the three-kilometer figure is estimated from a rather illegible report). Tikkanen reported that a weak central anomaly with lower resistivity and slightly higher frequency effects was indicated on three of the lines but noted that the survey covered only a limited area.

6.1.2 IMEBESA (Northgate Exploration Ltd.) 1970-1971

IMEBESA, the Spanish subsidiary of Northgate Exploration Ltd., examined the Salave property in 1970 and 1971 on the basis of a weak response in an IP survey (Thomas, 1982). IMEBESA's work at Salave in 1970 was described by Müller (1971); Campos de Orellana Pardesa (2001a) and Agnerian (2004, 2010) summarized IMEBESA's work in both 1970 and 1971. Thomas (1982) also described some of the work performed by IMEBESA.

From late May 1970 through the end of that year, IMEBESA conducted geological mapping, geochemical surveying, and test drilling. Drilling continued into 1971, but MDA has no details on other exploration conducted during 1971.

A soil geochemical survey was conducted over the concessions between Tapia and Campos and Salave, including some additional ground to the south and east. Geological mapping at a scale of 1:5,000 covered the same area and was performed at about the same time as the soil survey. The soil survey, conducted by Geotecnica, analyzed 671 samples for copper, zinc, mercury, antimony, arsenic, and molybdenum and 1,678 samples for molybdenum, arsenic, and mercury. Samples were collected at 30-meter intervals along lines trending approximately west-northwest spaced 75 meters or 150 meters apart, depending on the zone. The soil samples were taken from a depth of about 15 centimeters from the surface. The survey identified some local, low-intensity anomalies of arsenic, molybdenum, and mercury but few strong anomalies (Müller, 1971; Catuxo, 1997; Rodriguez Terente, 2007).

IMEBESA's drilling consisted of 34 core holes totaling 7,026.4 meters (holes 1-3, 3A, 4-25, 26A, 26B, 27-32) (Ayala, 1973; Thomas, 1982); numerous previous references attribute only 32 holes to IMEBESA. The database used by MDA for this report contains all but holes 3A and 26A. All were inclined holes drilled at angles from 35 to 75°, based on the hypothesis that the best zones of mineralization were vertical or sub-vertical (Catuxo, 1997). These holes tested the extension at depth of the mineralization below the Roman open-pit workings (Thomas, 1982). IMEBESA's drilling program outlined a substantial area of significant gold mineralization (Crump and Suarez, 1977).

IMEBESA contracted with Lakefield Research ("Lakefield") of Canada for a short program of metallurgical test work on one composite high-grade sample, assaying 8.4 g Au/t (Thomas, 1982; Wilkinson, 1986; Wyslovzil and Bano, 1971). This test work is described in Section 13.1. IMEBESA stopped work at Salave in December 1971 (Ayala, 1973).

6.1.3 Rio Tinto Patiño S.A. 1971-1972

Rio Tinto Patiño S.A. ("Rio Tinto") explored the Salave property in 1971 and 1972. Before conducting field work, Rio Tinto completed check assaying of IMEBESA's reject core samples and found significant discrepancies, with IMEBESA's assays tending to be higher than Rio Tinto's checks (Ayala, 1973; Crump and Suarez, 1977). Due in part to these initial uncertainties about assay results (Crump and Suarez, 1977), Rio Tinto proceeded with an exploration program, conducting geological, geochemical, and geophysical surveys and drilling.

An IP and resistivity survey was carried out from April 24 through June 11, 1972 using Rio Tinto's own equipment (Cumpstey, 1972). The purpose of the geophysical survey was to investigate the intrusion surrounding the open pit that had been mined for gold by the Romans in the hopes of finding an extension to the mineralization. The survey used a pole-dipole electrode array with a potential electrode spacing of a=50 meters. Line spacing was 300 meters, with intermediate lines at 150 meters where anomalies occurred; the station spacing was 100 meters, with 50-meter spacing where anomalies occurred. The survey covered a total of 28 line kilometers. Four identified anomalies showed very low resistivity associated with high chargeability in most cases; all appeared to be near-surface anomalies. A fifth, less intense anomaly was found underlying the old Roman pit. A magnetic survey yielded negative results (Ayala, 1973).

While conducting the geophysical survey, soil-geochemical surveying was carried out on a 300 by 50-meter grid (272 samples) that enclosed a central grid covering 150 by 50 meters (131 samples) (Ayala, 1973). A sampling tool measuring 1.8 meters in length was used to sample at depths greater than 1.5 meters in order to avoid the marine Quaternary sediments that cover almost all of the project area. Of the 403 samples taken, the first 272 were analyzed for gold, copper, lead, zinc, molybdenum, and arsenic. The remaining 131 samples were analyzed for gold, copper, molybdenum, and arsenic. The maximum gold value was 11.9 ppm. Only a few limited anomalies were detected (Campos de Orellana Pardesa and Lobo, 1997a).

Rio Tinto drilled 10 vertical core holes totaling 2,014 meters (holes 33 through 42). Their drilling was not concentrated on the mineralized area as defined by IMEBESA, but instead tested the granodiorite and geochemical and geophysical anomalies in metasedimentary rocks along a 1,500-meter west-northwest-trending profile through and west of the western portion of the Roman excavations (Rayment, 1975a); only five of the 10 holes were located in the mineralized zone, according to a fragment of what appears to be a Gold Fields internal memorandum dated December 1976.

Rio Tinto's Chessington laboratory conducted mineral processing test work on Salave samples in 1972 and 1973 (Bulled, 1973; Gold Fields Espanola, S.A., 1976; Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Wilkinson, 1986). The results of this test work are discussed in Section 13.2.

Rio Tinto dropped the property in December 1972 (Ayala, 1973).

6.1.4 Gold Fields Española S.A. 1975-1976

Gold Fields Española S.A., the Spanish subsidiary of Consolidated Gold Fields Ltd. ("Gold Fields"), carried out geological and mineralogical studies as well as core drilling at Salave from October 1975 until December 1976 (Harris, 1979; Crump and Suarez, 1977). Gold Fields noted "significant analytical discrepancies" between the results of Rio Tinto and those obtained by Gold Fields in an initial check on IMEBESA and Rio Tinto reject core samples from March to July 1975. These discrepancies were a principal factor in Gold Fields' decision to investigate the property, along with a substantial increase in the gold price since 1972 (Crump and Suarez, 1977); Gold Fields felt that analyses by IMEBESA and especially Rio Tinto were too low (Harris, 1979). As part of their work at Salave, Gold Fields subsequently re-logged, prepared, and re-analyzed the remainder of available IMEBESA and Rio Tinto reject core. Gold Fields found that IMEBESA had over-reported gold content by 15-20% and that Rio Tinto had seriously under-reported gold content.

Gold Fields began field work in October 1975 with geologic mapping of the prospect on 1:2000 and 1:5000 scales and thin- and polished-section examination of selected drill core. Following interpretation of the deposit geometry from previous drilling, Gold Field initiated their drilling program in January 1976 (Thomas, 1982). Various reports indicate Gold Fields drilled eight holes totaling approximately 1,855 meters (Harris, 1979; Knutsen, 1991b; Campos de Orellana Pardesa, 2001a; Rodriguez Terente, 2007), although Crump and Suarez (1977) and the database used by MDA list seven holes totaling 1,830.5 meters (holes 43 through 48 and 50). Holes generally were inclined 60° or 70° east or west, but one was inclined 45° and another was vertical. The purpose of Gold Fields' drilling was to fill in a block of mineralization in the southern area identified by previous drilling and to test the northeast extension of this mineralization, where the geometry of the mineralization was poorly understood

(Crump and Suarez, 1977). Thomas (1982) reported that due to water problems at the bottom of the old workings, Gold Fields collared the majority of their holes on the periphery of the high-grade area identified by IMEBESA.

Warren Spring Laboratories carried out metallurgical test work for Gold Fields, which was limited to mineralogical examination of one sample with 2.59 g Au/t in addition to selected sections of core and standard cyanidation testing of four samples with grades ranging from 1.12 to 3.30 g Au/t (Crump and Suarez, 1977). Results of this test work are described in Section 13.3.

Gold Fields dropped the property in 1976 (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982), concluding it was uneconomic at that time (Crump and Suarez, 1977).

6.1.5 Exploraciones Mineras del Cantábrico S.A. ("EMC") 1980

EMC, a privately owned Spanish company, acquired the concessions that comprise the Salave property from the owners on February 1, 1980. EMC subsequently changed its corporate form in 2003 and appears as Exploraciones Mineras del Cantábrico S.L. in more recent references. The company's continuing history is described later in this section.

6.1.6 Anglo American Corporation of South Africa Limited 1980-1988

Anglo American Corporation of South Africa Limited and related Charter Consolidated P.L.C. (collectively referred to as "Anglo" in this report) held the Salave project from November 1980 to 1988 on a 50:50 joint venture basis through an option/lease between Charter Exploraciones, S.A., a subsidiary of Charter Consolidated P.L.C., and EMC; Charter Exploraciones, S.A. was the operator (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982). Exploration began in February 1981.

At the start of their program, Anglo ran analytical checks on 722 old pulps from previous drilling that represented all the mineralized portions in the area of prime interest that were still available (Anglo, 1981a). In addition, halved core from Gold Fields holes numbered 43, 45, and 48 was quartered, crushed, split, and also sent for analysis. The samples were sent to Johannesburg for analysis, presumably at the Anglo American Research Laboratories. Samples were analyzed for gold, silver, total sulfur, molybdenum, arsenic, and antimony (Anglo, 1981a). The results showed overall that the original gold values and standard deviations for gold in some longer intersections from IMEBESA, Rio Tinto, and Gold Fields holes were generally similar to results obtained by Anglo (Anglo, 1981a; Hutchison, 1986). In addition, Anglo's first 14 vertical core holes were drilled to confirm the previously identified mineralization, and these holes showed similar gold values to those obtained in earlier drilling (Hutchison, 1982, 1986).

Anglo reported on data from a geochemical exploration program conducted by the Institute of Geology and Minerals of Spain (Charter Exploraciones S.A., 1981). Seven east-trending sampling lines crossed the general Salave area, ranging in length from 2,250 meters to 400 meters. Samples were collected every 30 meters from the bottom of pits dug to about 1.5 meters deep, presumably designed to penetrate the marine gravels. Three of the lines were in the Salave pit area. Two lines south of the pit area identified gold and arsenic anomalies about 400 meters southeast of the Roman pit.

Anglo conducted geologic mapping, channel sampling, geochemical and outcrop sampling, and percussion drilling to probe for extensions to the mineralized body (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Hutchison, 1986). Geological mapping was completed in the area of the old Roman workings at a scale of 1:1000, while geologic mapping of the entire mining lease was completed at a scale of 1:5000 (Hutchison, 1982). However, the lack of outcrop limited the value of regional mapping and outcrop sampling. Channel sampling in 1981 and 1982 over the area of the Roman workings and along the cliff faces on Represas beach, west of the old workings, showed significant gold mineralization, up to 22.0 g Au/t over two meters, in the eastern part of the old workings (Hutchison, 1982). An initial soil-geochemical sampling program was conducted over an area 1,000 meters square surrounding the old Roman workings on lines 100 meters apart with samples every 25 meters, which was later extended to the limits of the property along lines 200 meters apart and with samples collected every 50 meters (Hutchison, 1983). Several anomalous gold concentrations in the soils were identified, with some north, east, and west of the old workings thought to reflect bedrock mineralization (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Hutchison, 1983). Shallow percussion drilling south and east of the Roman workings showed anomalous concentrations of arsenic and gold, with a peak value of 1.45 g Au/t. Outcrop sampling within the old workings but beyond the limits of previous drilling revealed several areas with greater than 0.5 g Au/t.

Anglo drilled 99 core holes (totaling 15,412 meters) on the Salave property. In addition to these core holes, Anglo used a small percussion drill to drill a total of 26 holes (116 meters) scattered over the area south and east of the old Roman workings as described above (H-series holes) (Hutchison, 1982, 1983); these H- series holes are not in the database used for the resource estimate for this report, and Astur reports that no records for these holes have been found. The high water table severely limited the effectiveness of this percussion drilling, but granodiorite drilled in one of the holes located 700 meters southeast of the old workings showed a peak anomalous gold value of 1.45 g Au/t with 0.35 g Ag/t (Hutchison, 1982). Three other holes in the granodiorite in the same area showed highly anomalous arsenic values. Anglo performed a structural analysis using oriented core, but no preferential directions to faults and fractures were found within the mineralized body (Hutchison, 1986).

Anglo completed an IP survey totaling 14.75 line kilometers in 1983 over the area west of the Roman workings and up to the concession boundaries to probe for mineralization and/or granodiorite beneath the Quaternary cover. The contractor for the work was Compania General de Sondeos S.A. (Charter Exploraciones S.A., 1983c). Lines 100 meters apart were run with five depth readings at stations every 50 meters. Resistivity and chargeability profiles interpreted by both the contractor and Anglo's geophysical department showed several anomalies. Seven core holes were drilled to test these anomalies, drilling to projected anomaly depths of between 50 and 100 meters for a total of 488.8 meters. No granodiorite or significant mineralization was found (Hutchison, 1986).

The Anglo American Research Laboratory conducted a number metallurgical test programs on Salave samples. These are discussed in Section 13.4.

During their second phase of drilling, Anglo ran tests on water inflow rates in the core holes, and salinity tests were conducted on the water (Hutchison, 1982, 1983, 1986). Although the salinity test results indicated the water was fresh, drillers had reported slight tidal variations in the water level in hole S13/1(Hutchison, 1986).

In January 1984, Anglo signed an option agreement with EMC for the Fabrica de Mieres property adjoining the Figueras concession on the southeast and including the eastern end of the Salave granodiorite (Charter Exploraciones S.A., 1984a). An IP survey was completed by Compania General de Sondeos (Charter Exploraciones S.A., 1984b). Anglo drilled an additional 22 core holes on this property in 1984 (FM- series) to test the granodiorite and to investigate IP anomalies but found no significant mineralization (Hutchison, 1986). They did not renew the option on the Fabrica de Mieres property (Charter Exploraciones S.A., 1984d).

As described in Section 6.1.7, Anglo dropped the Salave property following dissolution of an agreement with the Oromet Joint Venture.

6.1.7 Oromet Joint Venture 1988-1989

The Oromet Joint Venture ("Oromet") was a joint venture between Glamis Gold Inc. and Biomet Technology Inc. Oromet negotiated a controlling interest of the Salave property with Anglo in order to investigate the response of the Salave mineralization to bio-oxidation. Oromet completed 503 meters of shallow core drilling in 20 holes (12.5-meter by 12.5-meter grid) in the northeast part of the old Roman pit in 1988. In addition, in 1988 Oromet conducted a number of metallurgical tests using BioMet technology; these are described in Section 13.5. In 1989, Oromet suddenly withdrew from Salave, and Anglo chose not to continue work on the project, which reverted to EMC (Knutsen, 1991b).

6.1.8 Newmont Mining Corp. 1990-1991

Empresa Minera Newmont Inc. y Compañía, S.C., a partnership held by two wholly owned subsidiaries of Newmont Mining Corporation (collectively called "Newmont" in this report), acquired a two-year lease with a terminal purchase option on the Salave property from EMC in November 1990. Newmont had been interested in the property since 1965. Newmont conducted confirmatory geologic mapping, measured a stratigraphic section of the metasedimentary rocks in Poleas playa, and re-logged core from 25 Anglo drill holes.

Newmont did not conduct any geochemical or geophysical surveys at Salave. Knutsen (1991b) did note that a 1983 soil geochemical survey by Anglo showed no obvious soil geochemical anomaly in the area between Newmont's holes NSC4 and NSC28, where Newmont found an extension of gold mineralization.

Based on the information in the database provided to MDA, Newmont completed 5,873.55 meters in 32 core holes and 202.5 meters in two RC drill holes; Knutsen (1991b) reported 5,870.45 meters in 29 core and two RC holes. The disparity appears to be primarily in holes 5A, 5B, and 5C included in the database.

Newmont also conducted metallurgical test work, which is described in Section 13.6.

Newmont installed piezometers in 17 drill holes to assess fluctuations in water level, as discussed in Section 10.7.

Newmont carried out work in 1991 for a feasibility study that was never completed, as described in Section 24.0 and then returned the property to EMC at the end of 1991. According to Knutsen (1991b), Newmont did not renew the lease for the second year because of inadequate tonnage and grade for an underground mine and a then hypothesized 10:1 stripping ratio for an open pit.

6.1.9 Exploraciones Mineras del Cantábrico S.A. (continuing)

On July 6, 1992, EMC leased the Salave property to John Patrick Sheridan of Toronto, Canada. Also in 1992, EMC carried out an estimate of the mineral resources that could be exploited by underground mining (see Table 6.2).

6.1.10 Lyndex Explorations Ltd. 1993-2004

John Patrick Sheridan formed a Spanish company called San Diego Gold Minery, S.A., a subsidiary of Lyndex Explorations Ltd. ("Lyndex") of which John Patrick Sheridan was a director, to explore the Salave property (Campos de Orellana Pardesa and Lobo, 1997a). Lyndex held the property until 2004.

Magnetic and electromagnetic surveys were conducted in November 1995 on a grid about 2,000 meters in an east-west direction and about 600 meters north-south, centered on the Roman pit (Campos de Orellana Pardesa and Lobo, 1997a; Campos de Orellana Pardesa, 2001a). The electromagnetic survey was conducted with APEX-MAX/MIN equipment. Lines were spaced 100 meters apart. The transmitter and receiver stations were spaced 50 meters apart, and station spacing was 20 meters. A Scintrex MP-2 proton magnetometer was used for the magnetic survey, with a 10-meter spacing between stations. These surveys did not detect any significant anomalies (Campos de Orellana Pardesa and Lobo, 1997a).

Lyndex conducted both core and RC drilling at Salave from October 1996 through December 1997 (Campos de Orellana Pardesa, 2001a). They completed 9,077.65 meters of core drilling in 23 vertical holes, based on the database provided to MDA; a table in the reports by Catuxo (1997) and Campos de Orellana Pardesa (2001a) shows the same 23 holes but totaling 9,044.90 meters, with the discrepancy in total depth appearing in three holes (9601, 9703, and 9708). In addition, Lyndex drilled RC holes (Catuxo, 1997), variously reported as 102 holes totaling 5,455 meters (Agnerian, 2004, 2010) or 5,296.70 meters (Valdés Suárez, 2012) and 109 holes totaling 5,333 meters (Campos de Orellana Pardesa, 2001a); the database used by MDA included only 24 RC holes totaling 683.9 meters. Lyndex's core holes tested a relatively small and deep high-grade zone of mineralization originally identified by some of Anglo's (3/2, 5/4, and 5/5) and Newmont's holes (NSC19, 20, 21, 22, and 26) (Campos de Orellana Pardesa, 2001a; Catuxo, 1997). Lyndex's RC holes were generally very shallow and were drilled in a narrow grid with a spacing of 7.5 meters to 15 meters at the bottom of the Roman open pits in order to confirm results of previous operators and to improve knowledge of the oxidized mineralization in the area of a potential open pit (Campos de Orellana Pardesa, 2001a; Catuxo, 1997).

In November 2002, Lyndex drilled a percussion hole 30 centimeters in diameter and 200 meters deep as a pilot for a proposed shaft. Instability of the hole due to the presence of Quaternary sediments and older metasedimentary rocks to a depth of 40 to 45 meters in the hole led Lyndex to consider use of a ramp to permit underground drilling.

Lyndex also hired divers to collect seven samples from five points in the seabed off the beach at El Figo to look for possible continuation of the mineralized zone to the northeast. The gold content did not exceed 0.03 ppm (Campos de Orellana Pardesa, 2001a).

6.1.11 Rio Narcea Gold Mines, Ltd. 2003-2010

Rio Narcea Gold Mines, Ltd. ("Rio Narcea") purchased 85% of the shares of EMC in October 2003 through its wholly owned subsidiary Naraval Gold S.L. (Rio Narcea Gold Mines Ltd. news release, April 5, 2004, and 2003 Annual Report). On March 9, 2004, the lease between EMC and John Patrick Sheridan was terminated subject to a agreement which entitled John Patrick Sheridan to receive cash payments based on permitting and production milestones and ultimately an underlying royalty (see Section 4.4.2). The lease termination agreement gave Rio Narcea the exclusive right to explore and develop the project. Later in 2004, Rio Narcea acquired 93.7% of EMC through two equity financings in EMC in which the minority shareholders did not participate (Rio Narcea Gold Mines Ltd. news release, March 29, 2005). By February 2010, Rio Narcea controlled 95.04% interest in the issued and outstanding shares of EMC, according to the share purchase agreement dated February 10, 2010.

Rio Narcea compiled all available information about the project from previous operators and developed an updated database that included drill-hole data from Lyndex, Newmont, and Anglo. In early 2005, Rio Narcea contracted with International Geophysical Technology, based in Madrid, to conduct a gravimetric survey at Salave. Figure 6.2 shows the residual gravity. Altered granodiorite is believed to be reflected by the blue colors showing lower density (Valdés Suárez, 2012).

Rio Narcea drilled 79 holes from May 2004 to May 2005, of which five were geotechnical holes (RN01, GT1, GT2, GT3, and GT4) and two (Hidro1 and Hidro2) were for hydrological purposes; the remainder were for resource evaluation and exploration (Astur, written communication). All but the two hydrological holes were core holes; the remaining two were RC holes.

In addition, Rio Narcea contracted for metallurgical work (Ausenco Limited, 2006), a geotechnical report, design of potential mining facilities, an archeological study, hydrogeological studies, and environmental baseline studies. The metallurgical studies are described in Section 13.7.

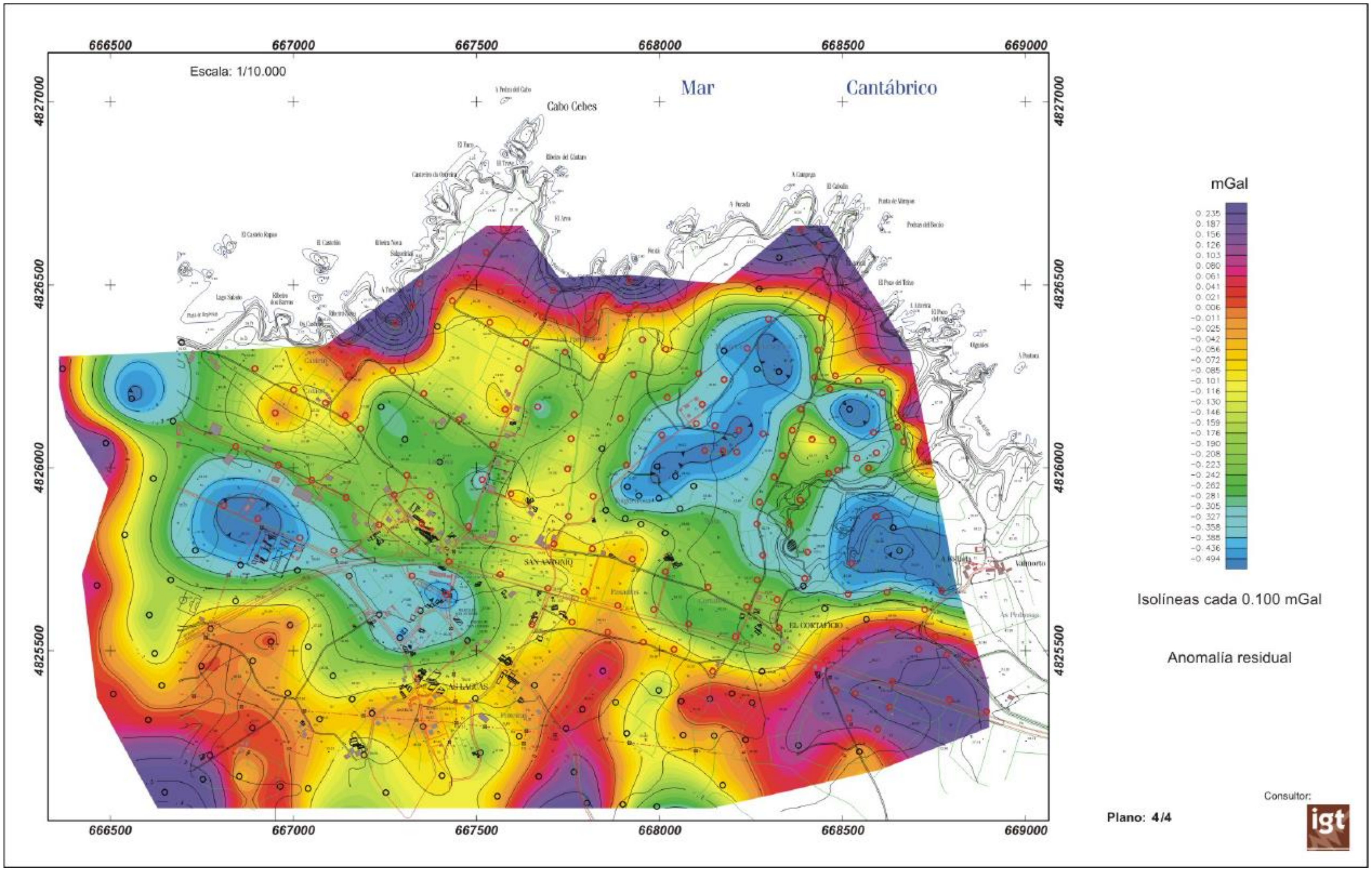
Rio Narcea ceased further exploration at Salave in August 2005 when they were unable to permit an open-pit operation.

6.1.12 Lundin Mining Corporation 2007-2010

In 2007, Lundin Mining Corporation ("Lundin") acquired all of the outstanding shares of Rio Narcea (Lundin Mining Corporation news release, November 13, 2007), thereby acquiring Rio Narcea's interest in the Salave project. Rio Narcea became a wholly owned subsidiary of Lundin. In February 2010, Rio Narcea entered into an agreement to sell their interest in the Salave project to Dagilev Capital Corp. (subsequently renamed Astur Gold Corp.). Terms of the sale are discussed in Section 4.4.1.

From Lundin's news releases during this period, there is no evidence that they or Rio Narcea conducted exploration or other activities on the Salave project.

Figure 6.2 Residual Gravity of the Salave Area
(From Valdés Suárez, 2012)



6.1.13 Astur Gold Corporation 2010 to 2016

Dagilev Capital Corporation ("Dagilev") acquired 100% interest in the Salave project by purchasing the issued and outstanding securities of EMC held by Lundin's subsidiary Rio Narcea in February 2010 and by purchasing the remaining issued and outstanding securities of EMC in March 2010; EMC became a wholly owned subsidiary of Dagilev (Dagilev Capital Corp. news releases, February 11, 2010; March 18, 2010; and April 14, 2010). Dagilev was renamed Astur Gold Corporation on June 4, 2010 (Astur Gold Corp. news release, June 4, 2010). Astur's exploration of the Salave project is described in Section 9.0. Following the passing of John Patrick Sheridan in 2015, Astur assigned the underlying royalty and rights of John Patrick Sheridan (Section 4.4.2) to SPG Roylaties Inc. Astur changed its name to Black Dragon Gold Corp. on October 14, 2016.

6.2 Historical Mineral Resource and Reserve Estimates

All but one of the following historical estimates pre-date the implementation of NI 43-101 reporting requirements. The following historical estimates are presented here only for historical completeness. A qualified person has not done sufficient work to classify any of these historical estimates as current mineral resources or mineral reserves, and Black Dragon is not treating any of these historical estimates as current mineral resources or reserves. Terminology used by the authors of these reports, such as "reserves" and "resources," is shown in quotation marks and may not reflect the use of those terms as defined by CIM Standards, nor are the differences from the CIM Standards known. The author has not verified these historical estimates and very little is known of the key assumptions, parameters and methods used in the preparation of these estimates. These estimates are not considered reliable and are superseded by the current mineral resource estimate described in Section 14.0.

Table 6.2 summarizes various historical "resource" and "reserve" estimates made for the Salave project.

Table 6.2 Historical "Resource" and "Reserve" Estimates for the Salave Deposit
(Modified from Agnerian (2004, 2010), with additional information from Crump and Suarez (1977), Brown (1986), Hutchison (1986), Knutsen (1991b), Lavandeira (1992), and Campos de Orellana Pardesa, (2001a))

Company	Date	Method	Category[1]	000's Tonnes	Au g/t	Cutoff g Au/t	Contained Au 000's oz
Gold Fields	1976	Manual	"probable reserves"	21,880.0	1.88	1	1,322.6
Anglo	1982	Manual	"indicated reserves"	9,116.0	2.90	1	850.0
	1983	Manual	"probable geologic reserves"	9,226.6	2.82	1	836.5
	1984	Geostatistical[2]	"*in situ* open-pit reserves"	10,930.0	2.15	1	755.5
			"minable selective open-pit reserves"	7,230.0	4.23	1	983.3
	1986	Manual	"probable+possible reserves"	19,370.9	2.73	1	1,700.4
			"probable reserves"	9,290.7	2.83	1	845.3
			"possible reserves"	10,080.3	2.64	1	855.6
			"*in situ* mineable reserves"	15,008.0	2.67	1	1,288.3
	1988	Manual		26,244.0	2.04	1	1,721.5
Newmont	1991	Geostatistical	"resource"[3]	25,081.0	2.35	1	1,894.5
		?	"underground *in situ* resources"[4]	2,800.0	7.71	3	694.1
		Polygonal	"underground minable 'reserves'"[3]		5.50	3	300.0
EMC	1992	Manual	"drill proven, undiluted resources"	1,697.6	7.35	3	401.2
			"probable, undiluted resources"	698.2	8.22	3	184.5
			"possible, undiluted resources"	382.1	8.35	3	102.6
Lyndex	2001	?	"resource" for "potential underground mining"	5,500.0	7.70	3	1,361.6
Rio Narcea	2004	See Table 6.3					

[1] *"Category" is as cited by the original authors and does not conform to current CIM Standards.*
[2] *Mineral Industries Computing Limited performed these estimations for Anglo (Lavandeira, 1992).*
[3] *Information taken directly from Newmont (Knutsen, 1991b)*
[4] *Information from Campos de Orellana Pardesa (2001a), presumably taken from Newmont information*

In a 2004 Technical Report prepared for Rio Narcea, RPA estimated a mineral resource for the Salave deposit (Agnerian, 2004). RPA used the same drill-hole database as the one Newmont had used for their 1991 estimate and also used the assay database from Lyndex's drilling and for holes RN-02 to RN-14 and RN-16 to RN-17 drilled by Rio Narcea as of the date of the estimate. RPA constructed a 3D block model with blocks measuring 10 meters (east-west) by 10 meters (north-south) by five meters (vertical) and used kriging to interpolate the gold grades of the blocks. Using a density of 2.74 g/cm^3, recovery of 90%, and a gold price of $350 per ounce, RPA calculated a cutoff grade of 1.74 g Au/t but reported the resource at a nominal cutoff grade of 1 g Au/t because the gold price considered by Rio Narcea was considerably lower than the price at the time of the estimate, in the range of $390 to $410 per ounce. Table 6.3 shows the 2004 estimate for Salave.

Table 6.3 2004 Estimated Resources for Salave
(from Agnerian, 2004)

Category	000's Tonnes	Grade g Au/t
Measured	354.1	2.70
Indicated	14,841.0	3.00
Measured + Indicated	15,195.1	2.99
Inferred	2,812.6	2.47

6.3 Historical 1991 Newmont "Pre-Feasibility" Work

As part of its investigation to assess the mineral potential of the Salave project, Newmont carried out initial aspects of a pre-feasibility study in 1991. The following description of that work is taken from Knutsen (1991b) and the Technical Report by Agnerian (2010).

Newmont's work included:

- Identification of required surface properties
- Generation of detailed topographic maps
- Environmental baseline studies, including socio-economic impacts and climatic data
- Site geotechnical studies
- Archeological studies to ensure that the company satisfied the requirements of the Consejería de Cultura (Council of Culture) of Asturias
- Assessment of capabilities of Spanish engineering and construction companies
- Mineralogical studies. Newmont carried out a number of analyses using x-ray fluorescence ("XRF") and x-ray diffraction ("XRD") techniques.
- Metallurgical studies. Newmont concluded that the high dolomite content coincident with the mineralization (would make) bio-oxidation of heap-leachable ores impractical (Knutsen, 1991b).
- Collection of information regarding permitting, applicable regulations, and government financial support
- Consideration of the potential value of feldspar as a by-product from future mining operations at Salave.

Newmont paid particular attention to the hydrologic and archeological aspects of the property because of the project's proximity to the coastline and the potential dewatering problems of operating below sea level. In terms of hydrogeology, Newmont's primary concerns included:

- Delineation and characterization of the water table aquifer in the unconsolidated and weathered bedrock
- Delineation and characterization of fracture and fault flow in the bedrock.

Based on a report by Sunblad (1991), Newmont concluded that:

- "Bedrock is competent with the exception of faulted, brecciated and highly fractured zones. It is probable that intrusive syenite dikes in the deposit may provide zones of aquifer storage due to solution weathering.
- Examination of the water levels in the borehole piezometers indicates confined aquifer condition in the bedrock. Boundary conditions produce dramatically different pressure heads (up to 8m) across relatively short horizontal distance between boreholes. The local flow gradient in the deposit area is toward the lagos or the center of the project area.
- The lagos (small flooded area within the Roman pit) provide a potential connection or outlet to the atmosphere for the deeper confined system and water table aquifer. The aquifer zones are connected in the mine area due to previous mining in the pit area, exploration boreholes and adits, and the dewatering galleries."

Although minor data collection of public information continued until Newmont relinquished the property at the end of 1991, further work remained to be completed by Newmont prior to a feasibility study report on the project. Newmont, however, did not complete this feasibility study.

Newmont also contracted an archaeological study of the project area by Dr. A. Villa Valdés. As expected, the archaeological inventory confirmed the historic mining activities by the Romans, including the presence of a network of hydrologic canals, but no evidence was found for Roman habitation (Agnerian, 2010).

6.4 Past Production

The only known past production of gold from the Salave project dates from Roman times.

There are various reports of estimates of total production by the Romans. Rio Narcea estimated that approximately 3,265,000 tonnes of material were mined from the four areas of the Roman excavation (Figure 6.1) (Rodriguez Terente, 2007, citing Maldonado, 2006). Hutchison (1986) reported that it had been estimated that about three million tonnes of friable material were mined at an average grade of possibly 6 g Au/t (surface concentration). Crump and Suarez (1977) estimated that the Romans mined between two and four million tons of material, recovering between 5,000 and 7,000 kilograms of gold (Parry, 1991, cited by Rodriguez Terente, 2007). Lavandeira (1992) estimated that the Romans removed some five million tons of rock. Harris (1979) reported a "rough volume calculation" of four to five million tonnes mined from the ancient open pits. Lyndex (1994) proposed the largest tonnage produced during the Roman era – some six million tonnes.

Mining by the Romans was done by open-pit methods, excavating the near-surface material to depths averaging 30 meters. Dewatering tunnels and canals were dug out to the sea. Processing of the material included gravity concentration of the gold by transporting the loose oxidized material along several large and adjacent sluice channels (Agnerian, 2010, citing Jones and Bird, 1972; Lewis and Jones, 1970; Domergue, 1970). Crump and Suarez (1977) hypothesized that the presence of abundant ground water and high-grade mineralized outcrop at the base of the open pit imply that the Romans abandoned the mine due to problems of draining below the local water table rather than because the deposit had been mined out.

7.0 GEOLOGIC SETTING AND MINERALIZATION

The following summary of the geologic setting and project mineralization includes numerous interpretations and observations from others, including background information from Agnerian (2004, 2010), Tenorio (2011; Tenorio *et al.*, 2013), Martínez Catalán *et al.* (2013), Valdés Suárez (2012), Rodriguez Terente (2007), Nieto (2004), McMillin (1991), Bastida *et al.* (1986), Harris (1979), Crump and Suarez (1977), Müller (1971), and other references as cited. Mr. Gustin believes this summary is an accurate representation of the geology of the Salave project as it is presently understood.

7.1 Geologic Setting

7.1.1 Regional Geology

The Salave gold deposit is located within the West Asturian–Leonese Zone ("WALZ") of the northwestern portion of the Hercynian Iberian Massif (Figure 7.1). The Hercynian, or Variscan, orogen consists of rocks of Late Proterozoic to Carboniferous age that were deformed, often metamorphosed, and intruded during the collision of Laurasia and Gondwana in Late Devonian to Carboniferous time (370 to 290 Ma). The WALZ represents the transition between unmetamorphosed foreland areas (Cantabrian Zone) situated to the east and the more internal zones of the Hercynian orogen to the west (Central Iberian Zone) (Figure 7.1).

The Cantabrian Zone contains the continental part of the Paleozoic succession, with relatively small thicknesses of pre-orogenic sedimentary rocks that were deformed in a foreland thrust belt. In contrast, the WALZ contains a nearly continuous series of Cambro-Ordovician to Carboniferous clastic siliceous and carbonate rocks approximately 11,000 meters thick, which has undergone intense deformation. The Paleozoic sedimentary rocks of the WALZ were deposited unconformably on Upper Proterozoic rocks that are not exposed in the Salave project area. Proterozoic rocks are found on the eastern and western edges of the WALZ in the cores of two antiforms (Figure 7.1). Silurian to Carboniferous rocks are also not exposed in the Salave project area.

Compressional tectonics during the Hercynian orogeny formed east- and northeast-directed overturned and recumbent folds as well as major thrust faults. Three phases of deformation affected the WALZ:

- The first deformation phase (D_1) produced eastward-verging recumbent folds. The primary slaty cleavage or schistosity (S_1) developed during D_1.
- The second deformation phase (D_2) was responsible for the appearance of thrusts, associated sub-horizontal shear zones, and related structures. The largest of the thrust sheets is the Mondoñedo nappe. A variety of fault breccias, shear folds, crenulation cleavages or schistosities (S_2), and mylonitic zones are related to this phase.
- The third deformation phase (D_3) gave rise to large, upright open folds with steep axial planes plus minor folds and local development of crenulation cleavage (S_3). Locally there is also a system of transverse folds, which, when superimposed on the earlier D_3 folds, produced interference patterns.

Figure 7.2 shows both a plan view and cross section illustrating the complex compressional deformation that has affected the WALZ, with – from west to east – stacked recumbent folds verging toward the east, thrusts, and then large open folds with sub-vertical axial planes located farther to the east.

The morphology of the coastline near Salave is controlled by northeast-trending and moderately to steeply northwest-dipping, upright to isoclinally folded metasedimentary rocks. Northwest-trending faults have acted as secondary control to the coastline morphology.

The Bay of Biscay developed in Late Triassic to Early Cretaceous time as Iberia slowly separated from northern Europe along one arm of a tensional triple junction.

Hercynian magmatism covers a time span of approximately 70 Ma (from 350 Ma to 280 Ma) and took place during the waning stages of the Hercynian collision. Syntectonic intrusions that include peraluminous to strongly peraluminous monzogranites and leucogranites were emplaced during the D_2 and D_3 deformational events. Post-tectonic granodiorite-monzogranite intrusions with some leucogranite were emplaced after the main phases of Hercynian crustal shortening. These post-tectonic intrusions are mainly responsible for the Salave gold deposit and the gold-copper deposits of El Valle-Boinas and Carlés, as well as other gold prospects in the northern Iberian Peninsula.

Synkinematic regional metamorphism, contact metamorphism related to intrusions, and retrograde metamorphism has affected the rocks within the WALZ. The Salave plutonic complex is mainly within the biotite zone, but in the vicinity of granitic intrusions, the andalusite-cordierite and locally garnet isograds are reached.

Figure 7.1 Geologic Map of the Northwestern Part of the Iberian Peninsula
(from Nieto, 2004)

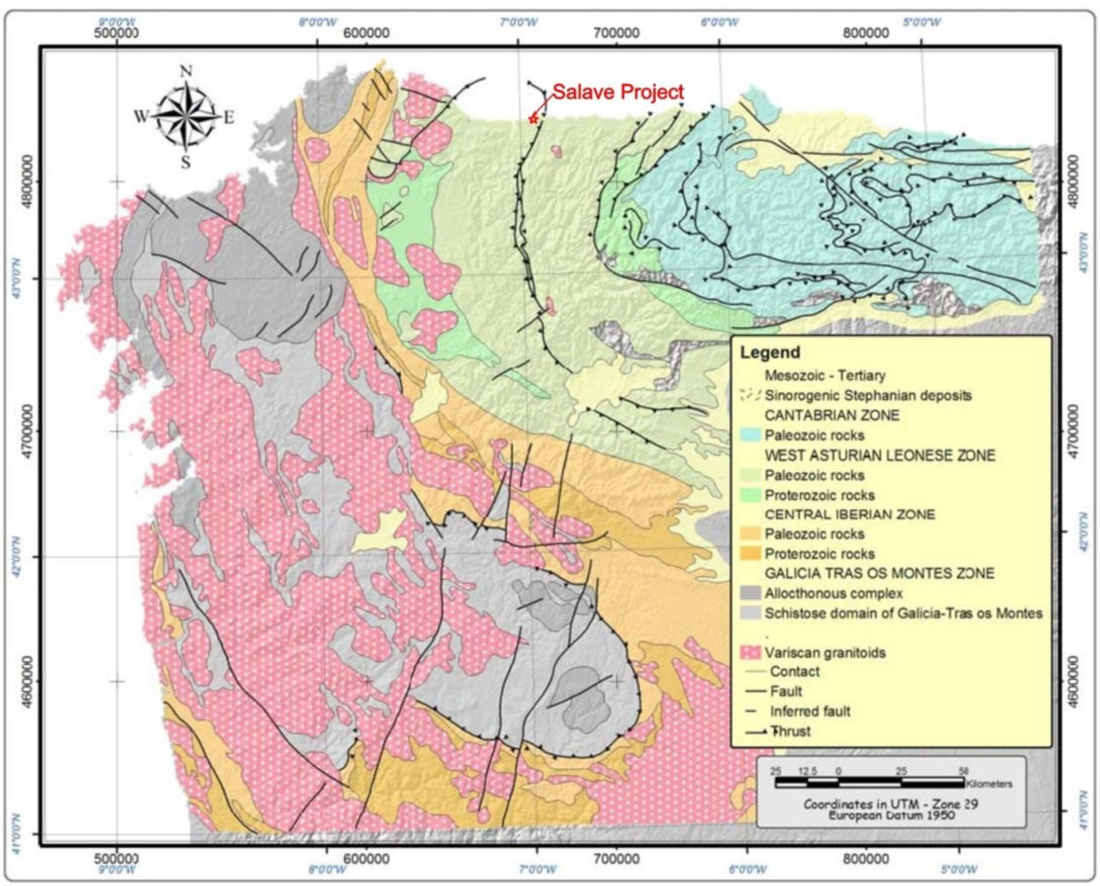
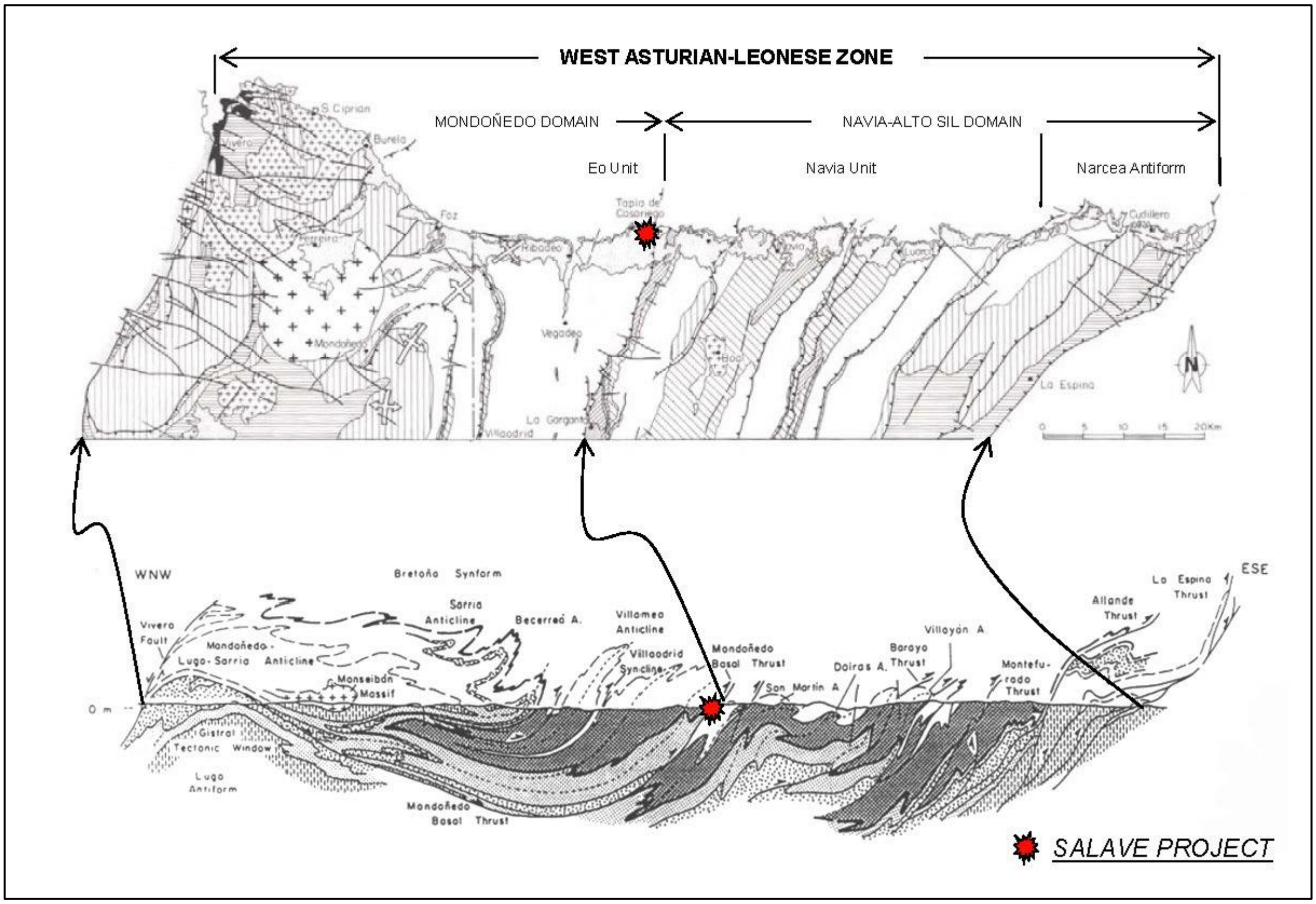


Figure 7.2 Deformation in the West Asturian–Leonese Zone
(from Nieto, 2004)



7.1.2 Local Geology

The Tapia area is dominated by a thick sequence of Upper Cambrian to Ordovician metasedimentary rocks that includes the Los Cabos Series and Luarca and Aqüeira formations (Crump and Suarez, 1977). These rocks are predominantly arenaceous to argillaceous metasedimentary units with quartzite, greywacke, and black graphitic and pyritic schist and slate as important members of the succession. A number of oolitic ironstone horizons are present in the Luarca Formation that crops out in the Porcia area. These metasedimentary rocks strike northeast and generally dip west.

The Mondoñedo nappe consists of low- to medium-grade metasedimentary rocks that were folded by east-verging recumbent structures during the first phase of deformation and then thrust several tens of kilometers toward the east during the second deformation phase (Bastida *et al.*, 1986). A shear zone up to three kilometers thick was developed at the base of the thrust sheet, deforming granitoid bodies that were intruded after D_1 and before or during D_2. The north-northeast-trending Mondoñedo thrust that passes just east of the Salave project is one of the major Hercynian thrust faults and separates the large stack of recumbent folds and thrusts of the Mondoñedo nappe to the west from an area of smaller and more open folds to the east (Figure 7.2). Late- to post-Hercynian intrusions, such as the Salave granodiorite, were likely channeled by these crustal-scale thrusts (Knutsen, 1991b). The Salave plutonic complex was emplaced just at the eastern border of the Mondoñedo nappe. The Salave deposit lies in the Mondoñedo nappe, close to its thrust contact with the Narcea antiform to the east.

In the Tapia area, the metasedimentary rocks are intruded by three west-northwest-trending plutons that range in composition from gabbro to granodiorite (Figure 7.3). These plutons are aligned along a west-northwest-trending strike-slip fault that predated the intrusions. The close proximity, mineralogical similarities, and single metamorphic aureole of these intrusions suggest they have a common parent magma (Crump and Suarez, 1977).

7.1.3 Property Geology

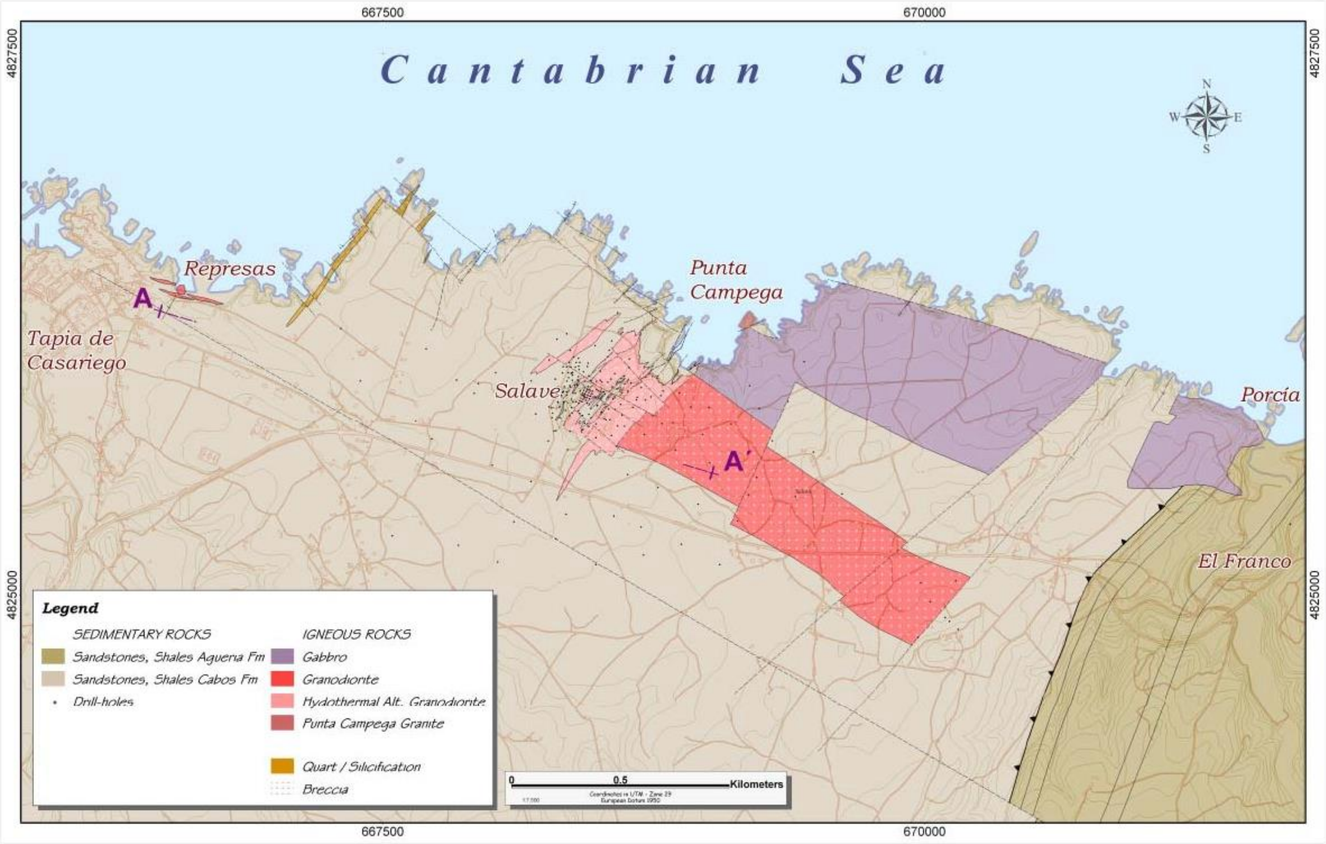
Most of the Salave project area is covered by Quaternary marine sediments ranging from a few centimeters to over 70 meters thick. The scarcity of outcrops, which are largely confined to coastal cliffs, makes geologic mapping of the property difficult.

The Salave concessions are situated at the eastern border of the Mondoñedo nappe, which is separated from a less-deformed area to the east by the basal thrust of the nappe – the Mondoñedo thrust. West of the Mondoñedo thrust, and within the Salave property, the area is underlain by quartzite, sandstone, argillite, shale, and greywacke of the Cambro-Ordovician Los Cabos Series that have been metamorphosed to slate, arenite, quartzite, and graphitic slates (Figure 7.3). The Mondoñedo thrust places the Upper Cambrian Los Cabos Series over the Upper Ordovician Agüeira Formation. Where the metasedimentary rocks are intruded by igneous rocks, contact metamorphism takes the form of biotite and pyroxene hornfels, with cordierite, andalusite, and local garnet, which is superimposed on the greenschist-grade regional metamorphism exhibited by rocks beyond the contact aureole.

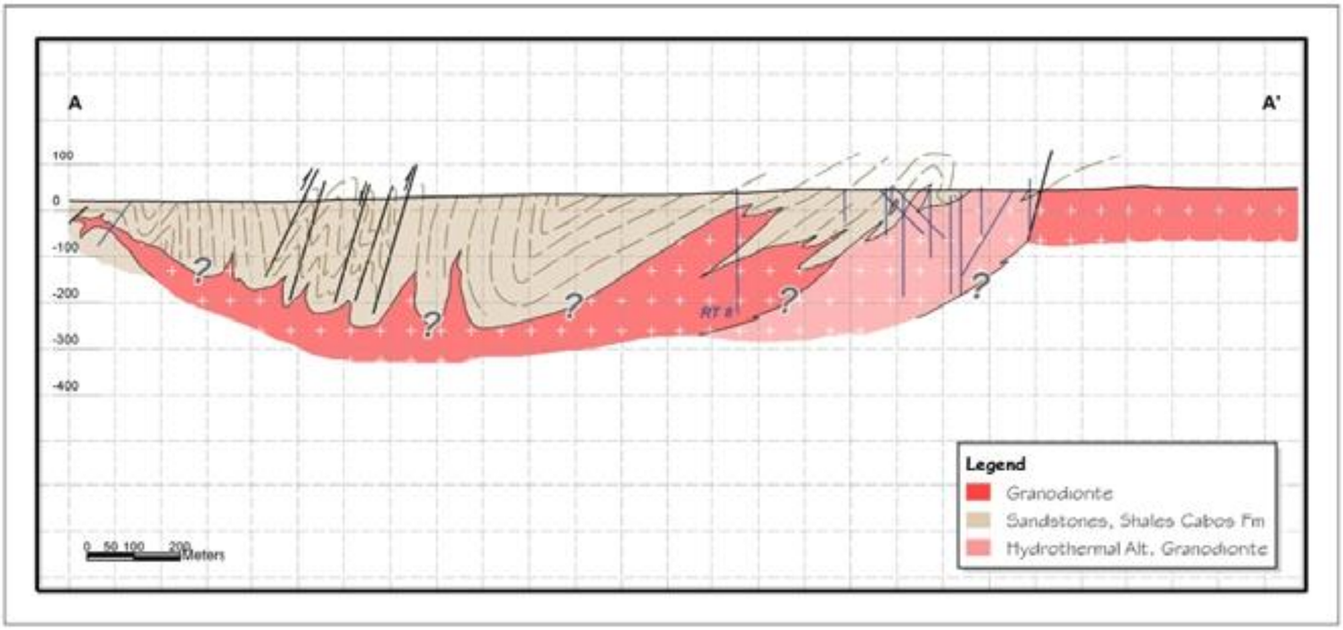
The Salave deposit is underlain by granodiorite, which is a small part of the Porcia Intrusive Complex that extends approximately four kilometers, from Rio Porcia to Represas Playa just east of Tapia. The granodiorite crops out in the western part of the complex. To the south, the complex is covered by thin Quaternary alluvium. The igneous rocks in the Salave area are directly related to the mineralization and comprise several stocks and dikes whose ages range from 330 to 287 Ma.

Oxidation is not intensive and extends for a few meters below the surface (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982), except along larger faults and structural zones where it can locally exceed 200 meters vertically.

Figure 7.3 Local Geology of the Salave Gold Project
(from Nieto, 2004)



The "Aqüeira" Formation is shown as the "Agueria" Fm on the legend for this figure.



7.1.3.1 Igneous Rocks at Salave

The igneous rocks at Salave range in composition from gabbro to granodiorite. Important plutons are discussed individually below.

Salave Granodiorite

The Salave gold deposit is primarily hosted by the Salave granodiorite. From outcrops and drill holes, an elongate shape has been deduced for this pluton; the Salave granodiorite is thought to be a large dike (Hutchison, 1983; Nieto, 2004). It has a west-northwest trend and is interpreted to cover an area approximately two kilometers by 500 meters. In the area of Los Lagos, at the old Roman open pit, roof-pendants and apophyses of metasedimentary rocks occur within the Salave granodiorite (Figure 7.4).

Two samples of unaltered Salave granodiorite from outcrops south of the highway at Cantón yielded an average apparent minimum K-Ar age on biotite of 291.71 ± 9.56 Ma (Harris, 1979). This and other K-Ar ages reported by Harris (1979) were corrected with new decay constants by Harris; in the text of his report, he uses uncorrected ages to facilitate comparison with previous studies. Rb-Sr dating of biotite from the Salave granodiorite yielded an age of 287 ± 8 Ma (Rodriguez Terente, 2007, citing Suarez *et al*., 1978).

Where it is unaltered, the granodiorite appears as a hard, black-and-white, slightly porphyritic rock. It has a hypidiomorphic-granular texture, and the main minerals are plagioclase (40%), quartz (30%), biotite (15%), potassium feldspar (10-15%), and muscovite (1%). Due to its variable potassium-feldspar content, it often passes into the quartz diorite or tonalite range but is widely referred to as "granodiorite."

Salave and Porcía Gabbros

The Salave and Porcía gabbros extend over an area of 2.5 kilometers by 0.6 kilometers in two main bodies from El Figo beach to the western bank of the Porcía River. These igneous bodies are the oldest intrusions in the area, and gabbro xenoliths frequently occur in the granodiorite. The contacts of gabbro with the metasedimentary rocks are sharp; xenoliths of the metasedimentary rocks are common in the gabbros. A very fresh sample of the Porcía gabbro has yielded an apparent minimum K-Ar age on biotite of 329.95 ± 10.60 Ma (Harris, 1979), and gabbro has also yielded a U-Pb age on zircon of 295 ± 3 Ma (Rodriguez Terente, 2007, citing Suarez *et al*., 1978).

Sericitic and chloritic alteration and carbonatization observed in some of the gabbros are generally fracture controlled, but no significant mineralization is found in the gabbros.

Punta Campega Granite

This rock is described as microgranite or aplitic granite and intrudes the Salave gabbro just at the shoreline. It is a leucocratic equigranular rock, with allotriomorphic textures, formed by quartz, sericitized plagioclase, potassium feldspar, sericitized chlorite, and iron oxides. The intrusion has a slightly reddish appearance.

Dikes

Porphyritic dikes of dacitic to rhyodacitic to andesitic composition occur in the Salave area. They range from a few centimeters to over a meter in width, and where unaltered, are dark colored and composed of feldspar, biotite, and generally rounded quartz phenocrysts in a very fine-grained matrix of similar composition that is typically altered to sericite.

Dikes are older than the hydrothermal alteration and mineralization, and they are affected by the same events as the granodiorite.

Represas Intrusions

The Represas area lies just to the east of Tapia and less than 1.5 kilometers west of the westernmost known extension of the Salave granodiorite, to which these intrusions are probably genetically related. Three main types of igneous rocks are observed in this area: fine- grained biotite-rich granodiorite; a very quartz-rich granodiorite with lesser amount of mica; and a small outcrop of pinkish rhyodacite porphyry with quartz, chlorite, and altered feldspar in a matrix of quartz and potassium feldspar.

The Represas intrusions appear to have been controlled by the same steeply-dipping, northwest-trending fault system that controlled the emplacement of the Salave granodiorite.

Two samples of granodiorite from Represas yielded a K-Ar age on biotite of 276.93 ± 9.01Ma, and one sample of rhyodacite from Tapia yielded an age of 283.63 ± 9.25 Ma (Harris, 1979).

7.1.3.2 Structure at Salave

Metasedimentary rocks in the Salave region were affected by the three main stages of the Hercynian deformation described in Section 7.1.1 and show the corresponding folding, faulting, and cleavages. The morphology of the local coastline reflects northwest- and northeast-trending systems of fractures and faults, which also appear to be significant in localizing mineralization.

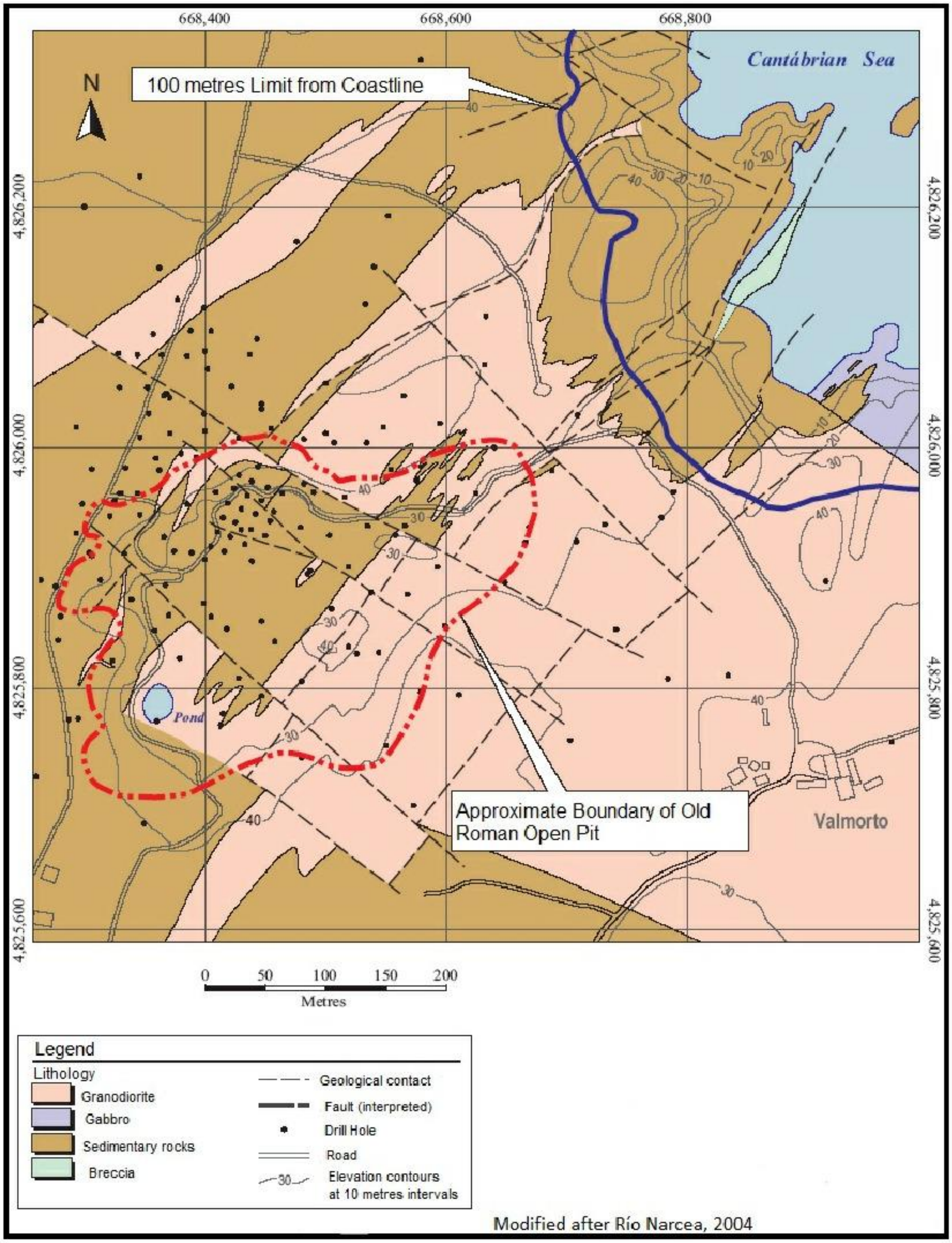
Northwest- to west-northwest-trending faults are parallel to the general shape of the Salave granodiorite and may have provided a conduit for the emplacement of the granodiorite as well as the Salave and Porcía gabbros. Several gold-bearing quartz veins in the metasedimentary rocks and several porphyry dikes are localized in high-angle northwest-trending structures.

The northeast-trending structural system is parallel to regional Hercynian structures (bedding, folding, thrusting, and late faulting). Contacts (except where faulted) between the metasedimentary rocks and the Salave granodiorite are oriented in a north-northeasterly direction. Lithologic contacts may have been overprinted by subsequent faulting and/or brecciation, as evidenced by the north-northeast-trending breccia zone situated in the northeastern corner of Figure 7.4. In the Salave area, the basal thrust of the Mondoñedo nappe, many porphyry dikes, some gold-bearing quartz veins in the metasedimentary rocks, and the tabular zone that encases the various mineralized horizons of the Salave deposit, trend northeast (Nieto, 2004).

Mapping and subsequent structural analysis by Newmont in the Salave pit and to the northeast of the pit identified four major fault trends (McMillin, 1991): 1) an east-west trend is strongest on the west side of the pit; 2) a steeply dipping N20°E trend is strongest toward the center of the pit; 3) a N40°E trend with moderate to steep dips to the northwest is strongest toward the east side of the pit; and 4) faults with a N40°W trend and dipping steeply to the southwest are crosscut by most other generations of faults but appear to guide the distribution of intrusive rocks and possibly gold mineralization. Bedding in the metasedimentary rocks strikes N20°E and dips 40 to 60° NW. Much of the faulting has occurred along bedding planes (McMillin, 1991). Intrusive-metasedimentary rock contacts in core and outcrop are largely conformable, suggesting that the granodiorite intrusion was sill-like and passive (McMillin, 1991).

Analysis of historic, oriented drill-core data from six holes revealed that if fractures are parallel to bedding, bedding strikes N34°E and dips 33° NW (Barclay, 2013). A second dominant subset of joints/veins that cut both intrusive and metasedimentary rocks strikes N66°W and dips 46°SW, nearly perpendicular to the overall trend of bedding in metasedimentary rocks. This subset of data may be much more pertinent to the distribution of gold since both rock types host gold mineralization, and mineralization apparently straddles the upper contact of the intrusion with metasedimentary rocks (Barclay, 2013).

Figure 7.4 Property Geology at the Salave Project
(from Tenorio, 2011, based on information from Rio Narcea Mines Ltd.)



7.2 Mineralization

The Salave deposit is located in the Oscos gold belt, a gold district in the Hercynian massif on the northwestern Iberian Peninsula. The Oscos belt is one of four mineralized belts that trend northeast or north-northeast in the region (Agnerian, 2010, citing Spiering *et al*., 2000).

The Salave gold deposit is hosted mainly by the Salave granodiorite at its western boundary, close to the contact with the Los Cabos Series. The mineralized units occur within an area approximately 400 meters wide, 500 meters long, and at least 350 meters deep. Gold mineralization occurs in a series of stacked, north- to north-northwest-trending, shallowly west-dipping irregular lenses related to faults and fracture zones that are parallel to the contact of the intrusive and metasedimentary rocks. The fault/fracture zones appear to be related to one or more vertical structures, at least some of which contain high-grade mineralization and which probably acted as conduits for hydrothermal solutions. Anglo (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982) noted that the physical attitude of the sheeted alteration-mineralization zones mirrors that of the overlying metasedimentary rocks. In places, these lenses may be sub-horizontal. The dimensions of the individual mineralized zones range from 50 meters to 300 meters in length, 10 meters to 150 meters in width, and five meters to 60 meters in thickness, with an average thickness on the order of 20 meters. The thickness is dependent on the number of contact-parallel fractures and their influence on the fracturing of the surrounding rock. Narrow zones of gold mineralization are also present within the Los Cabos metasedimentary rocks.

At least two types of mineralization have been described in the western portion of the Salave granodiorite: a molybdenite-rich type and the volumetrically much more important gold-rich type (Knutsen, 1991b; Puig P., 1991; Rodriguez Terente, 2007). The first type contains molybdenite with small amounts of bismuthinite. Different stages of quartz veining contain sulfides, including molybdenite, pyrite, arsenopyrite, sphalerite, stibnite, and minor chalcopyrite. This type of mineralization occurs in sub-vertical quartz veins hosted both by metasedimentary rocks and granodiorite and was formed by a low-salinity magmatic fluid at minimum temperatures between 210°C and 300°C. The molybdenite was remobilized by the later hydrothermal stage.

The later and volumetrically more important gold-rich mineralization occurs with intense albite and muscovite (phengite) alteration. Gold occurs both disseminated and in veins and is primarily associated with acicular disseminated arsenopyrite and variable amounts of pyrite and stibnite. The gold mineralization occurs close to near-vertical and gently west-dipping fractures in the granodiorite. Mineralizing fluids rose through the near-vertical fractures and then extended through the low-angle fractures towards the surface, giving rise to an asymmetric "fir-tree geometry" (Figure 7.5) (Rodriguez Terente, 2007). Ar/Ar dating of sericitic alteration yielded an age of 295.4±1.6 Ma (Rodriguez Terente, 2007). The gold mineralization formed by magmatic, low-salinity fluids with a minimum temperature of around 350°C in the deepest zones close to the feeder.

Rodriguez Terente (2007) proposed that the gold mineralization appears to have two stages. An arsenic-rich stage, characterized by gold-rich arsenopyrite, pyrite, and native gold, makes up most of the Salave deposit. Randomly superimposed on this mineralization is a second antimony-rich stage, characterized by stibnite, sphalerite, lead-antimony and silver-antimony sulfosalts, scheelite, and gold. Gold occurs within arsenopyrite and as native gold in micro-fractures, veins, and on the edge of arsenopyrite, pyrite, and stibnite crystals.

Gold mineralization at Salave is related to hydrothermal alteration of the host granodiorite, although Anglo (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982) noted that isolated gold values have been found in unaltered granodiorite. Alteration is zoned from fresh rock, to chlorite-sericite alteration, then albitic alteration, and finally advanced sericitic-albite-carbonate alteration, which usually contains the highest gold values. The zoning of alteration reflects increasing sericitization, albitization, and desilicification. The alteration was accompanied by the introduction and development of carbonate minerals, principally dolomite, as narrow veinlets, especially in shears, faults, and joints. Destruction of the original texture is a major feature of the most intensively altered and mineralized granodiorite.

Figure 7.5 shows the distribution of alteration and mineralization at Salave on a northwest-southeast cross section, as well as the previously mentioned fir-tree geometry. Figure 7.6 is a map of the geology and alteration on and adjacent to the Salave concessions.

Figure 7.5 Schematic NW-SE Cross Section of Alteration at Salave Showing Relationship to Mineralization
(modified from Rodriguez Terente, 2007; NW/SE cross section)

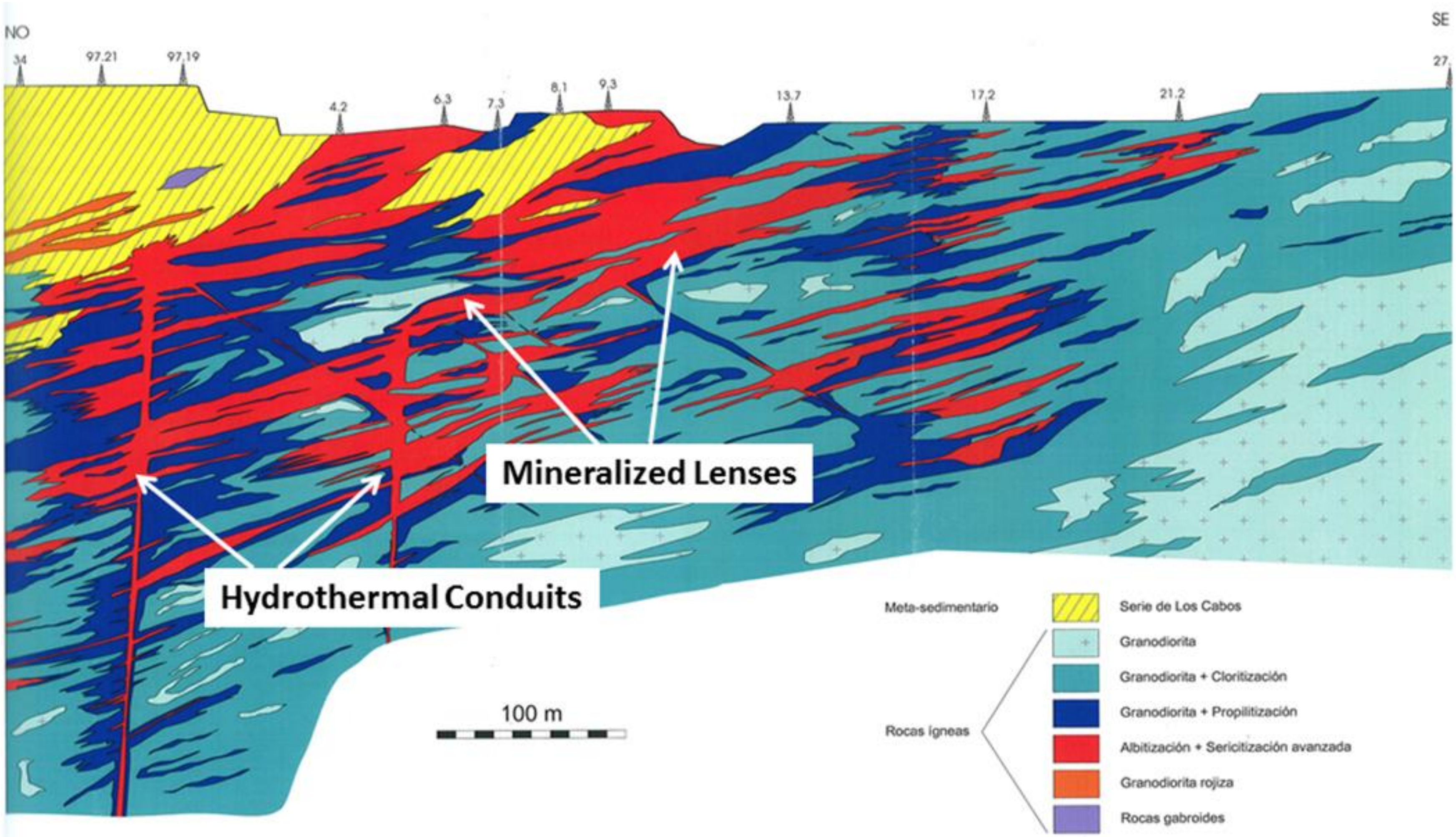
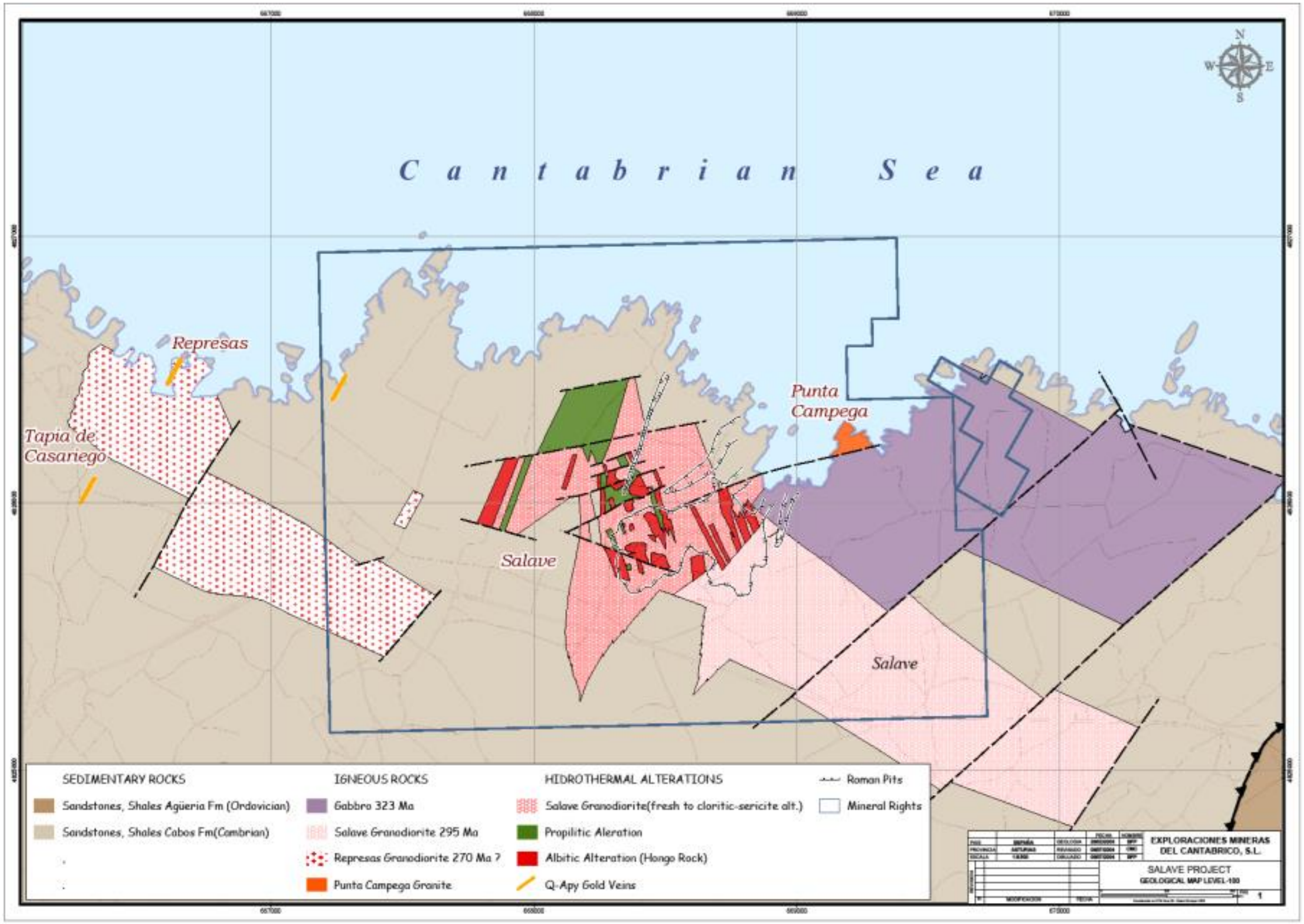


Figure 7.6 Plan Map of Geology and Alteration of the Salave Area
(Provided by Astur)



8.0 DEPOSIT TYPE

Gold mineralization at Salave is largely intrusive hosted and is structurally controlled. The mineralization is localized within a 350 to 400-meter-wide corridor that hosts a set of generally north- to north-northwest-trending and gently west-dipping to almost flat-lying mineralized zones.

Gold mineralization at Salave is related to hydrothermal alteration of the host granodiorite. The highest gold grades are associated with intense albite-sericite alteration with fine-grained arsenopyrite, commonly disseminated as fine needles. Other sulfide minerals, such as pyrite and stibnite, are also associated with the gold mineralization. Destruction of the original texture is a major feature of the most intensively altered and mineralized granodiorite. Quartz veins, although present, do not contain the gold-arsenopyrite assemblage, and their presence is largely due to desilicification and re-precipitation of quartz remote from the main mineralized area. The quartz-carbonate molybdenite-bearing veins present in the deposit do not contain gold and represent a separate mineralizing event.

Harris (1979) established the following tentative genetic model for the sequence of events that might have resulted in the Salave gold deposit:

- The Salave granodiorite was intruded into the gabbro and metasedimentary rocks during the end of the Hercynian orogeny;
- Volatiles (H_2O-CO_2-H_2S) driven from the surrounding country rocks travelled along major structures. These fluids encountered the cooling granodiorite causing the resulting alteration and mineralization. Whether the introduced As, Sb, Mo, Au, Zn, W, and B were scavenged from the metasedimentary rocks or were an igneous contribution is unclear.
- The alteration assemblages and the mineralization were the result of a roughly isochemical redistribution of the original chemical composition of the granodiorite under the new pressure, temperature, and fluid composition. The fluids are interpreted to have been near neutral solutions, at temperatures in the range from 250ºC to 350ºC, with sporadic episodes of boiling.
- Late stage faulting provided oxidizing conditions.
- Faulting and deposition of carbonate continued for some time following the cessation of the main alteration and mineralization events.

Harris (1979) and other early workers initially characterized the Salave deposit as a type of porphyry deposit, but Harris demonstrated that Salave's sulfide assemblage and associated hydrothermal alteration were strikingly different from even the very gold-rich porphyries.

Gold mineralization in intrusive rocks generally contains large amounts of copper sulfides, unlike Salave, or lacks the alteration types seen at Salave. An exception may be Au-Mo deposits of eastern Transbeikalia, in which arsenopyrite, pyrite, molybdenite, scheelite, and gold are disseminated in granodiorites that have been affected by sericitization, carbonatization, and more rarely by chloritization and pyritization (Harris, 1979). Gold Fields had also noted the following similarities between Salave and deposits in the eastern Transbeikal Russia and to Au-Mo deposits of Darasum and Dzhalinda, specifically (Crump and Suarez, 1977):

- Mineralization associated with small, oval stocks of typically quartz-diorite porphyry composition, with Au-Mo deposits generally associated with granodiorite intrusions;

- Mineralization consisting of arsenopyrite, pyrite, scheelite, antimonite, and gold; and
- Alteration including sericitization, carbonatization, and, more rarely, chloritization and pyritization.

Rodriguez Terente (2007) proposed that the Salave deposit is a mesothermal-type gold deposit hosted by a granodiorite intrusion and developed in the latest episode of the collisional Hercynian orogeny. RPA (Agnerian, 2004, 2010) concluded that the gold mineralization at Salave is related to albitization within a wide shear zone in the host intrusive rocks.

Harris (1979) proposed the "Salave type" gold deposit as one formed in any kind of feldspar-quartz-ferromagnesian rock, probably in an area of major tectonism, with a zoned alteration sequence of decreasing carbonatization, albitization, desilicification, sericitization, and texture-destruction away from the disseminated gold mineralization, which is associated with pyrite, arsenopyrite, stibnite, and minor amounts of other base-metal sulfides.

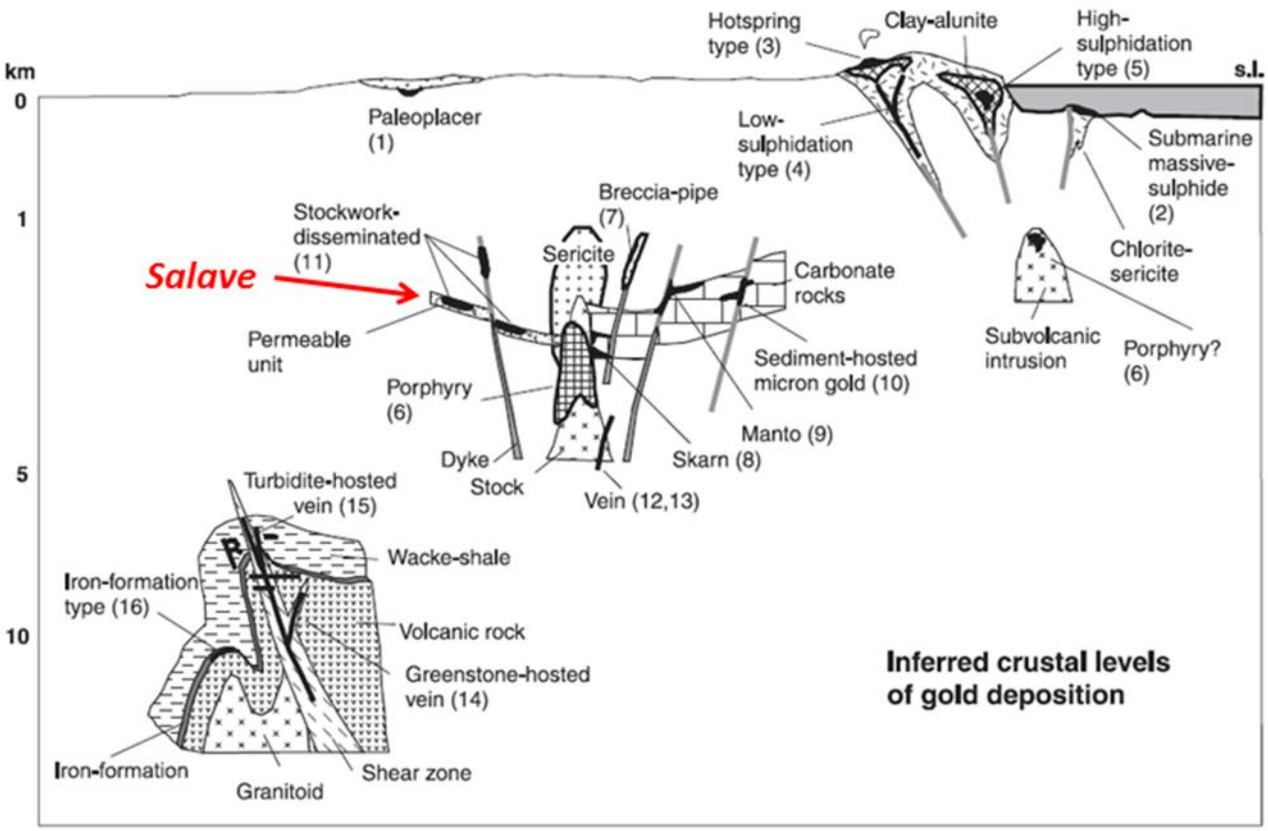
Harris (1979) cited literature review by Gallagher (1940), who noted that gold deposits related to albitization almost always occur in quartz-carbonate gangues with associated sericitization-chloritization. Pyrite was always present, and arsenopyrite and pyrrhotite were common to many.

More recently Poulsen *et al.* (2000) published a classification system based on observations on a wide range of gold deposits occurring in Canada. The classification is not restricted to Canadian deposits and draws on examples from around the world. Astur staff believe that Salave appears to best fit the "non-carbonate stockwork disseminated deposits" model, which is described by Poulsen *et al.* (2000) as follows:

> "*This poorly defined group of deposits includes the Andacollo gold deposit in Chile, the 'stage I' mineralization at Porgera, Papua New Guinea, and perhaps the bulk of the ore at Muruntau, Uzbekistan. This deposit type consists of discordant to stratabound stockwork and disseminated sulphide zones along faults, permeable units, and lithological contacts (including intrusive contacts) in miogeoclinal siliciclastic and volcaniclastic sequences in volcano-plutonic arcs in oceanic and continental settings. The deposits are hosted mostly by supracrustal rocks, but in cases where felsic sills, dykes, and stocks are present, the ore may also occur within and along the contacts of intrusions (Sillitoe, 1991a).*
>
> *Disseminated sulphide minerals (1–20 volume per cent) are mostly pyrite, with smaller amounts of chalcopyrite and arsenopyrite, accompanied by hematite, magnetite, tellurides, and anhydrite in some deposits. The ores have variable, but generally gold-rich, compositions (Au:Ag > 1) and contain elevated concentrations of copper, arsenic, bismuth, tellurium ± tungsten, fluorine, and boron. Associated alteration involves potassium metasomatism (sericite, biotite, or K-feldspar) and/or sodium metasomatism (albite), typically accompanied by carbonatization and, in some deposits, silicification.*"

Figure 8.1 shows where the Salave deposit might fit in the classification system of Poulsen *et al.* (2000).

Figure 8.1 Salave Gold Deposit Model
(modified from Poulsen *et al.*, 2000)



9.0 EXPLORATION

Astur (now Black Dragon) acquired the Salave gold project in 2010. Very little exploration work has been undertaken by or on behalf of Astur since acquisition of the property. Exploration undertaken by prior operators is summarized in Section 6.1.

In 2013, Astur contracted for a structural analysis to assist in modeling of the mineralization. Oriented-core data were analyzed from the following six historic drill holes by W. A. Barclay Exploration Services Ltd. (Barclay, 2013): RN02, RN13, GT1, GT2, GT3, and GT4. The principal conclusion of this study was that one particular subset of fracture/joint/vein orientations (with a strike and dip of 114° / 46° SW) appears to control gold distribution at the Salave deposit. These fractures/joints extend across the contact between upper intrusive and metasedimentary rocks. In granodiorite, this subset of fractures exhibits a mean orientation with a strike and dip of 114° / 46° SW. In metasedimentary host rocks, these fractures exhibit a mean orientation of 127° / 57° SW. The moderate difference in fractures/joints orientation between the host rocks plausibly can be attributed to refraction of fracture orientations across the rheologic contact between them. The moderate south-southwest dip of this fracture/joint subset may correlate with progressively deeper distribution of gold mineralization at Salave to the south-southwest. It is recommended that joint/vein data be compiled exclusively from mineralized zones, which could result in a better interpretation of the controlling structures.

Astur began infill core drilling in September 2013 and drilled geotechnical core holes to establish geotechnical characteristics of the rock in December 2011, December 2012, and May 2013. Astur's drilling is discussed in Section 10.10.

Metallurgical work conducted for Astur is described in Section 13.8.

Tenorio (2011) reported that there were geophysical anomalies that had not been drill tested. It is recommended that these be evaluated for future testing.

A relatively steeply dipping high-grade zone has been intersected near the northwestern edge of the deposit. This structure has been traced on a number of cross-sections through the deposit and has good continuity from section to section. Most of the exploration at Salave has been by vertical drill holes. Although most mineralized zones appear to be shallowly dipping, this high-grade zone is different. The definition of the high-grade zone can be improved by drilling more inclined drill holes. Other nearly vertical zones could easily have been missed due to the predominance of vertical drilling.

Other steeply dipping structural zones that appear to be highly mineralized have been observed by Mr. Prenn on ocean cliff faces. These zones should be explored.

10.0 DRILLING

This section is taken from Prenn (2014, 2016). Mr. Prenn has reviewed this information and believes this summary accurately represents the Salave property.

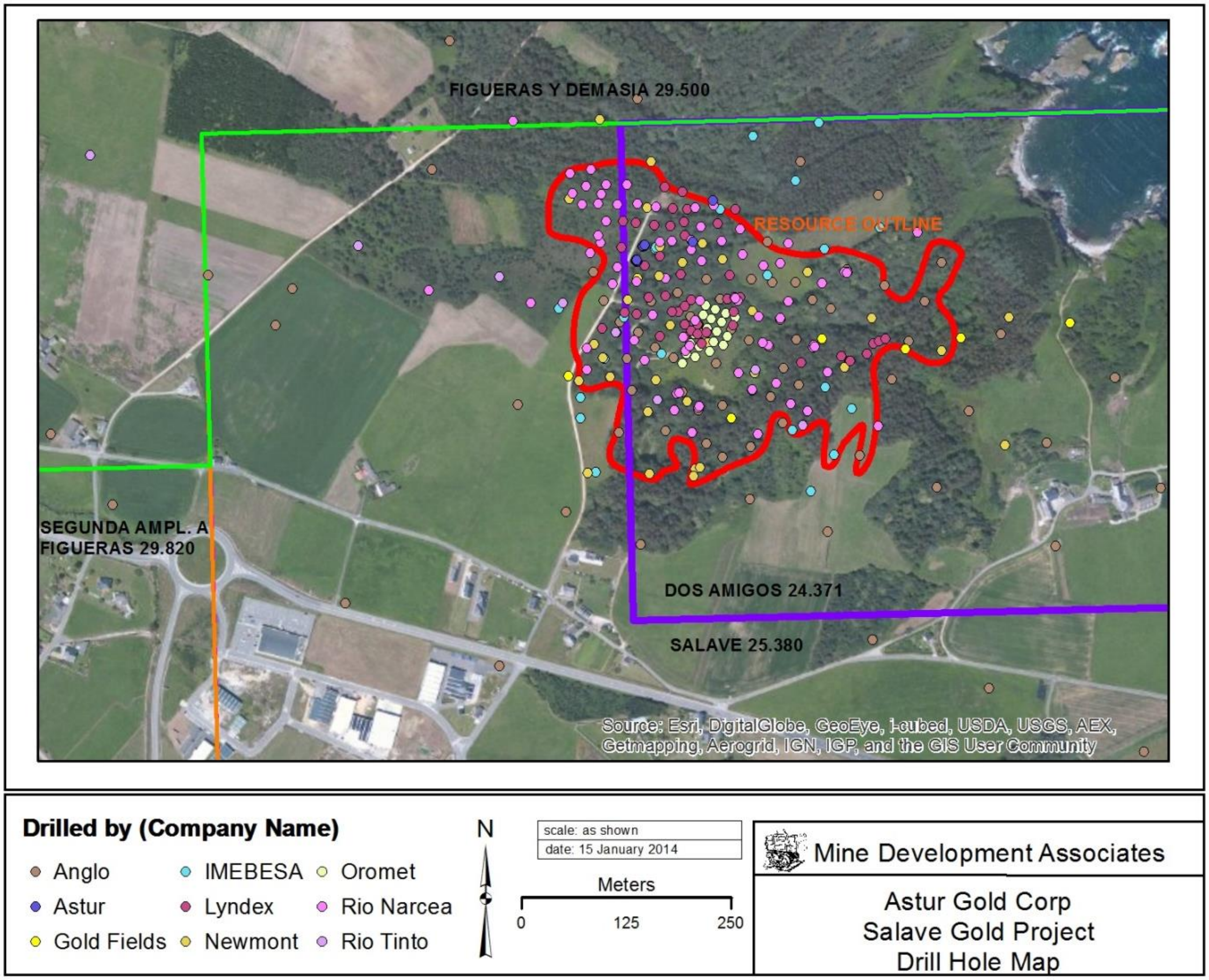
10.1 Summary

Nine companies have drilled the Salave property, starting with IMEBESA in 1970 and continuing through Astur in 2013. Those companies are IMEBESA, Rio Tinto, Gold Fields, Anglo, Oromet, Newmont, Lyndex, Rio Narcea, and Astur. As described in Sections 6.0 and 9.0, at least 345 core holes, including holes lost before reaching target depth, and 139 percussion/RC holes have been drilled at Salave, including some holes drilled outside the current property boundary. Most of the drill holes for which data are available are vertical holes. Those holes included in the Salave database used by MDA are listed on Table 10.1, and those holes drilled in the vicinity of the resource estimate are shown on Figure 10.1.

Table 10.1 Salave Mineral Resource Database Summary

Company	Core Drill Holes	RC or Percussion Drill Holes	Total Drill Holes	Core Meters	RC or Percussion Meters	Total Meters	Year	Comnments
Imebesa	32		32	6,956.2		6,956.2	1971	Note: Not used for Resource Estimate
Rio Tinto	10		10	2,014.0		2,014.0	1972	
Goldfields	7		7	1,830.8		1,830.8	1976	
Anglo American	99		99	15,412.1		15,412.1	1981-4	
Anglo American	22		22	1,080.5		1,080.5	1981-4	Shallow Core
Oromet	20		20	503.0		503.0	1988	
Newmont	32		32	5,873.6		5,873.6	1991	Note: NSC05 A,B,C counted as 3 holes
Newmont		2	2		202.5	202.5	1991	
Lyndex	23		23	9,077.7		9,077.7	1996-7	
Lyndex		24	24		683.9	683.9	1997	
Lyndex		1	1		200	200.0	2001	Drilled possible shaft location
Rio Narcea	72		72	15,946.1		15,946.1	2005	Note: Some RC/Core included
Rio Narcea	5		5	1,385.8		1,385.8	2005	Geotech Drilling
Rio Narcea		2	2		140	140.0	2005	Hydrology Drilling
Astur Gold	10		10	589.1		589.1	2011-3	Geotech Drilling
Astur Gold	10		10	3,031.0		3,031.0	2013	
Totals	**342**	**29**	**371**	**63,699.6**	**1226.4**	**64,926.0**		

Figure 10.1 Location of Drill Holes in the Vicinity of the Salave Resource



10.2 Drilling by IMEBESA

IMEBESA drilled 34 inclined core holes (holes 1-3, 3A, 4-25, 26A, 26B, 27-32) totaling 7.026.4 meters in 1970 and 1971, of which all but holes 3A and 26A are in the database provided to MDA. IMEBESA's drilling in 1970 through DDH9 was contracted to Cimentaciones y Sondeos SA of Madrid (Müller, 1971). As often as possible and with few exceptions from DDH3 through DDH9 (the last hole drilled as of the time of the report), individual core samples represented three-meter drill intersections (Müller, 1971).

MDA has no information on the drill contractor and type of rig or procedures used for IMEBESA's remaining holes and no information on the size of core drilled for any of their holes. The IMEBESA drill holes were not used in the resource estimation due to check-assaying issues pointed out by Rio Tinto and Gold Fields and because drill-hole locations could not be verified.

10.3 Drilling by Rio Tinto

Rio Tinto drilled 10 vertical core holes (holes numbered 33 to 42) totaling 2,014 meters in 1971-1972. Down-hole survey data are not available for the Rio Tinto drill holes. They contracted with Agua y Suelo Company as drilling contractors, who used two rigs: a Longyear 38 and a Craelius D-750. Drilling was with NQ and BQ core. Recovery always exceeded 95% and reached 100% for large intervals (Ayala, 1973).

Core logging paid special attention to petrography, structure, alteration, and mineralization. Each core box was marked with the depths, and core recovery was calculated. All mineralized zones were prepared and analyzed. All sample intervals measured one meter. Core was split lengthwise with a mechanical splitter, and one half was placed back into the box; the other half was sent for analysis. When the condition of the core did not permit splitting, the sample was crushed and divided into two parts with the riffle splitter.

Thomas (1982) reported that as of that time when Anglo was evaluating the property, there were assay sheets but no logs or records of core recovery for Rio Tinto's drilling.

10.4 Drilling by Gold Fields

The following information was taken from Crump and Suarez (1977), with information from additional references as cited.

Gold Fields drilled eight core holes (holes 43 through 50) totaling approximately 1,855 meters in 1976. Some previous references listed only seven Gold Fields core holes, excluding hole 49, but Harris (1979) indicated hole 49 was drilled, although it is likely that this hole was lost prior to reaching mineralization. All but one of the holes were inclined; one was vertical, with limited down-hole survey information.

Gold Fields contracted with Compania General de Sondeos to conduct the drilling at Salave, which began in January 1976. Two types of drills were used: a Longyear 38 and a Craelius D-750. Most of the drilling was of NQ and BQ diameter.

With the exception of holes 44 and 46, recovery exceeded 95%. Those two holes encountered highly fractured rock, and core recovery approximated 80% overall. Sludge samples were collected routinely for every run on all holes.

Samples for analysis were two meters in length. Where practicable, core was cut with a diamond saw prior to preparation; one half was prepared, and the other kept in storage. In sections where the rock was extensively broken, the core was jaw and roller crushed prior to splitting. All core was analyzed for drill holes 43 through 48, but in hole 50, the visually barren sections were left unprepared.

10.5 Drilling by Anglo

During their tenure on the Salave project from 1981 to 1988, Anglo drilled 99 core holes totaling 15,412.14 meters and an additional 22 FM- series shallow core holes totaling 1,080.45 meters that were drilled in 1984 on another property Anglo held for one year just off the southeast corner of the present Salave property. In addition, Anglo drilled 26 percussion holes (H- series) totaling 116 meters.

Two drill rigs were used in Anglo's initial core drilling in 1981 (Anglo, 1981a) and were also being used in 1983, when they were drilling HQ core (Charter Exploraciones S.A., 1983a). For the drilling completed in 1983, the drill contractor was Drillsure (Charter Exploraciones S.A., 1983a). MDA has no information on the drill contractor used for Anglo's other core drilling.

All of the Anglo core drill holes were vertical, with down-hole survey information available for all of the holes.

Core was sawn longitudinally, with halves of core, taken in approximately two-meter lengths, sent for assay (Hutchison, 1986).

A small percussion drill was used to drill the 26 H- series holes (Hutchison, 1982, 1983), but a high water table in the area south and east of the old Roman workings where these holes were drilled severely limited the effectiveness of this percussion drilling (Hutchison, 1982). These 26 holes are not in the database used for the resource estimate for this report.

10.6 Drilling by Oromet S.A.

Oromet completed 503 meters of shallow core drilling in 20 holes (12.5-meter by 12.5-meter grid) in the central part of the old Roman pit in 1988. Summaries of drill logs reviewed by MDA indicate core was sampled on two-meter intervals and analyzed for gold. MDA has no further information about drill contractors, the type of rig used, or drilling procedures.

10.7 Drilling by Newmont

Newmont reportedly drilled a total of 5,870.45 meters in 29 HQ-diameter, vertical core holes plus two failed reverse circulation ("RC") holes totaling 181.05 meters (Knutsen, 1991b); however, the database provided to MDA includes 34 holes totaling 6,076.05 meters (holes NSC01-05, NSC05A, NSC05B, NSC05C, NSC06-19, NS-21-22, NSC24-31, NSR20, and NSR23). The difference appears to be that Knutsen (1991b) did not include the three additional NSC05 core holes lettered A-C. The database provided to MDA also showed 202.5 meters as the total of the two RC holes, rather than the 181.05 meters reported by Knutsen (1991b). Down-hole survey data are included in the drill-hole database.

The following information on Newmont's drilling is taken from Knutsen (1991b).

Newmont's drilling was conducted by Drill Sure Limited Sucursal en Espana. The drillers used two trailer-mounted Boyles BBS 56 or 37 rigs, according to the drill-contract specifications. Drill Sure set 116 millimeter conventional core casing into solid bedrock and drilled HQ wireline core to depths up to 300 meters. Knutsen (1991b) reported that core recovery was very good.

An attempt was made to use RC down-hole hammer drilling, but problems with air leaks in the drill steel and the head drive precluded a viable test of the system. The attempt was abandoned after drilling holes NSR20 and NSR23.

Down-hole surveys were conducted in each hole using a down-hole Eastman camera; usually two surveys were conducted in each hole.

Because of proximity to the Bay of Biscay, Newmont paid particular attention to geotechnical evaluations (Knutsen, 1991b). All drill core was photographed and geotechnically logged before cutting. Information recorded included: length of core run; core recovery; RQD; Rock Mass Rating ("RMR"); fractures per meter of core; rock hardness; fracture type, orientation, and filling; and remarks relating to fracture sets. Uniaxial compression tests were performed in conjunction with evaluation of geotechnical logging. Piezometers were installed in 17 drill holes and monitored periodically. They revealed fluctuations in the water level, which were tentatively correlated with tidal variations.

10.8 Drilling by Lyndex

Lyndex drilled 23 vertical core holes and 109 RC holes at Salave from October 1996 through December 1997. Down-hole survey information is available for the core drill holes. In 2002, they drilled a percussion hole as a pilot for a proposed shaft. The following information has been taken from Catuxo (1997) and Campos de Orellana Pardesa (2001a, 2003; and Lobo, 1997a), unless otherwise noted.

Lyndex's 1996-1997 core drilling was conducted with three different rigs: one with their own crew used their own Craelius 90 rig drilling NQ and BQ core; the other two rigs, from contracted drilling company Insersa, were a Longyear 44 and a Longyear 38, both truck mounted and drilling HQ and NQ core. Core remaining after sampling was stored in waxed cardboard boxes kept in a warehouse the company maintained in the town of Barres. Logging of the core placed special emphasis on alteration, structure, and geotechnical features of the core.

Catuxo (1997) and Campos de Orellana Pardesa (2001a) identified 23 vertical core holes (S-96-1 and S-97-1 through S-97-22) totaling 9,044.90 meters, although the database used by MDA had a total of 9,077.65 meters for the same holes. The Lyndex crew drilled holes S-96-1, S-97-1 through 3, 7, 11, 14, 16, 18, and 20-22; the INSERSA crews drilled the remaining 11 core holes.

The core was cut longitudinally. Sample intervals were variable, depending on lithology and mineralization, but were a maximum of 1.5 meters; many were one meter, and some were 0.5 meter in length. Initially, Lyndex only sampled sections rich in sulfides as had been done by previous operators, but later the remaining sections were analyzed and subsequent holes were sampled in their entirety.

Geotechnical data were gathered on the 23 core holes, including RQD, RMR, structural discontinuities, fracture spacing, tensile strength, etc.

Lyndex's RC drilling consisted of very shallow holes. An Atlas-Copco Roc 203 rig was acquired by Lyndex in 1996 and used for this drilling with a contract drill crew. This rig can use conventional drilling or reverse circulation with diameters of 131, 115, or 105 millimeters at the beginning and ending with 85 millimeters and can drill to a depth of 50 meters under optimum conditions (Campos de Orellana Pardesa and Lobo, 1997a; Campos de Orellana Pardesa, 2001a); however, 56 of the Lyndex holes exceeded 50 meters in depth with a maximum of 75 meters. Campos de Orellana Pardesa (2001a) reported that Lyndex drilled 109 RC holes totaling 5,333 meters, but Agnerian (2010) reported that Lyndex drilled 102 holes totaling 5,454 meters; MDA cannot account for the difference. MDA's database only includes 24 of the Lyndex RC drill holes, which were not used in the resource estimate.

The down-hole hammer percussion hole drilled as a pilot for a proposed shaft in 2002 was drilled by Sondeos Principado, from Avilés, using a JR EFMS 3/2002 hydraulic drill on wheels with a #8 hammer and 4/3 drill. This hole was 30 centimeters in diameter and 200 meters deep. The presence of Quaternary sediments and metasedimentary rocks in the first 42 meters of the hole caused problem with stability of the walls, which were addressed with ground-freezing techniques. Water was encountered at a depth of nine meters, and at 15 meters in depth, with the appearance of granodiorite, the flow of water entering the hole was 0.5 l/sec. In March 2003, four months after completion of the hole, the water level still stood at a depth of 10 meters. No relationship was observed between water level in the hole and tides from completion of the hole on November 13, 2002 until water-level measurements stopped on March 15, 2003 (Campos de Orellana Pardesa, 2003).

10.9 Drilling by Rio Narcea

The following information is taken from Valdés Suárez (2012) and Agnerian (2010), with additional information provided by Astur and other references as cited.

Rio Narcea drilled 79 holes from May 2004 to May 2005, of which five were geotechnical holes (RN01, GT1, GT2, GT3, and GT4) and two (Hidro1 and Hidro2) were for hydrological purposes (Astur, written communication and Rio Narcea news releases, September 17, 2004; May 11, 2005; May 13, 2005; July 11, 2005). Hidro1 and Hidro2 were RC holes; the remaining 77 holes were core. The geotechnical and hydrological holes were sampled and assayed in the same manner as the resource holes, with the exception of Hidro1.

Four rigs were used. Astur reports that Rio Narcea used their own rig for holes RN01, 02, 07, 09, 12, 35, 37, 42, 46, 48, 51, 59, 62, 68, 69, 71, 72, and 73, and that Sondeos y Perforaciones Industriales del Bierzo S.A. ("SPIB") of Leon, Spain, drilled the remaining holes with Longyear 38 and 44 machines plus an SPIB-built rig D640. The core holes were drilled with HQ core. The two RC holes were drilled by SPIB using their proprietary D640 rig, which had both RC and core capabilities.

Core logging and sampling were performed at a warehouse in the town of Tapia. Drill core was photographed and logged by Rio Narcea geologists. The core was oriented and reference lines were drawn on the core before logging to ensure that no sampling bias was introduced during splitting/sawing. RQD and core recovery measurements were done on intact core prior to lithologic/mineralogical logging. Geologic data, core orientation, and additional geotechnical data were noted as part of the drill-hole logging. Density measurements were taken at this time (see Section 11.9.2). Upon completion of the geotechnical work and lithologic logging, the handwritten forms were transferred to data entry personnel for conversion of the data into digital format. The newly entered data were checked by the geologists until they were free of data-entry errors. All the original forms related to a drill hole were kept in a separate file folder for future reference.

Rio Narcea technicians sampled the whole drill core at regular intervals of 1.5 meters to 2.0 meters; sampling intervals were adjusted locally to honor changes in lithology. The core was cut with a diamond saw. Samples were bagged, put in large rice packing bags, and sent to the laboratory.

10.9.1 Rio Narcea Collar and Down-Hole Surveys

Nineteen of the 73 core holes were inclined, and 54 were drilled vertically. All of Rio Narcea's drill-hole collar locations were surveyed by Rio Narcea surveyors, and the coordinates were in the Universal

Transverse Mercator grid. Drill hole deviation was measured by down-hole Flexit and Maxibor equipment and recorded directly into an onboard computer.

10.10 Drilling by Astur Gold Corporation

From late September until early November 2013, Astur drilled 10 resource holes totaling 3,031 meters. Drilling was done under contract by SPIB.

The contractor provided two SPIB-manufactured core drill rigs. The rigs employed were track mounted. All drill holes were collared using PQ equipment and then downsized to HQ, generally when entering more competent intrusive rocks. Core recovery averaged about 90 – 95 % for the program, with the best recoveries in the intrusive rocks. Figure 10.2 shows drilling in progress at Salave.

The drill program was designed to complement an on-going resource estimate. Holes were designed to provide infill information where previous drilling was considered too widespread for confidence in interpretation and to extend the size of known mineralized zones. Two holes were also drilled to twin previous holes, one drilled by Lyndex and the other by Rio Narcea.

Due to issues concerning surface rights and environmental concerns due to the proximity to the Silva Lakes, the area in which the drill holes could be collared was severely limited. This necessitated drilling multiple holes from a single platform and drilling at azimuths and dips not considered ideal for the presumed geometry of the mineralization.

All drill holes except for the two twin holes were inclined, while the twin holes were vertical.

Down-hole surveying of the drill holes was performed by the SPIB drill crews, using a Reflex EZ- Shot. An initial measurement was taken at 15 meters downhole, then at 50 meters, and then at intervals of 50 meters until the end of the hole.

All drill-hole collars were surveyed by Topocad Ingeniera S. L. from Ribadeo, Galicia, Spain, using a Topcon GPT-7003 total station unit. Surveying was done in ETRS89 UTM29 North.

In addition to the resource drilling, Astur drilled four geotechnical core holes during 2011 to 2012 and an additional six geotechnical core holes in May 2013 for a total of 589.05 meters. Terratec Geotecnia y Sondeos S.L. ("Terratec") was the drilling contractor, and all holes were drilled with HQ core. Terratec used two rigs manufactured by Rolatec in Spain – Rolatec RL 48 L and Rolatec RL 800.

The following description of sample preparation and core handling protocols applies to all drilling carried out by Astur on the Salave property. Drill core was placed in wooden trays at the drill site by the drill crew. The geologist prepared a quick log of the drill hole at the drill site, after which the core boxes were transported to the core logging facility by Astur personnel. The drill site was kept secure by means of a fence and gate, and only authorized personnel had access.

When the core was received at the core shack, it is immediately washed, reconstituted, and all distance markers checked for accuracy and clarity. It is then photographed by Astur personnel. The photos were captured digitally, and at the end of the day were downloaded into a directory of core photographs with a separate folder for each drill hole. Core was photographed wet.

Once the geologist was ready to log the core, it was placed in order on the logging benches, and the core was reconstituted, if necessary. The geologist verified all the distance blocks and changed those that were in poor condition. Labelling of the boxes was verified, corrected where necessary, and augmented by adding the down-hole distance (From-To) for each individual box. Figure 10.3 shows the core-logging facility for the project.

Figure 10.2 Drilling by Astur Gold Corporation

Figure 10.3 Core-Logging Facility for the Salave Project

Geotechnical logging was completed first, recording recovery and RQD, relative hardness, degree of weathering or oxidation, and fracture fillings. Data were recorded onto paper sheets and then transferred to Excel before the end of each day. For drill holes SA-3 and SA-6, additional geotechnical data, mostly fracture information, were recorded as these two holes were used for hydrologic testing.

The core was descriptively logged and marked for sampling by Astur geologists. Logging and sampling information was entered onto paper logging sheets, which were later scanned and stored on several computers. Backups were made at regular intervals.

After logging, the core was prepared for sampling. A line was drawn down the core, and the cutter used this as a guide. The entire intrusive section was marked for splitting as the mineralization is often very fine grained and difficult to identify visually. The core was sampled at intervals of no more than 1.5 meters and no less than 0.3 meter. The intervals shorter than 1.5 meters were selected where dictated by the geology in order to respect contacts or changes in character of the mineralization.

Astur did not have a core saw on site due to permitting issues. The core was transported by Astur personnel to a dimension stone cutting facility where it was cut under Astur supervision by a professional cutter (Figure 10.4). The core was then returned to the logging facility where half of the drill core was placed in a plastic sample bag, while the other half was retained in the core box for future reference. The sample number was written on the bag, and an assay tag with the same number placed inside the bag. The samples and sample bags were numbered sequentially in advance, allowing for the insertion of standard reference samples, duplicates, and blanks. The plastic sample bags were placed in larger rice bags, palletized, and wrapped for shipment to the laboratory by commercial transport.

Figure 10.4 Core Being Cut in a Dimension Stone Facility

11.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

This section is taken from Prenn (2014, 2016). Mr. Prenn has reviewed this information and believes this summary accurately represents the Salave property.

MDA has no information about measures taken by operators prior to Astur to ensure sample security; Astur's security measures are described in Section 10.10.

Figure 11.1 summarizes the sample preparation and analysis procedures used by the operators at Salave prior to Astur that are described in Sections 11.1 through 11.8. Astur's procedures are described in Section 11.9.

11.1 IMEBESA Sampling

The only information MDA has seen on sample preparation by IMEBESA is that shown on Figure 11.1 and a similar figure in the 2010 Technical Report (Agnerian, 2010).

IMEBESA's drill-core and surface samples taken in 1970 were analyzed by the following laboratories, as reported by Müller (1971):

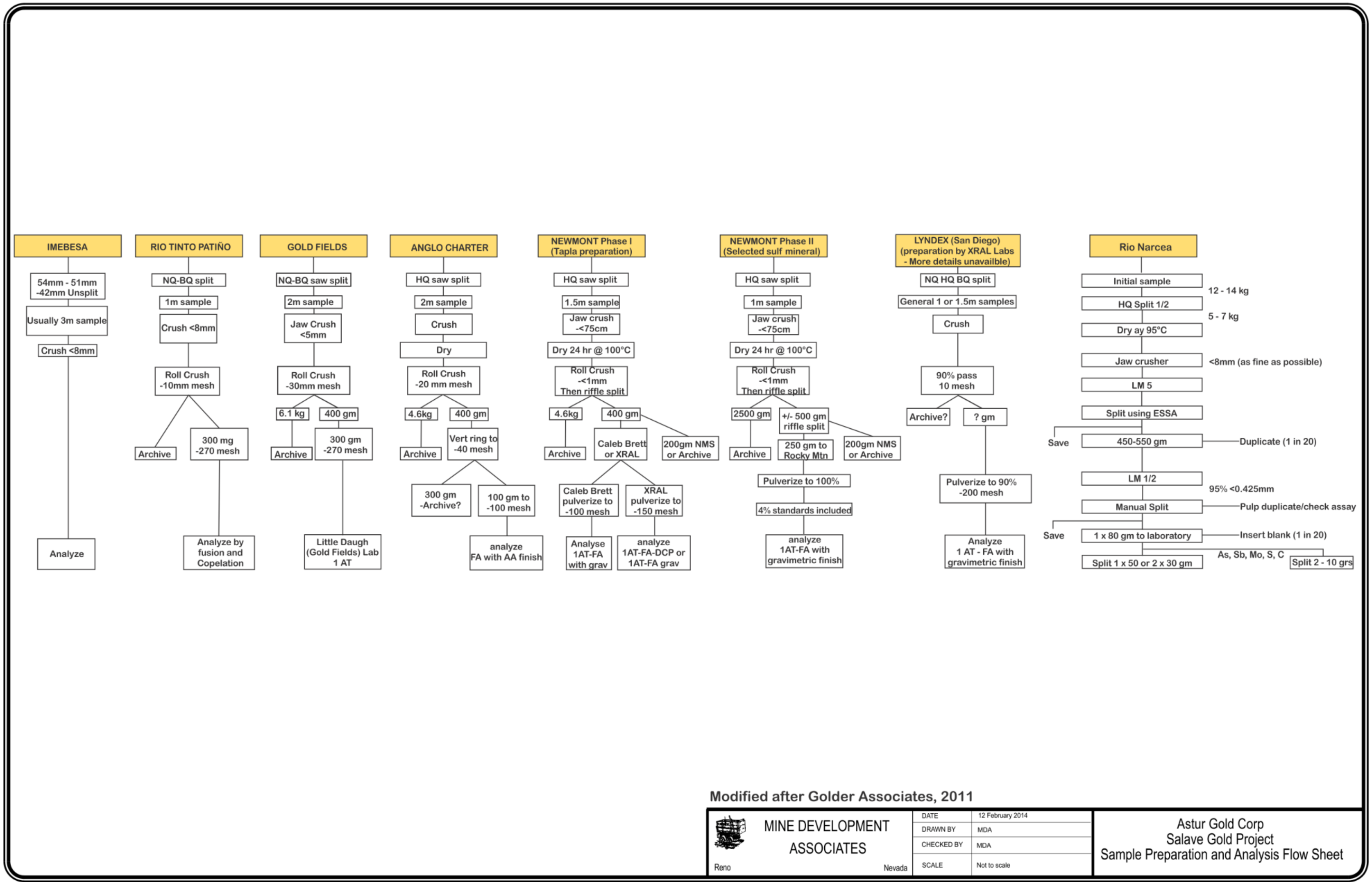
- Irish Base Metals Ltd., Exploration Dept. in Loughrea, Ireland – soil samples
- Metals and Chemicals Ltd. in Cork, Ireland – soil samples
- Instituto Geologico y Minero de España ("IGME") in Madrid, Spain – surface outcrop and drill-core samples
- Emprese Nacional Adaro de Investigaciones Mineras ("Adaro") in Madrid, Spain – drill-core samples
- X Ray Assay Laboratories Ltd. ("XRAL") in Ontario, Canada – drill-core samples
- Lakefield Research of Canada Ltd. ("Lakefield") in Ontario, Canada – preliminary metallurgical testing of drill-core material.

A report by Rio Tinto in 1973 (Ayala, 1973) identified the laboratories who analyzed the drill samples of IMEBESA as IGME, Bell-White Analytical Laboratories Ltd. in Ontario ("Bell-White"), and Griffith-Iturribarria, S.A. but did not mention the other laboratories who analyzed drill-core samples listed above by Müller (1971). MDA cannot reconcile these differences.

Through their 1970 drilling, IMEBESA assayed all core samples for gold and molybdenum, with part of the samples also analyzed for arsenic, antimony, and silver (Müller, 1971). Thomas (1982) reported that the first two holes were analyzed for As and Mo by colorimetry, but after that, As was dropped and Mo, Sb, and Ag were analyzed only sporadically. Müller (1971) reported that molybdenum assays were conducted by IGME, Adaro, XRAL, and Lakefield, and that a comparison of the results indicated that IGME results were probably too high and XRAL's too low. Adaro results appeared to be confirmed by the few Lakefield results (Müller, 1971).

Rayment (1976) reported that as of 1976, approximately 50% of IMEBESA samples were missing.

Figure 11.1 Sample Preparation and Analysis Procedures of Previous Operators at Salave
(modified from Tenorio, 2011)



11.2 Rio Tinto Sampling

Rio Tinto crushed split core to six to eight millimeters in size with a jaw crusher. The whole sample was then reduced to less than 10 mesh in size with a roll crusher. A riffle splitter was used to obtain a sample of approximately 300 grams, which was sent to the laboratory for analysis; a second split was sent to archives.

Rio Tinto's analyses were performed by their lab at Huelva (Harris, 1979). The sample was pulverized to -270 mesh and quartered. A 100-gram sample was sent for fire assay, while 200 grams were saved, with a fraction used for other determinations. Although Rio Tinto's report by Ayala (1973) indicated 100 grams were analyzed by fire assay, a later report by Anglo indicated samples were analyzed for gold, silver, molybdenum, arsenic, and sulfur by atomic absorption (Thomas, 1982), which may have referred to additional analyses. Except for hole number 37, all samples were analyzed for gold, silver, and sulfur; arsenic was analyzed on all samples except for 29 samples from hole number 34 and eight from hole number 41; and molybdenum was analyzed in all samples except those from holes numbered 38 and 40 as well as eight samples from hole 41 (Ayala, 1973). Duplicate samples were analyzed by Rio Tinto's lab (Ayala, 1973). Check assaying on Rio Tinto's samples was performed by Anglo American's laboratory in Salisbury, Rhodesia for 10 samples from drill holes 33, 34, and 35.

11.2.1 Rio Tinto's Check of IMEBESA's Assays

Rio Tinto acquired the Salave property in 1971. Before conducting field work, Rio Tinto completed check assays on IMEBESA's reject core samples (Crump and Suarez, 1977). Significant discrepancies between Rio Tinto's and IMEBESA's results are shown on Table 11.1, later compiled by Gold Fields from Rio Tinto's data (Crump and Suarez, 1977). Rio Tinto felt that IMEBESA's assays tended to be higher than the actual amount, although their attempts to determine which were the accurate lab results were not conclusive (Ayala, 1973). Crump and Suarez (1977) later noted that Rio Tinto's comparison of their assays and those of independent laboratories indicated that, comparatively, Rio Tinto was reporting low.

Table 11.1 Comparison of Check Assays by Rio Tinto on IMEBESA's Original Assays
(Crump and Suarez, 1977)

Range of Au Values	Rio Tinto Mean Value	IMEBESA Mean Value	% difference
(g Au/t)	(g Au/t)	(g Au/t)	Rio Tinto from IMEBESA
0-0.99	0.39	2.84	-86.27
1.0-1.99	1.51	2.72	-44.49
2.0-3.99	2.70	4.64	-41.81
4.0+	4.71	6.88	-31.54
All Values	2.33	4.27	-45.43

11.3 Gold Fields Sampling

Gold Fields split core with a diamond saw then crushed it to less than five millimeters with a jaw crusher, followed by crushing with a rolls crusher to -30 mesh (Crump and Suarez, 1977). Splitting produced a sample for storage and a 300-gram sample for analysis. The 300-gram sample was pulverized with a disc pulverizer to -100 mesh (Harris, 1979). A 50-gram split was sent to Gold Fields' Little Daugh laboratory for gold analysis by atomic absorption (Harris, 1979). For every tenth sample, a 200-gram split was sent to Imperial Chemical Industries ("I.C.I."), a custom laboratory, for gold analysis by neutron activation (Harris, 1979).

Thomas (1982) reported that all the Gold Fields core was analyzed for gold by atomic absorption; the majority was also tested for sulfur, and core from two of the holes was also analyzed for Mo, Sb, and As. Drill logs indicate that the Mo, As, and Sb analyses were performed on holes 47 and 48; they were performed by Hunting Technical Services Ltd. ("Hunting;" now HTSPE Limited) in the United Kingdom; Harris (1979) reported that those analyses were made by colorimetry and noted that the same analyses were performed for Gold Fields on parts of holes 18, 22, 24, 28, 29, 32, 33, and 35. Harris (1979) reported that a 50-gram sample was sent to Hunting or Robertson Research for analysis of silver, arsenic, antimony, molybdenum, and sulfur with variable frequency.

Harris (1979) reported on the following procedures for Mo, Sb, and As used by Hunting:

- Mo: Digestion by HNO_3 and $HClO_4$ with leaching of the residue with dilute HCl. No concentration determined spectrophotometrically. The lower detection limit was 0.2 ppm Mo.
- Sb: Ammonium chloride digestion followed by leaching with dilute HCl and oxidation with sodium nitrate. Sb concentration measured spectrophotometrically. The lower detection limit was 0.5 ppm Sb.
- As: Fusion with potassium bisulfate, followed by leaching with dilute HCl and addition of potassium iodide and stannous chlorite. Zn pellets were added, and liberated arsine permeated filter paper impregnated with mercuric chloride. Color was compared to standard color charts. The advertised lower detection limit is 5 ppm As.

11.3.1 Gold Fields QA/QC

Gold Fields established a QA/QC process to monitor their Little Daugh laboratory's performance that utilized "control samples" and check assays (Crump and Suarez, 1977; Harris, 1979). Analyses of all IMEBESA, Rio Tinto, and Gold Fields samples at Gold Fields' Little Daugh laboratory routinely included 10% control samples. Ten control samples were prepared from excess material remaining from previous inter-laboratory testing; mean values from the original replicate analysis of each sample were taken as the control to which all subsequent analyses were compared. Control samples representative of all gold grades likely to be encountered in the drill hole were included in each batch of samples sent for assay. After receiving assay results, Gold Fields analyzed the performance of the controls. Splits of the same control samples along with duplicate samples covering the range of expected gold values were sent to I.C.I. for check assaying; I.C.I. used neutron activation.

From September 1975 to May 1976, values for controls determined at the Little Daugh laboratory were approximately 5 to 10% lower than the original control values based on the earlier replicate analysis exercise (Rayment, 1976; Crump and Suarez, 1977). Over the same period, the results from I.C.I. for the corresponding control samples were about 10% higher than those of Little Daugh but were still about 6% lower than the original values of the controls (Rayment, 1976; Crump and Suarez, 1977).

In May 1976, a new batch of control samples was prepared and, after that, Little Daugh's results corresponded well with the original mean value as determined by the May replicate analyses (Rayment, 1976; Crump and Suarez, 1977). For the new batch of control samples, I.C.I.'s results averaged consistently 15% higher than Little Daugh's results; duplicate samples sent to I.C.I. averaged 19% higher than the results from Little Daugh.
Based on analysis of their control samples, Gold Fields used correction factors for four ranges of gold results. MDA used the "uncorrected" Gold Fields assays in their database.

11.3.2 Gold Fields' Check of IMEBESA's and Rio Tinto's Assays

In April 1975, shortly after Gold Fields had made an initial field visit to Salave, they conducted a program of check assaying of prior drilling results by IMEBESA and Rio Tinto (Crump and Suarez, 1977; Rayment, 1975a; Harris, 1979). A total of 520 check samples were selected from existing IMEBESA jaw-crushed core and from Rio Tinto half core for holes 22 (IMEBESA), 32 (IMEBESA), and 35 (Rio Tinto). The samples were prepared by Gold Fields at their Little Daugh laboratory and then analyzed for gold at three custom laboratories – I.C.I. (analysis by atomic absorption), Union Assay (analysis by fire assay), and Robertson Research (analysis by neutron activation). The purpose of this testing was to examine the performance of the three different laboratories and analytical methods and to check the accuracy of both IMEBESA's and Rio Tinto's analyses. The results (Table 11.2) show that there were significant differences is gold values reported by the three custom laboratories and that Rio Tinto's re-analyses of IMEBESA core were low when compared with I.C.I and Union Assay's results. Results from Robertson Research were uniformly low, and Gold Fields rejected this lab as a possibility for their routine assays.

Table 11.2 Comparison of Assays of IMEBESA and Rio Tinto Core Samples
(From Crump and Suarez, 1977)

Rio Tinto/Independent Laboratories Comparison – All Values					
% Difference Robertson Research from Rio Tinto	No. Samples	% Difference Union Assay from Rio Tinto	No. Samples	% Difference I.C.I. from Rio Tinto	No. Samples
-1.20%	180	+57.70%	55	+73.08%	62
IMEBESA/Independent Laboratories Comparison – All Values					
% Difference Robertson Research from IMEBESA	No. Samples	% Difference Union Assay from IMEBESA	No. Samples	% Difference I.C.I. from IMEBESA	No. Samples
-37.80%	94	-12.26%	64	-15.39%	65

Note: Robertson Research analysis was by atomic absorption. Union Assay analysis was by fire assay. I.C.I. analysis was by neutron activation.

In January and February 1976, Gold Fields apparently ran two checks of mineralized sections in IMEBESA's holes 20 and 28, comparing assays from Gold Fields' Little Daugh laboratory to original assays from IMEBESA. Results are shown in Table 11.3 and are taken from tables found in a collection of Gold Fields memoranda regarding the Salave project provided by Astur. A much larger comparison of Little Daugh and IMEBESA results was reported by Rayment (1976) and is shown in Table 11.4; this comparison applied a correction factor to Little Daugh values related to performance of Little Daugh results compared to control samples.

Table 11.3 Comparison of Gold Fields Little Daugh and IMEBESA Assays on IMEBESA Samples from Two Drill Holes

(from Gold Fields tables provided by Astur)

IMEBESA Hole Number 20 Main Mineralized Section 104-158 meters				
Range of Gold Values (g Au/t)	Gold Fields Mean Value (g Au/t)	IMEBESA Mean Value (g Au/t)	% Gold Fields from IMEBESA	No. of Samples
0-0.99	0.56	0.49	+14.70%	11
1.0-1.99	1.52	1.73	-12.14%	8
2.0-3.99	3.12	1.54	+102.60%	2
4.0+	4.85	4.53	+7.05%	2
All values	1.49	1.36	+9.56%	23
IMEBESA Hole Number 28 Main Mineralized Section 72-135 meters				
Range of Gold Values (g Au/t)	Gold Fields Mean Value (g Au/t)	IMEBESA Mean Value (g Au/t)	% Gold Fields from IMEBESA	No. of Samples
0-0.99	0.40	0.38	+5.26%	14
1.0-1.99	1.29	1.19	+7.60%	14
2.0-3.99	2.56	2.86	-10.49%	5
4.0+	5.06	6.75	-25.04%	2
All values	1.33	1.42	-6.34%	35

Table 11.4 Comparison of All Gold Fields Little Daugh Analyses of IMEBESA Samples

(from Rayment, 1976)

Range of Gold Values (g Au/t)	IMEBESA Mean Value (g Au/t)	Gold Fields Mean Value (g Au/t)	% IMEBESA from Gold Fields	No. of Samples	Correction Factor
0-0.99	0.387	0.482	-19.71	229	124.55%
1.0-1.99	1.388	1.322	+4.99	85	95.24%
2.0-3.99	2.637	2.360	+10.24	90	89.49
4.0+	6.807	5.563	+22.36	51	81.72%
All values	1.739	1.567	+10.98	445	90.11%

Note: Little Daugh values were corrected to control values by Gold Fields.

11.3.3 Gold Fields Specific-Gravity Measurements

Gold Fields made a total of 174 specific-gravity determinations using a Walker Steelyard Balance (Harris, 1979). In addition, 31 duplicate samples were measured, and the mean difference found between the replicate analyses was 0.03. Harris (1979) summarized the results, which fell into three groups:

- High specific-gravity values for "hongorock" samples ("Hongorock" is a term they used for a specific type of alteration that was generally mineralized. "Hongo" is Spanish for mushroom) 29 samples measured

Range of specific gravity: 2.72 – 3.01
Specific-gravity mean ± standard deviation: 2.81 ± 0.08

- Low specific-gravity values for albitite samples
  22 samples measured
  Range of specific gravity: 2.47 – 2.65
  Specific-gravity mean + standard deviation: 2.61 + 0.05
- Samples of dikes, unaltered granodiorite, granodiorite with chlorite-sericite, propylitic, and advanced propylitic alteration, and kaolinization
  92 samples measured
  Range of specific gravity: approximately between the two groups described above
  Specific-gravity mean + standard deviation: 2.69 + 0.04

11.4 Anglo American Sampling

For Anglo's core drilling with the exception of their 1984 holes, the core was split and half was sent for analysis by fire assay to Anglo American Research Laboratory in South Africa (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982). Initial samples submitted by Anglo in 1981 were analyzed for Au, Ag, total S, Mo, As, and Sb, but later in 1981, Anglo changed their procedure and samples were analyzed for gold and silver, and also for total S, Mo, As, Sb, and CO_3 if the gold value returned was greater than 0.5 g Au/t (Hutchison, 1986). Samples from Anglo's 1984 holes, including the FM- series, were split and sent to the Charter Laboratory in England for assay (Charter Exploraciones S.A., 1984c).

11.4.1 Anglo American Specific-Gravity Measurements

Anglo measured samples at their Research Laboratory for specific gravity. As of March 31, 1983, they reported that the average of 24 samples tested was 2.69, while the average of 13 samples with gold exceeding 0.25g Au/t was 2.72 and the average of two samples with gold exceeding 1.0g Au/t was 2.75 (Charter Exploraciones S.A., 1983a). By May 31, 1983, Anglo reported that the program of specific-gravity measurements had been completed (Charter Exploraciones S.A., 1983a). Seventy-two measurements were made, and the average specific gravity for all samples tested was 2.70. The 32 samples with gold exceeding 0.5g Au/t had an average specific gravity of 2.72, and the 17 samples with gold exceeding 1.0g Au/t also had an average specific gravity of 2.72. However, they noted: *"Though the >1.0g/t Au material average S.G. has worked out at 2.72 it has been noticeable that well-mineralized samples have higher S.Gs. and virtually all samples tested in this analysis were from outside the area of main mineralization. It is thus suggested that in tonnage calculations continued use is made of the S.G. of 2.74."*

Agnerian (2010) summarized density measurements from 75 Anglo samples which seem to show a different breakdown by gold grade than that described above. Table 11.5 shows the summary reported by Agnerian (2010).

Table 11.5 Density Measurements by Anglo American
(From Agnerian, 2010)

Number of Samples	Category	Density (g/cm³)
1	<0.5g Au/t	2.79
15	>0.5g Au/t	2.73
7	>1g Au/t	2.74
52	Others	2.70
Average of 75		2.71

11.5 Oromet Sampling

Oromet analyzed their core samples for gold, but MDA has no details on the procedures used; however, the assays are generally on two-meter intervals, with check assays every five to 10 samples.

11.6 Newmont Sampling

For Newmont's drilling, all core was sawn in half, and one-half of the core was subject to a primary crush in Tapia (Knutsen, 1991b). After drying at 100°C for 24 hours, and depending on Newmont's sample preparation capacity relative to drill productivity, crushed material was either roll-crushed to 95% minus 10-mesh on site or sent directly to the assay lab for sample preparation. The labs pulverized the minus 10-mesh material to at least minus 100-mesh before taking a representative split for fire assaying.

Samples were sent for analysis of gold by fire assay to Caleb Brett (now called Intertek Group Plc.) in St. Helens, England; X-Ray Assay Labs ("XRAL") in Toronto, Canada; or Rocky Mountain Geochemical ("RMGC") in Salt Lake City, Utah (Knutsen, 1991b). Samples from the first phase of drilling were sent to either Caleb Brett or XRAL, and samples from the second phase (holes NSC5A, 5B, 5C, 24, 28-31) were sent to RMGC. All samples were analyzed by one-assay-ton fire assay. In the first phase, all samples were analyzed on 1.5-meter intervals. In the second phase, only obviously well-mineralized (sulfides) intervals were analyzed, and assay intervals were 1.0 meter.

11.6.1 Newmont QA/QC

Newmont's QA/QC consisted of use of analytical reference standards and check assaying (Knutsen, 1991b). Newmont reference standards were included with each batch of assays at an average insertion rate of 4%. Results of analysis of the standards were reviewed for acceptability upon receipt. In addition, Caleb Brett provided Newmont with the results of their internal standards program.

Check assaying was performed by Newmont Metallurgical Services (Odekirk, 1991a, 1991b, 1991c). Analysis was by fire assay on a 1-assay ton sample (Odekirk, 1991c). All drill-hole intervals assaying greater than 1.0 g Au/t and selected intervals assaying less that that value were checked. Knutsen (1991b) reported that 200 assays were conducted on duplicate splits of material from drill holes NSC1, NSC2, NSC3, and NSC4 originally assayed by Caleb Brett. In addition, Caleb Brett re-analyzed 65 pulps grading more than 1 g Au/t.

Check assays on samples from Newmont holes NSC-1 and NSC-2 suggested that coarse gold was causing large variation in assay results, which was confirmed by hand panning (Odekirk, 1991c, 1991d). Knutsen (1991b) described sample analysis as follows:

"High statistical variability was observed, particularly at higher grades of gold mineralization and was shown to be a function of coarse gold. As a result, samples were subject to screen fire analysis to determine the optimal sample size and sample reduction steps. For the whole of the campaign, entire half-core samples were roll-crushed to minus 10-mesh before further sample volume reduction."

11.6.2 Newmont Specific Gravity

Knutsen (1991b) reported that eight samples of core from granodiorite and syenite were subject to apparent density determinations by Seinico CONTROL in Oviedo. Apparent density of four unaltered granodiorite samples averaged 2.68 kg/dm^3, and the four syenite samples averaged 2.62 kg/dm^3. Newmont used a tonnage factor of 0.370 m^3/t in calculating reserves, representing a rock density of 2.70 g/cc.

11.7 Lyndex Sampling

Lyndex sent their core samples to XRAL in Quebec, Canada, for sample preparation and analysis, using the following procedures (Catuzo, 1997):

- Coarse grinding to 90% passing -10 mesh
- Quartering for pulverizing
- Pulverizing to 90% passing -200mesh
- Quartering for analysis
- Analysis for gold by fire assay.

All samples were analyzed for gold, and some were also analyzed for antimony and molybdenum.

11.7.1 Check Assaying by Lyndex

Catuxo (1997) reported that the only check assaying of the core sampling by Lyndex was some performed for the consulting group MPH, who collected 15 Lyndex samples, including higher-grade ones, and sent them to a different laboratory for check assaying. The analysis of sample S-97-6 (201.5-202.5m), showed that the XRAL result was 134% higher than that provided for MPH, which was thought to be due to either a nugget effect or gold amalgamation problems (Catuxo, 1997). Otherwise, the check assays were on average 6% higher than the original XRAL results (Catuxo, 1997).

11.8 Rio Narcea Sampling

The following information is taken from Agnerian (2010) and Valdés Suárez (2012), with additional information provided by Astur or as noted.

Rio Narcea sent samples from their drilling program to their laboratory at the El Valle mine for analysis. Rio Narcea's geotechnical and hydrological holes were sampled and assayed in the same manner as the resource holes, with the exception of Hidro1. These are summarized in Figure 11.1 and are described as follows:

- The initial drill-hole sample was split to produce a five-kilogram sub-sample.
- Samples weighing five to seven kilograms were dried, crushed through a jaw crusher (95% <6 millimeter), and further reduced (95% passing <4 millimeter) using an LM5 ring mill. An Essa splitter was used to take a 450-gram to 550-gram sub-sample of each split for pulverizing. The remaining reject portion was bagged and stored.
- After reducing the sub-sample to a nominal -200 mesh with an LM2 pulverizer, the samples were thoroughly blended and sent to the fire assay department. A 50-gram portion or two 30-gram (60 grams) portions were used for fire assays.
- For geochemical analysis, or when lower detection was required, the gold was dissolved and the concentration was determined by the atomic absorption method.

All samples were analyzed for Au and As. For intervals of significant mineralization (>1 g Au/t), samples were also analyzed for Mo, Sb, total C, and total S. The determinations for C and S were done at ITMA, in Oviedo, Asturias. Acid digestion for As, Sb, and Mo was done on two-gram aliquots of samples. MDA has seen assay certificates from OMAC Laboratories Ltd. ("OMAC") in Galway, Ireland dated September and October 2004 and sent to Rio Narcea. Some of these were multi-element *aqua regia* ICP analyses performed by OMAC on samples from holes RN02 through RN11 and additional analyses for %S on samples from holes RN02 through RN16.

Assay results were faxed to the Rio Narcea exploration office at Tapia with original certificates sent by regular mail or through the normal pick-up procedure. Pulps and rejects were also returned through the normal pick-up routine. These were sorted for recheck and/or storage. Low-grade material that was well removed from known zones was discarded (Agnerian, 2010).

11.8.1 Rio Narcea QA/QC

QA/QC measures used by Rio Narcea for the Salave drill holes included an on-going recheck program at an independent laboratory, combined with close monitoring of the assay results from standards, blanks, and re-assaying of original pulps at the El Valle mine assay laboratory (Agnerian, 2010).

The "mine standard" was prepared by assaying a small sample from an area of known gold concentration at the El Valle laboratory in an attempt to establish consistency. A commercially prepared standard was also used – Geostats G397-4, whose value is 3.13 g Au/t with a standard deviation of 0.14 g Au/t. For standards, replicate assays were expected to be within ± 2 standard deviations.

A blank sample accompanying the standard was also inserted into each batch of samples by Rio Narcea. Blanks were usually quartz or waste rock for which previously analyzed gold content was less than 0.05 g/t.

There is a conflict in the references MDA reviewed about the two laboratories who conducted check assaying. Valdés Suárez (2012) reported that ITMA Foundation in Asturias and SGS in Ontario, Canada conducted the checks, but Agnerian (2010) reported the two labs were Inspectorate Laboratories in England and SGS. MDA cannot resolve this discrepancy.

Check assays were performed regularly on original pulp and occasionally on a second pulp prepared from stored rejects. Routine check assays were performed on every 20th sample. For the first 1,000 samples, 20% were check assayed in duplicate using two external laboratories, and the same sample was used for the internal laboratory duplicate. After the first 1,000 samples, pulp checks were done in one out of every 20 samples, alternating between the two external laboratories. The sample numbers for pulp duplicates and pulp checks were different after the first 1,000 samples.

Duplicate samples were prepared for 458 core sample intervals by preparing two pulps from different quarter-core samples. Figure 11.2 is a relative difference graph of the two assay pairs, which indicates relatively good agreement with the exception of two outlier assay pairs where samples may have been from unpaired intervals. This comparison is shown also shown in Table 11.6.

Figure 11.2 Relative Difference Graph of Quarter-Core Duplicate Samples

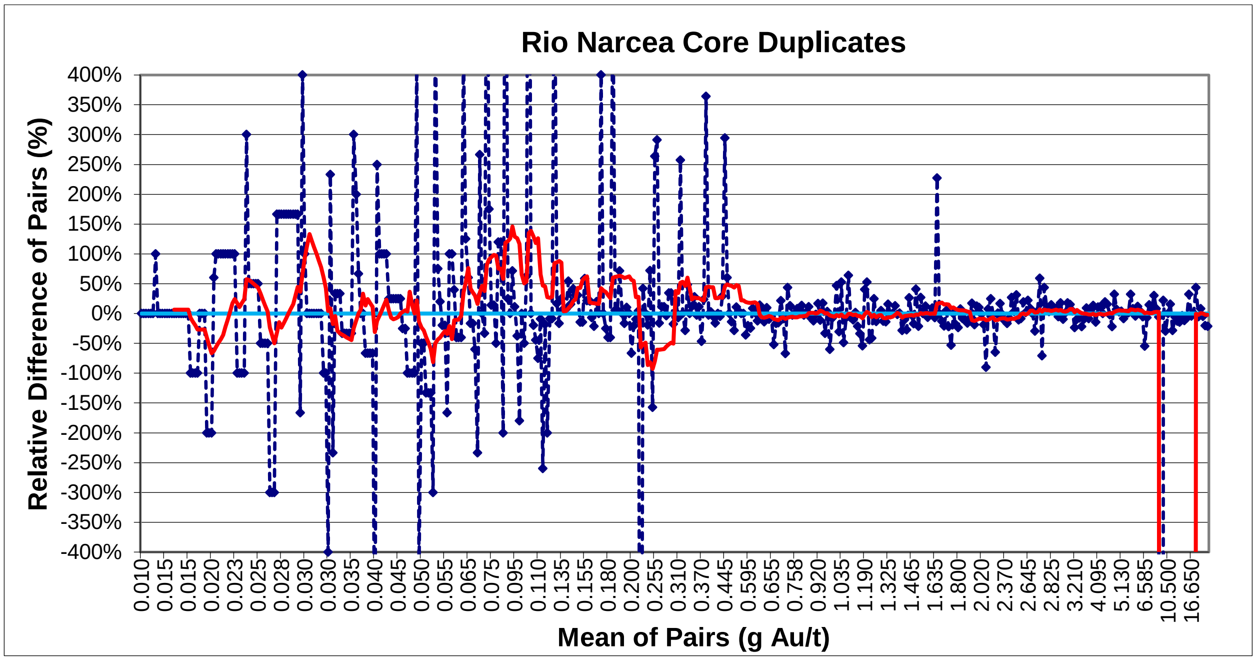


Table 11.6 Comparison of Quarter-Core Duplicate Samples

All Pairs	Mean	Original	Duplicate	Diff.	Rel. Diff.	A.V. Rel. Diff.
Count	458	458	458		458	458
Mean	1.860	1.892	1.827	-3%	-172%	245%
Median	0.308	0.285	0.320	12%		
Std. Dev.	5.143	5.405	4.937			
CV	2.765	2.856	2.702			
Min.	0.010	0.010	0.010	0%	-83550%	0%
Max.	53.165	58.330	50.000	-14%	1233%	83550%

11.8.2 Rio Narcea Density Measurements

Rio Narcea technicians carried out systematic density determinations on mineralized material as well as waste rock from different parts of the deposit. These density determinations are done using the formula:

Density= Weight in air / (weight in air-weight in water)

Results of various density determinations are as follows:

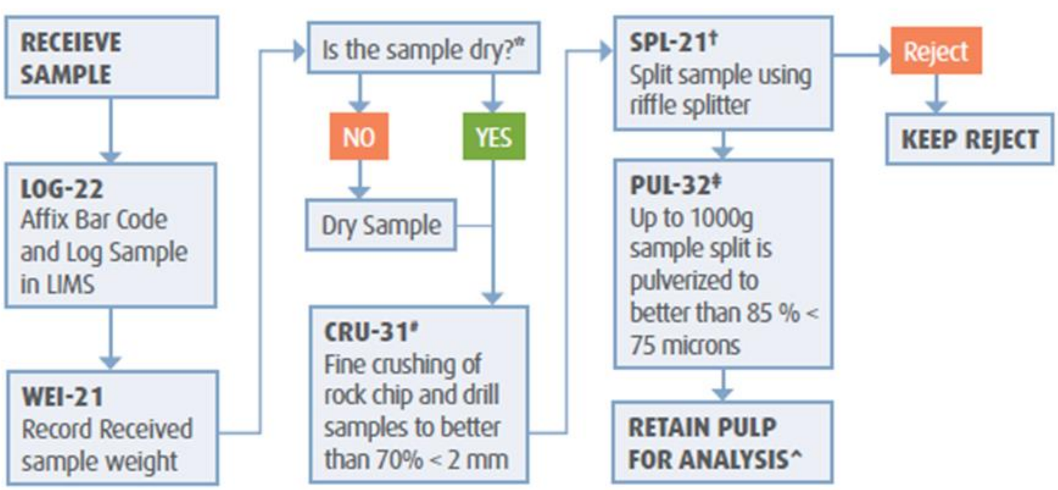
- Density determinations carried out on the 2004/05 Salave drill core show that the average of 261 density measurements on mineralized rock is 2.67 g/cm³, which is similar to the value of 2.65 g/cm³ reported by Newmont in its 1991 resource estimate of the Salave deposit.
- The average density for mineralized rock containing >0.5 g Au/t is 2.75 g/cm³.
- The average density reported in Rio Narcea's 2005 resource estimate is 2.74 g/cm³.

11.9 Astur Sampling

ALS was selected by Astur as their principal laboratory for the analysis of Salave samples. Sample preparation was done by a preparation facility in Seville, Spain, and then the pulps for analysis were shipped to ALS laboratory facilities in Loughrea, Ireland operating under OMAC Laboratories Ltd. OMAC with registration number 173T is accredited by the Irish National Accreditation Board to undertake testing as detailed in the Schedule bearing the Registration Number detailed above, in compliance with the International Standard ISO/IEC 17025:2005. The accreditation is dated 27/6/2006, was renewed on 13/5/2011, and expires on 13/05/2016 (http://www.inab.ie/directoryofaccreditedbodies/-laboratoryaccreditationtesting/173T.pdf).

ALS was requested to do their 31B preparation method on the sample, which pulverized approximately one kilogram of material to 85% < 75 µ. A 29.167g assay charge (one assay ton) was then weighed out for analysis. A flow chart of the sample preparation procedure is illustrated in Figure 11.3.

Figure 11.3 ALS Sample Preparation Method 31B



The prepared sample was fused with a mixture of lead oxide, sodium carbonate, borax, silica, and other reagents as required, inquarted with six milligrams of gold-free silver, and then cupelled to yield a precious-metal bead. The bead was digested in 0.5 milliliter dilute nitric acid in the microwave oven. Hydrochloric acid of 0.5 milliliter concentration was then added, and the bead was further digested in the microwave at a lower power setting. The digested solution was cooled, diluted to a total volume of 10 milliliter with de-mineralized water, and analyzed by atomic absorption spectroscopy against matrix-matched standards. Detection limits were 0.01 g Au/t at the lower end and 100 g Au/t at the upper end.

If a gold sample assayed over 10 g Au/t, the sample was re-analyzed with a gravimetric finish. A prepared sample was fused with a mixture of lead oxide, sodium carbonate, borax, silica, and other reagents in order to produce a lead button. The lead button containing the precious metals was cupelled to remove the lead. The remaining gold and silver bead was parted in dilute nitric acid, annealed, and weighed as gold. The lower detection limit was 0.05 g Au/t, while the upper limit was 1,000 g Au/t.

A 33-element ICP analysis was undertaken on all samples using a four-acid digestion. The sample is digested in a mixture of nitric, perchloric, and hydrofluoric acids. Perchloric acid was added to assist oxidation of the sample and to reduce the possibility of mechanical loss of sample as the solution was evaporated to moist salts. Elements were determined by inductively coupled plasma – atomic emission spectroscopy ("ICP-AES"). Detection limits for the various elements are shown in Table 11.7.

Table 11.7 ICP Detection Limits for ALS Method ME-ICP61a

Element	Symbol	Units	Lower Limit	Upper Limit
Silver	Ag	ppm	1	200
Aluminum	Al	%	0.05	50
Arsenic	As	ppm	50	100,000
Barium	Ba	ppm	50	50,000
Beryllium	Be	ppm	10	10,000
Bismuth	Bi	ppm	20	50,000
Calcium	Ca	%	0.05	50
Cadmium	Cd	ppm	10	10,000
Cobalt	Co	ppm	10	50,000
Chromium	Cr	ppm	10	100,000
Copper	Cu	ppm	10	100,000
Iron	Fe	%	0.05	50
Gallium	Ga	ppm	50	50,000
Potassium	K	%	0.1	30
Lanthanum	La	ppm	50	50,000
Magnesium	Mg	%	0.05	50
Manganese	Mn	ppm	10	100,000
Molybdenum	Mo	ppm	10	50,000
Sodium	Na	%	0.05	30
Nickel	Ni	ppm	10	100,000
Phosphorus	P	ppm	50	100,000
Lead	Pb	ppm	20	100,000
Sulphur	S	%	0.1	50
Antimony	Sb	ppm	50	50,000
Scandium	Sc	ppm	50	50,000
Strontium	Sr	ppm	10	100,000
Thorium	Th	ppm	50	50,000
Titanium	Ti	%	0.05	30
Thallium	Tl	ppm	50	50,000
Uranium	U	ppm	50	50,000
Vanadium	V	ppm	10	100
Tungsten	W	ppm	50	50,000
Zinc	Zn	ppm	20	100,000

11.9.1 Astur QA/QC

All laboratories routinely inserted blanks and analytical standards into each batch as an internal check.

Drill-core sampling carried out by Astur during the program was subject to a QA/QC program administered by the company. This included submission of blank samples, certified reference materials, and core duplicates and analysis of pulp reject and check sample splits at a third-party commercial laboratory. Results of both the in-house and laboratory QA/QC were monitored by Astur on an on-going basis during the course of the project.

11.9.1.1 Astur Certified Reference Material (Standards)

Results for the regular submission of Certified Reference Material ("CRM" or "standards") were used to identify problems with specific sample batches and long-term biases associated with the regular assay laboratory. Astur obtained five gold standards. The standards were prepared by two outside commercial laboratories who are specialities in the field of CRM preparation: CDN Resource Laboratories Ltd ("CDN") of Vancouver Canada and Ore Research and Exploration Pty of Australia. Details about the standards are listed in Table 11.8.

The standards covered the general range of values anticipated by Astur, and the source material for the standards is similar to that of the Salave deposit.

Table 11.8 Certified Reference Material Used by Astur

Standard	Certified Value (g Au/t +/- 2 Std. Dev.)	# of Laboratories
CDN-GS-5K	3.84 +/- 0.28	15
CDN-GS-9A	9.31 +/- 0.69	14
OREAS 19A	5.49 +/- 0.20	18
OREAS 66A	1.24 +/- 0.05	19
OREAS 502	0.49 +/- 0.02	20

Astur inserted standards into the sample sequence at the rate of approximately 1:20. Insertion was not systematic so that the occurrence of a standard in the sample sequence was not predictable. The results of the analyses of the standards are shown in Figure 11.4 through Figure 11.8 for each of the standards.

Figure 11.4 Analyses of Standard CDN-GS-5K

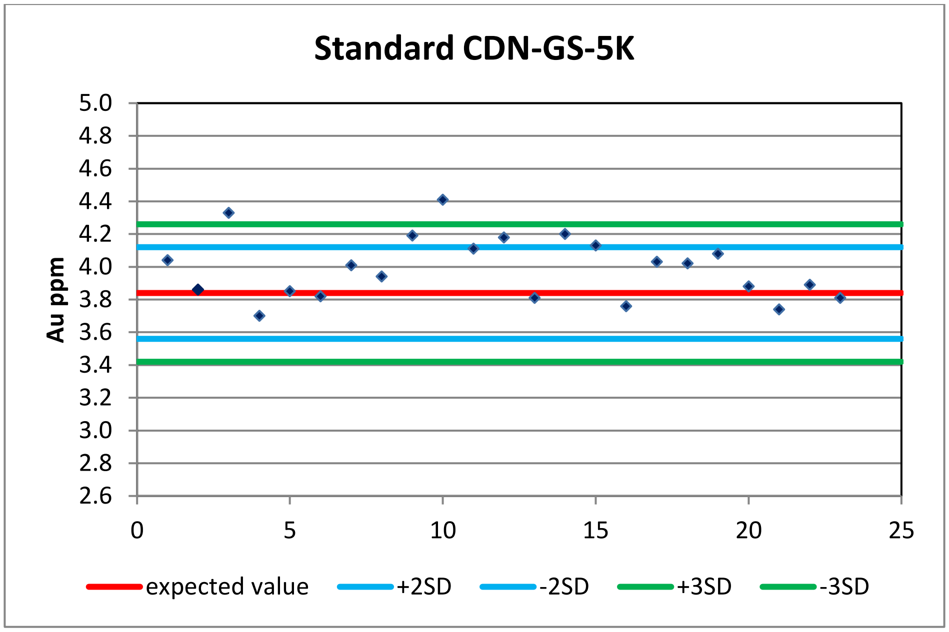


Figure 11.5 Analyses of Standard CDN-GS-9A

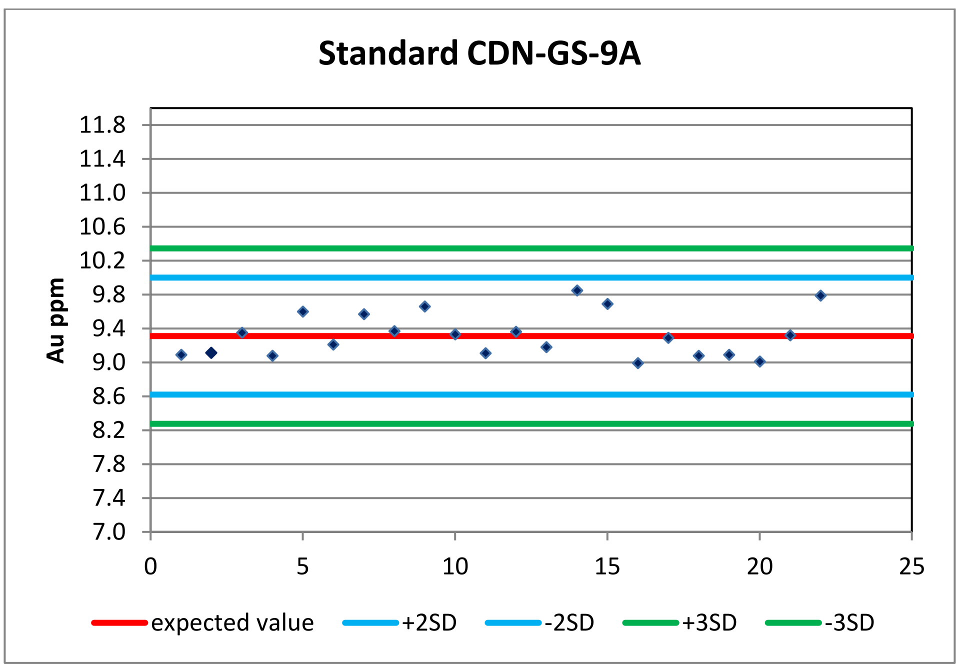


Figure 11.6 Analyses of Standard OREAS-19A

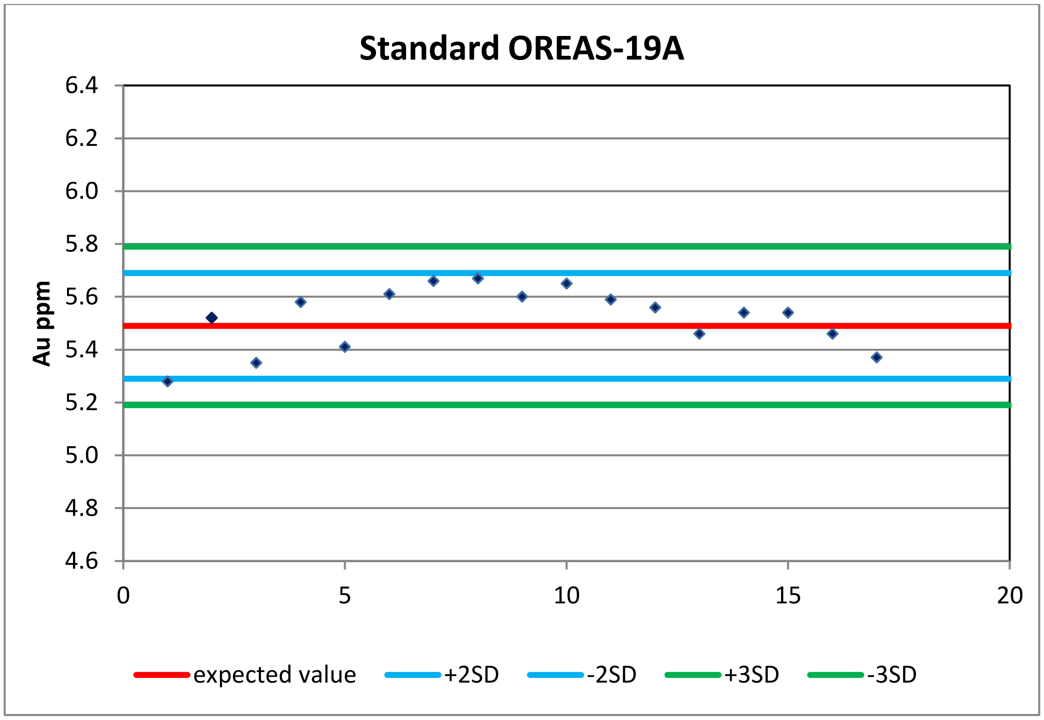


Figure 11.7 Analyses of Standard OREAS-502

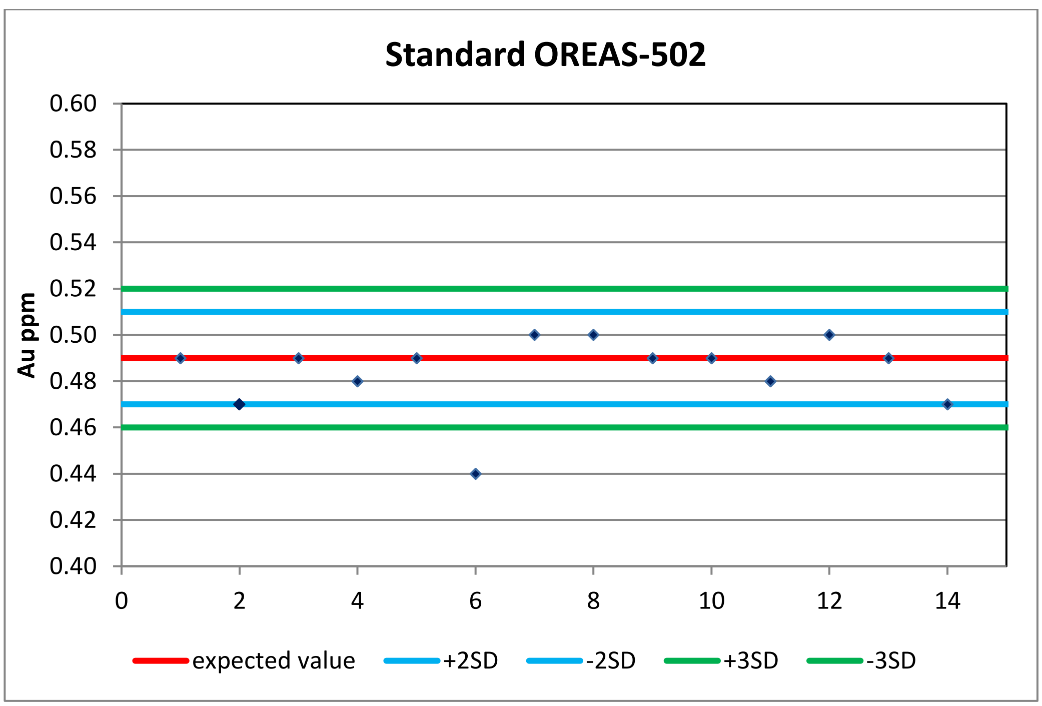
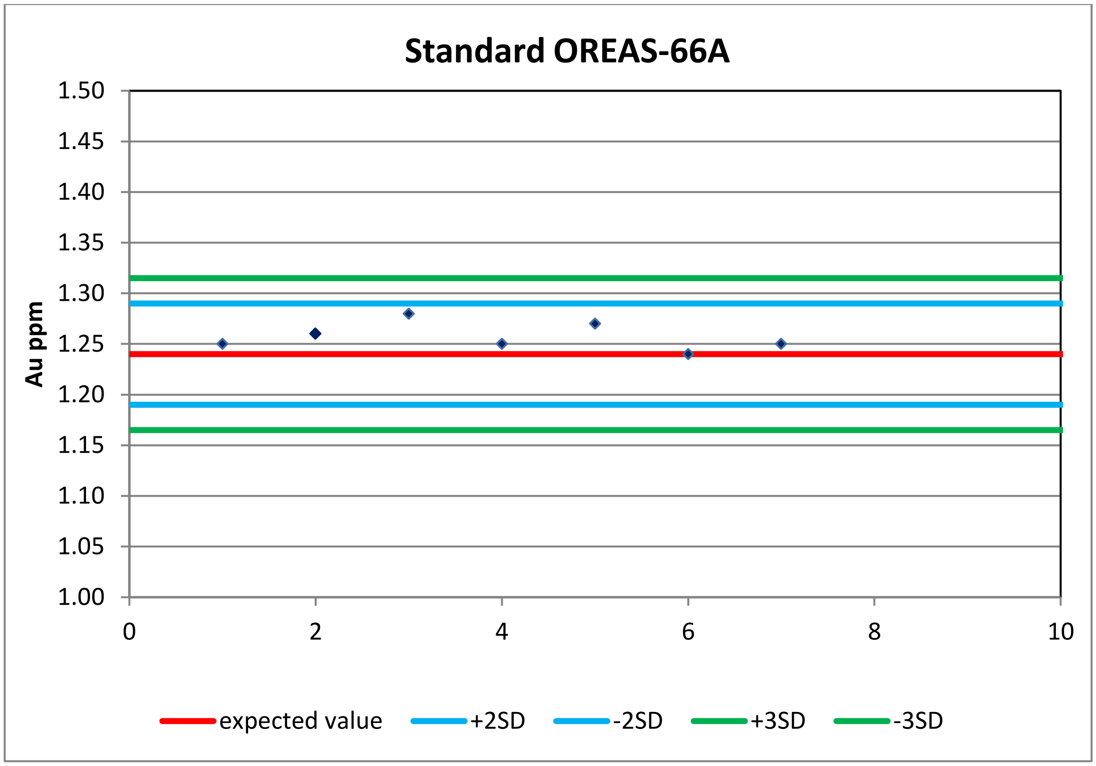


Figure 11.8 Analyses of Standard OREAS-66A



The analyses of the standards have been within expected values with the exception of a few analyses for standard CDN-GS-5K, which appeared to be slightly biased on the high side.

11.9.1.2 Astur Blanks

The regular submission of blank material was used to assess contamination during sample preparation and to identify sample numbering errors. Astur used barren quartzite as blank material. Prior to use, four samples were sent for gold and 33-element ICP analysis. Table 11.9 shows results for Au, As, Sb, and S, the principal elements of interest at Salave, and illustrates that this material is suitable as a blank.

Table 11.9 Analysis of Blank Material Used by Astur

Sample No	g/t Au	ppm As	ppm Sb	% S
50030	0.01	6	<5	0.01
50031	<0.01	<5	<5	<0.01
50055	<0.01	8	<5	<0.01
50056	<0.01	5	<5	<0.01

Of 90 blank samples submitted, all have returned values of 0.02 g Au/t or less, except one assay of 0.07 g Au/t.

11.9.1.3 Astur Drill-Core Duplicates

Drill-core duplicate samples, often called field duplicates, were used to help assess the natural local-scale grade variance or nugget effect (in the case of gold) and were also useful for detecting sample numbering mix-ups. At the time of sampling, a quarter core was cut from the remaining half-core sample and submitted as a duplicate. As rocks are rarely completely homogenous, it is normal to expect some variation between results. Table 11.10 illustrates the results for gold analyses of the core duplicates.

Table 11.10 Results of Gold Analyses of Drill Core Duplicate Samples

	Number	Mean	Median	Minimum	Maximum	Std.Dev.
Original	78	0.76	0.04	0.01	22.20	2.65
Check	78	0.82	0.03	0.01	19.35	2.44

11.9.1.4 Astur Pulp Duplicate Program

Pulp duplicates were submitted to the original laboratory and to secondary laboratories to assess the analytical accuracy and identify laboratory bias. After initial analysis by ALS, a pulp split of approximately every 10th sample was sent to ACME Labs in Vancouver, Canada for a check assay. A total of 87 check assays have been sent to date, representing drill holes SA-1 to SA-4. The check assay was performed for gold using ACME method G601, which is a lead collection fire assay with an atomic absorption spectrometry finish. The lower detection limit is 0.005 g Au/t, and the upper limit is 10 g Au/t. Overlimits were re-assayed using a gravimetric finish.

A duplicate pulp split was taken from the original 1,000-gram pulverized sample (see Figure 11.3 describing sample preparation) and was analyzed by ALS as a check of their original assay. A total of 87 duplicate pulp splits from holes SA-1 to SA-4 were submitted to ALS.

A preparation duplicate is a duplicate pulp derived from a second split of the coarse rejects of the original sample. A total of 87 preparation duplicates from holes SA-1 to SA-4 were sent to ALS for analysis to examine sample homogeneity.

Table 11.11 shows the results of the various Astur duplicate sample analyses. The first row summarizes the results of the original ALS analysis. The second row shows the results of the second analysis by ALS on a duplicate pulp split from the original 1,000-gram pulverized sample. The third row shows the results of analyses of the preparation duplicates by ALS. The fourth row summarizes the results of check assays by Acme of original ALS pulps.

Table 11.11 Astur Duplicate Analyses for Gold

Item	Number	Mean	Median	Minimum	Maximum	Std.Dev.
Original ALS analysis	87	2.14	1.51	0.01	17.90	2.78
ALS analysis of duplicate pulp split	87	2.19	1.45	0.01	23.00	3.15
Preparation Duplicate	87	2.07	1.15	0.01	22.20	3.19
ACME Check Assay	87	2.14	1.49	0.01	21.60	3.02

The duplicate analyses generally fall within an acceptable range of precision for gold analysis given the analytical method employed. Overall, the results of the duplicate analysis are acceptable.

11.9.2 Astur Specific-Gravity Measurements

The following methodology was employed based on method #3 from Lipton (2001):

- The sample was dried and then weighed on a triple-beam balance to determine the dry mass ("Ms").
- The sample was then placed in a basket, which was suspended in water.
- The weight of the basket was then subtracted to get the weight of the sample in water ("Ms $_{in\ water}$").
- The dry specific gravity was calculated as the mass of the sample in air divided by the difference of mass of the sample in the air and the mass of the sample in water

$$\rho_d = \frac{M_s}{M_s - M_{s\ \text{in water}}}$$

Specific-gravity measurements were recorded for the sedimentary and intrusive rocks plus varying degrees of mineralization. Astur made a total of 280 bulk density measurements. As a check on the in-house work, 20 samples were sent to a commercial laboratory for density measurements. The analyses were performed at Lacotec Laboratorio Asturiano de Control Técnico, S.A. ("Lacotec"), located in Soto de Llanera, Asturias. Lacotec used method # 4 after Lipton, (2001). The main difference in the Lacotec method from the method used by Astor is the use of a wax coating to prevent water infiltration into pore spaces or fractures and to hold together friable samples. Table 11.12 shows Astur's specific gravity results as well as those of Lacotec; comparable results from measurements made by prior operator Rio Narcea are also included on Table 11.12. Rio Narcea used the same Lipton method # 3 used by Astur.

Table 11.12 Specific Gravity for Salave Zone Mineralization and Rock Units

Lithology and Alteration	Rio Narcea		Astur Gold		Lacotec	
	S.G.	N	SG	N	SG	N
Chlorite altered Grandiorite	2.62	185	2.64	104	2.64	5
Albite Altered Granodiorite	2.67	128	2.68	86	2.66	10
Albite - Sericite Altered Granodiorite	2.75	29	2.73	18	2.75	4
Quartzite	2.63	6	2.63	22	NA	NA
Slate	2.62	28	2.65	50	2.77	1

12.0 DATA VERIFICATION

Most of the data gathered by operators previous to Rio Narcea and Astur occurred prior to 2001, and most of these historical drilling campaigns did not include rigorous check assaying or the insertion of blanks and standards as part of the programs, although limited check assaying was completed. The bulk of the QP's verification of the older drill data is derived from reviews of drill core and core photos, two site visits, verification of the project data, and a comparison of assays from metallurgical testing to drill-hole assays.

12.1 Metallurgical Testing of Drill Core Samples

12.1.1 Rio Narcea Metallurgical Tests

Considerable metallurgical testing of drill core has been completed on Rio Narcea, Anglo, Newmont, and Lyndex core intervals. These data provide the bulk of the data verification for the deposit. All of the tests reported have drill-hole sample weights so that the drill-hole assays can be compared to metallurgical test head assays and calculated heads.

The first metallurgical tests that can be compared to drill-hole assay data are from two large-scale metallurgical tests that were completed by Ammtec in 2005, compositing nearly three tonnes of mostly Rio Narcea drill core in each of the two composites for upper and lower mineralized horizons. A pilot flotation plant was operated to consume the composites at a rate of about 150 kilograms per day. Table 12.1 describes the comparison of the drill-hole assays to the metallurgical test head samples. Note that the pilot plant metallurgical testing indicates higher grades than the drill-hole assays. This may be due to a coarse gold component.

Table 12.1 Comparison of Pilot Plant Metallurgical Test Results to Drill Core Assays

Lab	Composite	Weight kg	Drill Hole g Au/t	Head Assay g Au/t	Pilot Feed g Au/t	Calculated Head* g Au/t	Daily Stream g Au/t
AMMTEC	Upper	2,848	4.09	4.31	4.48	5.06	4.28
AMMTEC	Lower	2,872	3.97	5.26	5.70	4.82	5.15
*Note: Calculated head is for one day only (150 kg)							

Ammtec also completed 65 variability tests on behalf of Rio Narcea. Drill core was selected, weighed, and composited into 65 samples for the tests. Each composite was based on a seven-kilogram sample, with the excess weight used to make the upper- and lower-horizon composites for the pilot plant test work. The assay heads and calculated heads of the one-kilogram split sample can be compared to the expected value calculated from the drill-hole assays of the intervals used in the composite; this comparison is shown in Table 12.2, Table 12.3, and Table 12.4 for the upper, lower, and "underground" samples used, respectively. The "underground" samples were higher in grade, presumably representing material that would be mined by underground methods.

Table 12.2 Metallurgical Test Results vs Drill Hole Assays – Upper Samples

Drill Hole Assays								Metallurgical Head Assay					Calculated Head Grade				
			Au	As	Sb	S	Fe	Au	As	Sb	S	Fe	Au	As	Sb	S	Fe
Hole	From	To	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%
RN014	74.65	83.65	2.07	2387	123			2.86	2140		0.94	2.19	2.21	2200		0.98	2.45
RN015	10.00	16.00	2.64	10319	25			5.62	10200		1.74	4.33	4.29	8800		1.66	4.37
RN015	43.50	49.50	2.24	5988	110			2.64	5900		2.93	3.68	2.77	6300		2.72	3.88
RN017	82.90	89.25	4.27	4421	2432			3.22	4300		3.27	3.85	4.25	4600		3.35	4.29
RN018	85.10	92.00	2.78	3622	136			1.72	3200		3.18	3.48	2.36	3200		3.21	3.60
RN019	26.00	32.15	3.16	8828	717			2.84	7700		2.81	3.48	2.74	7300		2.82	3.88
RN019	82.15	88.50	8.44	12031	521			6.50	9000		3.15	3.37	6.84	8900		3.17	3.59
RN021	15.00	21.00	9.60	3457	49			3.60	2800		0.94	2.06	4.24	2700		1.09	2.19
RN021	41.00	47.00	3.45	5344	159			11.7	6400		2.99	3.57	10.1	5900		2.99	3.58
RN023	72.00	77.55	3.59	8409	252			3.69	10000		1.75	2.97	3.64	8300		1.78	2.95
RN024	94.05	99.90	2.80	4440	353			2.98	4300		2.44	2.62	3.19	4400		2.42	2.99
RN025	40.00	46.50	3.45	625	25			3.08	4200		4.61	5.37	3.40	4400		4.46	6.07
RN025	97.50	103.50	4.71	4806	129			4.72	4500		0.57	1.86	4.73	4000		0.66	1.94
RN031	12.00	18.00	4.60	11587	208			3.82	8000		5.56	5.31	4.37	8500		5.48	6.00
RN032	59.20	72.30	2.65	5343	860			2.91	4800		2.05	2.93	3.28	5000		2.19	3.28
RN036	18.00	24.00	5.22	5384	1449			4.90	4700		7.22	7.28	4.96	5000		7.83	8.61
RN044	71.45	77.75	5.16	4739	1239			4.75	4600		0.91	1.99	5.91	4600		1.09	2.22
RN048	65.15	71.75	3.51	12842	36			3.60	11000		5.30	5.70	3.61	11200		5.13	6.81
RN050	95.20	101.75	2.95	4169	25			2.61	4300		2.96	3.60	2.48	4200		3.08	4.13
RN052	44.85	50.40	1.90	2041	1118			3.08	1900		0.40	2.28	4.76	1900		0.52	2.34
RN052	68.00	74.00	6.06	6559	652			5.15	6100		2.79	3.78	4.28	5500		2.81	3.98
RN058	72.00	78.80	3.87	5589	210			3.84	4700		0.96	2.18	3.52	4100		1.21	2.30
RN062	103.70	109.25	2.93	4354	25			2.30	3100		3.12	5.76	2.07	3100		3.04	5.96
RN063	26.20	33.60	7.56	4795	25			5.30	4400		0.62	1.99	9.15	3600		0.72	1.95
RN068	93.20	101.50	3.45	7686	25			3.30	6000		1.26	3.16	3.22	5600		1.21	3.22
Averages			**4.12**	**5991**	**436**			**4.03**	**5530**		**2.58**	**3.55**	**4.25**	**5332**		**2.62**	**3.86**

Table 12.3 Metallurgical Test Results vs Drill Hole Assays – Lower Samples

Drill Hole Assays								Metallurgical Head Assay					Calculated Head Grade				
			Au	As	Sb	S	Fe	Au	As	Sb	S	Fe	Au	As	Sb	S	Fe
Hole	From	To	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%
RN08	134.40	140.35	3.66	7335	25			3.74	7200		0.39	2.77	3.49	6500		1.30	2.99
RN09	128.50	134.95	2.24	566	25			2.65	600		0.49	2.94	2.84	600		0.62	3.39
RN12	116.80	121.80	2.65	9511	176			2.78	8100		1.71	2.44	2.86	7200		1.72	2.76
RN15	166.95	180.20	2.73	7222	347			3.28	7200		1.09	2.27	3.26	6600		1.14	2.55
RN19	139.40	144.75	3.88	7406	25			4.12	5600		2.28	3.41	4.14	4900		3.21	3.37
RN23	127.35	132.55	2.82	4523	41			3.40	4600		4.95	5.21	3.39	3700		5.01	5.64
RN23	171.85	177.90	11.29	19938	9589			11.70	18200		2.35	2.83	11.50	14400		2.42	3.11
RN23	206.65	212.00	3.85	11692	2806			4.14	10600		1.87	2.86	4.01	9200		1.97	3.21
RN26	126.30	132.50	3.16	7080	25			2.74	6200		2.98	3.27	2.69	5500		2.91	4.00
RN27	130.00	136.00	1.97	6580	25			1.83	6000		2.67	3.35	1.82	4700		2.81	3.66
RN29	159.60	169.50	2.73	7268	144			3.16	6200		1.01	2.49	3.13	4600		1.35	2.61
RN32	96.00	104.90	4.13	5062	263			2.56	4300		0.64	2.18	2.62	3400		0.90	2.37
RN33	166.20	172.30	2.97	5999	25			3.24	5700		0.94	2.19	3.00	4300		1.27	2.30
RN34	181.55	188.25	2.30	5860	25			2.32	5300		1.58	2.54	2.36	4700		1.95	2.79
RN35	186.69	197.20	5.70	7828	74			7.94	8600		1.64	2.56	7.47	7300		1.72	2.15
RN36	176.00	183.00	2.18	3227	81			4.00	3100		1.30	2.59	2.32	2600		1.35	2.11
RN37	165.15	180.85	2.26	6865	29			2.42	6300		0.97	2.62	2.20	5100		1.04	2.16
RN39	98.00	104.90	3.50	3786	461			3.26	3500		1.64	2.76	2.82	2800		1.69	2.36
RN40	128.00	137.00	4.45	4580	25			4.72	4100		1.45	3.01	3.30	3400		1.50	2.71
RN41	217.45	223.60	6.05	9583	25			6.20	8600		1.52	2.93	5.90	6900		1.82	2.57
RN42	196.20	203.45	5.01	12198	25			5.82	9300		1.03	2.51	5.61	7700		1.05	2.48
RN46	166.60	171.70	2.63	4896	351			2.50	3900		0.79	2.41	2.50	3300		0.82	2.37
RN52	132.50	138.80	5.71	11945	138			5.84	10300		1.39	2.45	5.82	8300		1.41	2.05
RN57	202.00	209.25	2.45	3777	31			2.40	4100		1.04	2.29	2.20	3700		1.16	2.10
RN68	213.70	223.50	5.17	6810	25			5.14	6300		1.30	2.36	5.11	5200		1.28	1.97
Lower Averages			**3.82**	**7261**	**592**			**4.08**	**6556**		**1.56**	**2.77**	**3.85**	**5464**		**1.74**	**2.79**

Table 12.4 Metallurgical Test Results vs Drill Hole Assays – "Underground" Samples

Drill Hole Assays								Metallurgical Head Assay					Calculated Head Grade				
			Au	As	Sb	S	Fe	Au	As	Sb	S	Fe	Au	As	Sb	S	Fe
Hole	From	To	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%	g Au/t	ppm	ppm	%	%
AA7/2	52.35	59	6.22	1874	1646			9.02	9450		1.62	2.41	7.71	4400		1.23	2.65
GT1	334.8	345.2	9.76	18692	28			11.1	14000		3.6	3.42	12	14900		3.43	4.54
RN03	214.4	222.55	6.99	13990	31			6.86	11200		1.00	2.41	6.85	11100		1.03	2.67
RN10	247	254	33.29	29750	192			32.00	22200		1.55	2.41	33.80	22100		1.47	2.99
RN20	253.35	257	28.50	26995	39633			30.00	22300		3.34	2.77	31.00	23300		3.12	3.53
RN27	244.5	252	10.08	6310	39			6.64	5710		0.85	1.71	6.74	5200		0.88	1.93
RN29	218.95	227	5.69	10377	30			5.68	8820		1.69	2.51	5.79	8400		1.65	2.91
RN32	130.9	133.9	7.49	7250	25			7.28	5170		1.24	2.71	3.96	5300		1.25	2.72
RN33	178.65	184.2	5.13	11795	25			5.54	10600		2.09	2.37	5.58	10400		2.05	2.83
RN36	122.25	127.5	4.41	9581	523			4.36	7820		1.43	2.18	4.40	7800		1.40	2.54
RN42	235.9	240.95	4.23	6807	25			3.36	5540		0.63	2.01	3.59	4700		0.72	2.08
RN45	145	148.3	7.64	4006	25			4.22	3890		0.45	1.61	7.18	3400		0.57	1.68
RN51	248.5	251.95															
RN51	258.05	260.6	5.34	9302	25			6.32	9320		1.4	2.81	6.73	8500		1.57	3.04
RN60	95.5	100.5	10.04	7763	6270			8.92	7490		1.7	2.21	8.51	7100		1.54	2.47
RN62	188.55	190.85	6.11	4008	652			5.76	4600		2.82	2.96	2.86	4300		2.54	3.29
Underground Averages			**10.06**	**11233**	**3278**			**9.80**	**9874**		**1.69**	**2.43**	**9.78**	**9393**		**1.63**	**2.79**
all 65 tests-Averages			**5.38**	**7689**	**1152**			**5.38**	**6927**		**1.98**	**2.99**	**5.38**	**6320**		**2.05**	**3.20**

Note that the average drill-hole gold assay grade is the same as both the metallurgical test assay head and calculated head, confirming the drill-hole gold assays. The arsenic drill-hole assay is about 18% above the calculated head arsenic grade, indicating the drill-hole arsenic grade may be higher than the actual grade.

Table 12.4 also summarizes the test results of all 65 variability tests.

12.1.2 Astur Gold Corporation Metallurgical Tests

Astur completed metallurgical tests on a number of composites. Composite samples were constructed from low-grade, average-grade, and high-grade samples from both Upper and Lower zones of mineralization. The nature of the Upper and Lower zones is discussed in Section 13.0. Master composites were constructed for both the Upper and Lower zones. The size of each test was generally around two kilograms. The comparison between the calculated head grade, assay head grade, and the composite grade from drill-hole assays is shown in Table 12.5. The metallurgical tests show slightly higher grades than the estimated head grade by using the drill-hole assays.

Table 12.5 Astur Metallurgical Test Results – Drill Hole Grade vs Test Results

	Drill Hole	Head Assay	Calc Head	Number
Composite Name	**g Au/t**	**g Au/t**	**g Au/t**	**Tests**
Upper High Grade	19.14	25.68	22.95	2
Lower High Grade	20.85	18.18	20.25	2
Upper Low Grade	3.01	3.54	3.68	1
Lower Low Grade	2.63	2.21	2.56	1
Upper Average	5.16	5.05	5.16	1
Lower Average	6.42	4.75	4.82	1
Upper Master	5.61	5.68	6.44	16
Lower Master	7.89	6.98	7.24	9
Master Composite 2	7.05	11.00	10.64	5
Upper Zone 2004-2005 Barre	4.20	3.41	2.34	1
Upper Zone 1981-1983 Barre	5.26	4.08	4.81	1
Lower Zone 2004-2005 Barre	7.27	7.51	6.84	1
Lower Zone 1981-1983 Barre	8.25	9.05	8.71	1
Average	**7.90**	**8.24**	**8.19**	**42**

12.2 Twin Drill Hole Comparison

A total of seven twin (one is a triple) drill holes can be compared. The three-hole twin was drilled on a very high-grade, nearly vertical structure and compares about as well as can be expected with vertical drilling on a vertical structure. Table 12.6 is a comparison of the twin drill holes.

Table 12.6 Twin Drill Hole Comparison

Twin Pair	Hole	Company	Twin From	Twin To	Mineralized Interval	g Au/t	ppm As	ppm Sb	% S	Grade Thickness Gram Meters
1	SA-6	Astur	60	280	70.6	8.13	9,149	717	1.42	573.8
1	RN73	Rio Narcea	60	280	72.8	5.43	13,733	286		395.6
1	L9601	Lyndex	60	280	97.0	7.03				682.1
2	SA-3	Astur	70	280	74.1	5.03	8,675	56	1.55	373.1
2	L9709	Lyndex	70	280	59.5	5.57				331.1
3	RN03	Rio Narcea	70	200	38.9	2.49	5,686	46		96.9
3	NSC03	Newmont	70	200	43.5	2.43				105.7
4	RN72	Rio Narcea	70	260	91.4	4.93	12,066	313		450.4
4	NSC26	Newmont	70	260	96.0	4.56				438.0
5	RN10	Rio Narcea	80	200	23.4	6.08				142.2
5	NSC28	Newmont	80	200	28.0	4.41				123.5
6	L9720	Lyndex	60	120	24.0	2.28				54.8
6	NSR20	Newmont	60	120	24.0	1.45				34.8
7	L9716	Lyndex			53.5	3.44				183.8
7	AA1/3	Anglo			40.4	2.77	7,793	59		111.7

12.3 Astur Metallic Screen Check Assays

Astur completed 50 check assays by metallic screen and fire assay. The 1000-gram metallic screen checks indicate slightly higher grades than the drill-hole assays as shown in Table 12.7.

Table 12.7 Metallic Screen Check Assays

Original Drill Hole g Au/t	Metallic Screen Check g Au/t	Fire Check 1 g Au/t	Fire Check 2 g Au/t
5.99	6.29	6.39	6.41

12.4 Database Verification

A report of a 2013 survey by Topcad Ingenierias S.L. documents Astur's drill-hole survey and the transformation of the Salave drill data from local coordinates into the current project coordinate system (UTM Zone 29 coordinates using the ETRS89 datum). This report was used by MDA to check the locations of 51 (15%) of the core holes in the project database. No coordinates for the Oromet, Goldfields, or the FM-series of holes drilled by Anglo are provided in the document. One discrepancy was found in the collar elevation of hole RN07, but the elevation provided by the document is clearly inaccurate, as it would place the collar about 25 meters above the surface. The elevation in the project database for this hole is identical to that of hole AA6/4, which lies 0.2 meters away.

While Mr. Prenn was unable to verify the down-hole survey data, as the original down-hole surveys were not available, however, the database is dominated by vertical holes which do not show significant deviation.

Mr. Prenn further verified the historical drill-hole assays utilizing original paper laboratory certificates or copies thereof (Newmont, Rio Tinto, and Anglo holes) and various handwritten records, primarily drill logs. No backup data for assays from holes drilled by Oromet or Rio Narcea were available. In the case of Lyndex assays, handwritten notes that carefully document the drill hole, sample number, from-to interval, and gold assay in oz Au/ton were used in the verification process. It was found that the conversion of the original oz Au/ton values into g Au/t (metric tonne) was actually a conversion into g Au/ton (short ton), so MDA reconverted all of the values and replaced them in the project database.

Assays from 19% of a total of 2,816 drill-hole intervals from the IMEBESA, Anglo, Rio Tinto, and Newmont holes were verified. Other than inconsistencies with respect to the handling of less-than-detection analyses, 32 discrepancies between the verification materials and the gold assay values in the database were found. Of these errors, the most significant consist of an entry error, whereby a 0.5 g Au/t value was entered as 0.05 g Au/t, and an unassayed interval that had a value of “0” in the database; all other of the errors were immaterial.

Astur provided MDA with assay certificates for their 10 resource core holes drilled in 2013, which were imported into the project database.

12.5 Summary Statement and Discussion of Limitations on Data Verification

The metallurgical tests that utilized much of the historical mineralized core serve to confirm and therefore verify the drill-hole assay data. The drill-hole data from the IMEBESA core drilling and 24 Lyndex RC holes drilled in 1997 were not used to prepare a grade model for the deposit. The QP believes that the remaining drilling assay results, only two of which are from RC holes, are of sufficient confidence to be used to prepare a reliable grade model for the deposit. All of the metallurgical tests that can be compared to the core-hole assays show equal or greater grades than the drill-hole assays, which adds to the confidence in the assay data. Metallic screen check assaying by Astur also indicates slightly higher grades than the original drill-hole assays. Based on the database verification and the metallurgical confirmation of drill hole assays, it is the QP’s opinion that the data verification is adequate for the levels of classification of the resources estimated in Section 14.0.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

This Section 13.0 was prepared by Allen Anderson, P. E. and President of Allen R. Anderson Metallurgical Engineer Inc., and Craig A. Smith, of Metal Edge Solutions. No new metallurgical data have been generated subsequent to the prior technical report, so this section remains as originally presented in Prenn (2014; 2016). Mr. Anderson is the qualified person who takes responsibility for this section13.0.

The following information has been summarized from Wilkinson (1986), Bulled (1973), Crump and Suarez (1977), Agnerian (2010), Tenorio et al. (2013), Ausenco Ltd. (2006b), and other references as cited. Mr. Anderson has reviewed these reports and presents a summary of his conclusions in Section 13.9.

Early metallurgical test work on the Salave deposit was initiated by IMEBESA in 1971, and since then numerous other metallurgical investigations have been carried out by various operators, including Rio Tinto, Gold Fields, Newmont, Anglo, Oromet, Rio Narcea, and Astur.

Crump and Suarez (1977) summarized results of cyanidation testing by IMEBESA, Rio Tinto, and Gold Fields as follows:

> *"Gold extraction by straight cyanidation of finely ground ore has been extremely poor in tests performed to date. W.S.L. [Warren Spring Laboratories] achieved a maximum recovery of 56% on a head grade of 1.12 gm Au (80%-200/48 hours leaching time). Rio Finex [Rio Tinto Finance and Exploration Limited] and Lakefield Research Laboratories achieved much lower recoveries (10-13%) on higher grade samples. Cyanidation of a flotation concentrate gave even poorer extraction (5-8%).*
>
> *The conclusion is that Salave ore is highly refractory…"*

Wilkinson (1986) summarized the results of metallurgical testing from 1971 through April 1986. Cyanidation after pressure leaching and bacterial oxidation yielded gold extractions over 95%, but questions remained about the capital investment required. Subsequently Newmont determined that the high dolomite content coincident with the gold mineralization made bio-oxidation of low-grade material impractical (Knutsen, 1991b).

From 2004 to 2006, Rio Narcea commissioned metallurgical test work at AMMTEC to evaluate flotation and oxidation of the flotation concentrate by pressure leaching, the Activox process, and biological methods. Results of the studies indicated that gold, sulfur, and arsenic recoveries to a rougher concentrate were high. The oxidation studies concluded that pressure oxidation was the most appropriate technology considering gold recovery, reagent consumption, and the residue stability.

In 2013, Astur submitted samples of core splits of previous owners' drilling inventory to ALS Metallurgy Kamloops for metallurgical testing. The test program was designed to provide information for comminution circuit design and to confirm the AMMTEC flotation results. The flotation recovery process included cleaning stages, and locked cycle test results indicated that gold recovery ranged from 85 to 91 percent to a cleaner concentrate that graded 86 to 156 g Au/t. Test products were submitted to others to evaluate the concentrate marketability and tailing characteristics.

13.1 IMEBESA 1971

Lakefield Research ("Lakefield") of Canada identified pyrite and arsenopyrite as the principal minerals in samples submitted by IMEBESA, with pyrite predominating (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982). IMEBESA contracted with Lakefield for a short program of metallurgical test work on one composite high-grade sample, comprised of a composite of 12 samples, assaying 8.4 g Au/t (Thomas, 1982; Wilkinson, 1986).

Flotation tests with grinding to about 85% -75µm showed that 95.9% of the gold could be recovered in a bulk sulfide concentrate. Some selective flotation of pyrite and arsenopyrite was possible, but attempts to separate stibnite from other sulfides during cleaning were not successful (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Wilkinson, 1986).

Direct cyanidation of the concentrates yielded 13.5% gold dissolution with the head sample pulverized to -65 mesh and leached for 48 hours (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Wilkinson, 1986). Of three flotation-roasting-cyanidation tests, the best result was with the flotation concentrate roasted with 5% carbon at 650°C and calcine leached with 10 kg NaCN/t for 24 hours, which produced 79% gold extraction (Wilkinson, 1986). No attempt was made to suppress the effect of Sb or As during the direct cyanidation tests.

13.2 Rio Tinto 1972-1973

Rio Tinto's Chessington laboratory conducted mineral processing test work on Salave samples in 1972 and 1973 (Bulled, 1973; Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Wilkinson, 1986). Rio Tinto undertook grinding, froth flotation, roasting, and leaching on six samples from Salave and a seventh composite sample comprised of two kilograms of each of the original six samples. All of the samples contained native gold and sulfide minerals, chiefly pyrite and arsenopyrite, in a silicate matrix. Rio Tinto also sent a sample of mineralized weathered rock to the Robertson Research Laboratories to determine the habit and particle size of the gold (Thomas, 1982).

Grinding test work indicated that grindability was very variable and that the ball-mill grindability work index of the composite sample was 13.2 kWh/t. Open-circuit flotation tests included a simple rougher-cleaner flowsheet; a grind of 80% passing -300 mesh was determined to be suitable for flotation. Satisfactory roasting of the concentrate was achieved over two hours at a temperature of 600°C. Leaching was conducted for 48 hours in 0.1% NaCN solution with a starting pH of 10, adjusted by lime addition. Table 13.1 shows the results of this test work. Rio Tinto noticed that because of the difficulties involved in working with low-grade gold samples, a greater quantity of duplication of tests was necessary than is normal in mineral processing test work and recommended such duplication in future testing programs (Bulled,1973). Wilkinson (1986) noted that reservations were expressed about the accuracy of the results because of sampling errors, the nature of the mineralized material, and discrepancies between assay and calculated head values.

Table 13.1 Results of Rio Tinto Metallurgical Test Work
(from Bulled, 1973)

ample #	Calculated Head Grade (ppm Au)	Flotation Cleaner Concentrate		Gold Recovery from Concentrate by Roasting-Leaching (%)
		Grade (ppm Au)	Recovery (%)	
122	16.3	200	89.1	95.1
123	7.89	222	85.0	90.6
124	7.23	148	92.3	89.3
125	5.44	110	90.8	87.6
126	9.28	201	90.8	93.1
127	7.61	114	92.2	83.8
128	10.4	185	92.8	88.2

13.3 Gold Fields 1976

Four samples of material ground to 80% -200 mesh were submitted to Warren Spring Laboratories for standard laboratory cyanidation tests (Crump and Suarez, 1977). The grade of the samples ranged from 1.12 to 3.30g Au/t. Results are show in Table 13.2.

Table 13.2 Results of Cyanidation Tests by Warren Spring Laboratories
(condensed from Crump and Suarez, 1977)

Sample	No. 1 High Grade	No. 8 Medium Grade	No. 10 Low Grade	No. 9 Lowest Grade
Head Assays				
Au (g/t)	3.30	2.265	1.46	1.12
	3.30		1.59	
Sb (%)	0.15	0.009	0.005	0.005
	0.15		0.005	
As (%)	0.58	0.52	0.45	0.23
	0.58		0.45	
Residue				
Au (g/t)	-	1.83	0.74	0.49
	1.71		0.72	
Solution				
Au (g/t)	-	0.29	0.48	0.42
	1.06		0.58	
Gold Extraction				
%	-	19.4	49.3	56.3
	48.2		54.1	

Notes: Calculated head assays for gold; others actual head assays
All tests: 48 hours leaching time
Tests without lead nitrate at pH 10.8 to 11.5
Tests with lead nitrate at pH 9.8 to 10.0
All samples ground to 80% minus 200 mesh B.S.S.

One sample with 2.59 g Au/t and selected sections of core were sent to Warren Spring Laboratories for mineralogical examination, but Crump and Suarez (1977) gave no details.

13.4 Anglo American 1981-1983

In 1981, Anglo American Research Laboratory ("Anglo") conducted test work on high- and low-grade composites with head grades of 4.52 and 1.24 g Au/t, respectively (Anglo American Corporation of South Africa Limited and Charter Consolidated P.L.C., 1982; Wilkinson, 1986). The flotation test work showed that at a grind of 85% passing 74 microns, 95% of the sulfide sulfur and gold and 75% to 85% of the silver were recovered to the rougher concentrate. Gravity concentration prior to flotation failed to improve gold extractions significantly. Roasting, followed by leaching of the high- and low-grade calcines (100 g Au/t and 46 g Au/t, respectively) gave gold recoveries from the calcines of 77% and 70%, respectively. These disappointing results led Anglo to consider alternative methods of treating the mineralization at Salave.

In 1983, Anglo carried out metallurgical test-work to determine gold recovery using conventional cyanidation methods (Agnerian, 2010; Tenorio et al., 2013). The testing was performed on samples with size fractions varying from 1.6 millimeters to 12 millimeters material of crushed mineralized material, whose provenance is not known. Based on these test results, Anglo concluded that only some 20% of the gold in Salave mineralized material could be recovered by conventional cyanidation using percolation leach methods. Mineralogical studies by Anglo also indicated that some 70% of the gold occurs "*locked in sulphides, probably as sub-micron particles, and unlikely to be recovered by conventional methods*" (Agnerian, 2010, citing McArthur, 1983).

Anglo's tests also showed that for "*a typical mineable grade sample assaying approximately 4 g/t Au and 2% S*," more than 96% of the contained gold was recovered in a flotation concentrate containing 52 g Au/t, 27% S, and 6% As, with a concentration ratio of 15:1. Laboratory autoclave pressure leaching of such a concentrate, under conditions of 700 kPa oxygen partial pressure and at 180°C, achieved over 95% gold liberation, and subsequent cyanidation produced gold recoveries from 97% to 98%.

Anglo also examined bacterial oxidation, which was shown to be feasible with over 95% gold extraction after 5% sulfide oxidation (Wilkinson, 1986).

Based on these test results, Anglo recommended a flow sheet comprising three-stage crushing, conventional grinding to 80% passing 75 microns, bulk flotation, and then pressure leaching of the flotation concentrate followed by cyanidation/CIP gold recovery.

13.5 Oromet 1988

In 1988, Oromet carried out a number of metallurgical tests using BioMet technology. Oromet also dug a test pit within the old Roman open pit and constructed a pilot plant to treat the Salave mineralized material. Results are discussed below.

13.5.1 Bio-oxidation Tests

Bio-oxidation column test results on split core samples and two bulk mineralized material samples showed that acid consumption was directly related to crush size, with the coarser material consuming a lesser amount of sulfuric acid (Agnerian, 2010, citing Larrain, 1988). These test results also showed sulfuric acid consumption and pH as a function of leach time. In particular:

- Acid consumption dropped from an initial 120 kg/t to approximately 40 kg/t during the first 10 days of leaching and remained virtually constant during the remaining 150 days (total 160 days of leaching).
- pH increased rapidly from near zero to approximately 2 during this initial 10-day period, and thereafter increased gradually to approximately 5 during the remaining leach period.
- Other tests indicated that pH stayed well below 2 during the course of leaching.

13.5.2 Bioleaching Tests

Bioleaching tests included an initial bio-oxidation and subsequent cyanidation of crushed material. Results of seven tests carried out over periods ranging from 64 days to 181 days showed that:

- Extraction of the arsenic averaged approximately 59% within a range from 37.1% to 70.5%;
- Consumption of sulfuric acid averaged approximately 145 kg/t within a range from 96 kg/t of material to 180 kg/t;
- Gold extraction averaged approximately 63.5% (for three test results available), and ranged from 54.5% to 69.4%;
- Lime consumption averaged approximately 15.4 kg/t (for three test results available), and ranged from 12.5 kg/t to 18.5 kg/t; and
- Cyanide consumption averaged approximately 1.575 kg/t (for three test results available), and ranged from 0.525 kg/t to 2.52 kg/t (Agnerian, 2010, citing Larrain, 1989).

13.5.3 Bottle-Roll Cyanidation Tests

Bottle roll cyanidation tests were carried out on 13 column materials over periods ranging from 74 days to 154 days, and averaging approximately 118 days. These results showed that:

- Gold extraction averaged approximately 70%, and ranged from 35.2% to 83.2%;
- Lime consumption averaged approximately 24 kg/t and ranged from 7 kg/t to 79.8 kg/t; and
  Cyanide consumption averaged approximately 1.26 kg/t and ranged from <0.2 kg/t to 5.36 kg/t (Agnerian, 2010, citing Larrain, 1989).

13.6 Newmont 1990 - 1991

Semi-quantitative x-ray diffraction and x-ray fluorescence analyses were performed on samples from 12 drill holes. Results showed positive correlation of gold with plagioclase, dolomite, sodium, CaO, MgO, arsenic, sulfur, and stibnite and a negative correlation between gold and quartz and potassium feldspar. Newmont also calculated a net carbonate value ("NCV") for 97 six-meter drill-composite samples from holes NSC1, NSC2, and NSC3. The NCV is not clearly defined in the work except to note that it is a mathematical assessment of the acid-forming potential relative to the neutralizing potential for the samples. Newmont's conclusion was that acid discharge would probably not result from the oxidation of sulfides in a pile of waste rock from Salave, because the majority of the determinations exhibited either neutral or positive NCV (Knutsen, 1991b; Hofmann, 1991). This work also suggested that because of the high dolomite content coincident with the mineralization, heap-leach bio-oxidation was not a practical option for Salave due to high sulfuric acid requirements (Knutsen, 1991b).

13.7 Rio Narcea 2004 - 2006

In 2004, Rio Narcea commissioned Ausenco Ltd. ("Ausenco") of Australia to carry out a scoping study on the Salave deposit to assess the suitability of alternative concentrate oxidation technologies and their application to the Salave gold concentrate with arsenopyrite. These alternatives included:

- Roasting;
- Activox®;
- Redox;
- High temperature pressure oxidation;
- Conventional bio-oxidation (tank leach); and
- Bacterial assisted heap leach (GeoBiotics).

Based on the results of this scoping study, Rio Narcea concluded that, with the possible exception of replacing the three-stage crushing with a single-stage crush and SAG mill/ball mill grinding circuit, the flow sheet proposed by Anglo in 1983 remains valid. No mention in the reports documents SAG grinding test work results to support that judgment.

In 2004, values of 95% for gold recovery to a flotation concentrate and 95% for gold recovery by subsequent oxidation and cyanidation were being used by Rio Narcea (Agnerian, 2010, citing personal communication from A. Riles, 2004).

In 2004, Rio Narcea noted that given the relatively low sulfur content of the deposit and therefore high concentration ratio, and also the existence of cyanidation and gold recovery facilities at its El Valle plant in Asturias, the plan was to produce only a flotation concentrate at Salave itself and to transport the concentrate to El Valle. This concept offered capital savings as well as environmental advantages in that the El Valle plant already had suitable facilities for cyanide management and disposal of tailings from cyanidation (Agnerian, 2010, citing personal communication from A. Riles, 2004).

13.7.1 AMMTEC Testing 2005

In 2005, AMMTEC completed comminution and flotation testing on samples from Salave for Rio Narcea (AMMTEC Ltd., 2005a, 2005b, and 2005c). Mineralogical (Townend, 2004), Bond grind characterization, cyanidation, and flotation tests were completed on two composites from Salave. Composite 1 was from the "Upper Zone," and the Composite 2 was from the "Lower Zone" of the deposit. Upper Zone mineralization was described as predominantly pyrite mineralization, while Lower Zone mineralization was described as higher in arsenopyrite; the pyritic mineralization was generally lower grade than that associated with arsenopyrite. The head assays for the composites are shown in Table 13.3.

Table 13.3 Head Analysis
(from AMMTEC Ltd., 2005a)

Sample	Head Analysis (Averaged Data)								
	Au (g/t)	Ag (ppm)	As (ppm)	Fe (%)	Sb (ppm)	C(total) (%)	C(organic) (%)	S_{tot} (%)	S_{2-} (%)
Composite 1	3.41	0.4	5950	3.23	655	1.04	0.04	2.02	1.68
Composite 2	12.3	0.4	13600	2.49	340	1.43	0.04	1.22	1.01

Review of Table 13.3 indicates that both composites contained interesting concentrations of gold but also contain relatively high concentrations of arsenic and antimony.

Mineralogical examination indicated that the sulfide portion of the Upper Zone contained primarily pyrite, with major arsenopyrite and minor stibnite. Two gold occurrences were detected optically, a single nine-micron particle in pyrite and a second coarse pyrite particle with four fine (two micron) gold particles. For the Lower Zone, the sulfide portions of the dominant component was arsenopyrite with major pyrite, minor quantities of stibnite, and traces of molybdenite, galena, chalcopyrite and sphalerite. One occurrence of gold was detected optically, a single 30-micron x five-micron strip in pyrite.

Bond ball mill work index results indicated that Composite 1 and Composite 2 material had a work index of 17.2 and 16.3 kWh per tonne, respectively.

Whole-rock cyanidation tests at grind P80s of 75 and 10 microns were conducted. Results, summarized in Table 13.4, indicate that the material is relatively refractory but that fine grinding did improve the response in these scoping-level tests.

Table 13.4 Cyanidation Test Summary
(from AMMTEC Ltd., 2005a)

Sample ID	Test No.	Grind Size P_{80} (µm)	Lime Added (kg/t)	NaCN Added (kg/t)	Residue Au (g/t)	Calc'd Head Au (g/t)	12 hr Au Extraction (%)	33.5 hr Au Extraction (%)	58 hr Au Extraction (%)
Composite 1	MH4781	75	1.60	1.01	1.93	3.30	32.08	36.36	40.51
Composite 1	MH4783	10	4.16	10.0	1.18	3.98	51.26	60.30	70.35
Composite 2	MH4782	75	1.32	1.01	9.66	10.92	3.47	3.90	11.47
Composite 2	MH4784	10	4.42	10.0	5.66	9.98	14.03	26.85	43.29

Tests were run to evaluate flotation conditions, including pH, grind, and copper sulfate addition. Conditions recommended for follow-up testing were: 100 g/t of copper sulfate to rougher feed, 25 g/t sodium isobutl xanthate ("SIBX") to flotation, and 25 g/t Aero 3477 ("3477") to flotation with MIBC as needed for a frother. The effect of grind size was also evaluated. Based on the test results and operating cost estimates at a gold price of $400, the target grind size P80 of 106 microns was selected (Davis, undated).

Tests at selected flotation conditions, summarized in Table 13.5, indicated that excellent gold recovery could be realized into a concentrate containing less than 10 percent of the weight. The resulting concentrate contained five to twenty percent arsenic and 0.6 to 1 percent antimony.

Table 13.5 Results of Flotation Testing
(From AMMTEC Ltd., 2005a)

Test No.	Sample	Grind Size (P_{80}, µm)	Total Concentrate Mass Pull (%)	Concentrate S(total) Grade (%)	Concentrate Au Grade (g/t)	Au Recovery (%)	Flotation Tail Au (g/t)	Calc'd Head Au (g/t)
MH5010	Composite 1	106	6.27	33.27	64.87	96.27	0.168	4.22
MH5012	Composite 2	106	7.44	18.54	163.8	98.20	0.242	12.41

13.7.2 Ausenco Program 2006

In 2006, Ausenco reported results from flotation, variability, and pressure oxidation ("POX") testing on samples from Salave for EMC (Ausenco, 2006b, 2006a). Some of the results presented in the Ausenco report were included in the 2005 AMMTEC report and are not repeated here. Bench-scale and pilot testing was completed to evaluate flotation and concentrate oxidation processes. Products from the pilot plant were also submitted to specialists to evaluate thickening, filtration, and concentrate-handling characteristics. Composites of material designated Upper Zone, Lower Zone, and Underground were prepared.

The flotation testing was conducted at AMMTEC (AMMTEC Ltd., 2005b, 2005c). AMMTEC sent samples from the pilot flotation program to Larox Pty Ltd for concentrate filtration tests (Larox Pty Ltd, 2005), Outokumpu Technology Pty Ltd for thickening tests (Outokumpu Technology Pty Ltd, 2005), tailing samples to Vizon Scitec Inc. for tailing characterization, and filtered concentrate to Australian Testing Sampling & Inspection Service Pty Ltd for transport moisture limit determination (Australian Testing Sampling & Inspection Service Pty Ltd, 2005). POX testing on the concentrates produced was conducted at SGS Lakefield Oretest.

Conclusions from the Ausenco report (Ausenco Ltd., 2006b) are summarized below:

- The Salave mineralization is considered to be refractory. Gold is locked in the mineral matrix but can be liberated by oxidation of the sulfide minerals.
- At a primary grind of 106 microns, the samples showed consistently high gold recovery (over 95%) by flotation at a neutral pH to a rougher concentrate containing six to seven percent of the sample feed weight.
- Testing of samples that had been tested earlier and aged for 20 years yielded a gold recovery loss of 3.3 percent, indicating that rapid aging of the samples was not a significant issue. However, Ausenco noted that it remains prudent not to stockpile material for prolonged periods to ensure maximum gold recovery.
- Information generated from the flotation test program was considered sufficient to generate design criteria for this specific operation. Additional comminution and POX testing was recommended.
- Testing to evaluate the stability of arsenic and antimony in the precipitates from neutralization of the oxidation step products was also recommended.

- POX treatment of the concentrates yielded gold recovery from the concentrates of over 98%.

The metallurgical test samples submitted for the 2006 test program were substantial. Approximately 1,700 meters of quarter-core weighing 6.5 tonnes were submitted for testing. For the pilot test program, all quarter-core rejects from continuous zones that were greater than three meters in length and greater than 2 g Au/t gold were submitted. The composites were prepared based on sample depth. The Upper Zone (from 0 to 75 meters below surface) was noted to be pyrite rich, and the Lower Zone (from 75 meters below the surface to the bottom of the planned open pit) and the underground composite were noted to be arsenopyrite rich (Green, 2005). The underground composite represented the lower section of the arsenopyrite-rich zone below the proposed pit shell that was proposed to be accessed by underground mining methods. There was said to be no significant difference between the arsenopyrite-rich zones proposed for mining by both methods (Green, 2005). The mineralogist concluded that the low occurrence of visible gold, considering the head grade, indicates that the gold was likely present in the crystalline structure of the pyrite / arsenopyrite matrix.

Large batch and pilot-scale flotation tests were conducted to generate material for oxidation tests and other tests required for equipment sizing. The target feed rate to the pilot plant was 150 kg/hr with a target grind size P80 of 106 microns. Results from the pilot program are summarized in Table 13.6. Ausenco concluded that the pilot results confirm the bench-scale results.

Table 13.6 Pilot Rougher Flotation Test Result Summary

Mineralized material zone	Product	Mass	Grade			Distribution %		
		% w/w	Au g/t	S %	As %	Au %	S %	As %
Upper Zone	Feed	100	3.77	2.33	0.59	100	100	100
	Conc.	8.1	44.3	28.5	7.1	95.2	99.0	97.0
	Tail	91.9	0.20	<0.05	0.019	4.8	1.0	3.0
Lower Zone	Feed	100	4.27	1.38	0.65	100	100	100
	Conc.	6.0	68.9	22.6	10.5	96.9	98.3	97.3
	Tail	94.0	0.14	<0.05	0.019	3.1	1.7	2.7

Ausenco noted a correlation between the gold and arsenic recovery in the pilot plant. Assays of screen fractions indicated the recovery of gold, sulfur, and arsenic was relatively high and consistent on the minus 75 micron material, but somewhat lower on the coarse fractions for both the Upper and Lower composites.

The viscosity of pilot plant concentrate and tailing samples was measured. The viscosity of the tailing streams is dependent on the percent solids, with typical values noted between 50 and 60 percent solids.

Settling rates for concentrate and tailing samples were measured to allow thickener sizing (Outokumpu Technology Pty Ltd, 2005). Results indicate that for the flotation tailing: underflow percent solids of 50 to 55 percent solids were achieved at loading rates of 0.72 (t/m2 hr) with 30 g/t flocculant addition. For the flotation concentrate, underflow percent solids of approximately 70% were obtained as 0.26 (t/m2 hr) loading rates with 10 to 20 g/t flocculant addition.

Concentrate filtration tests conducted by Larox on a PF-1 test filter indicate a filter cake with 9.9% moisture was produced at a unit rate of 90 to 95.5 (kg dry solids / m2 hr) (Larox Pty Ltd, 2005). A cycle time of 24 to 26.5 minutes was estimated.

A sample of flotation concentrate was evaluated at Australian Testing Sampling & Inspection Services Pty Ltd (2005). Results indicated the transportable moisture limit for the Upper and Lower concentrate to be 10.3 and 10.4 %, respectively.

The variability samples were selected from the available samples to provide a vertical and geographic representation of the deposit. A total of 65 rougher flotation variability tests were run on samples from the three zones: Upper, Lower, and Underground. Average test results for the three zones are shown in Table 13.7. Ausenco's analysis of the variability results are summarized below:

- Gold recovery is not significantly affected by gold head grade.
- Gold, sulfur, and arsenic recovery is consistently high across each ore zone.
- The average rougher gold recovery from the Upper, Lower, and Underground variability tests was 96.3, 97.2, and 97.8 percent, respectively.

Table 13.7 Variability Test Summary

	Gold Head; g/t	Au Recovery; Percent			Head Sulfur Grade; % S			Concentrate Mass Pull; % Wt			Conc. As; %
	Average	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Average
Upper	4.22	91.3	96.3	98.5	0.52	2.62	7.83	2.80	7.60	17.30	7.5
Lower	3.85	85.7	97.2	98.9	0.62	1.70	5.01	3.42	6.13	13.83	8.8
Underground	9.82	93.7	97.8	99.3	0.57	1.62	3.43	2.97	8.35	15.72	10.9
Overall	5.37	85.7	97.0	99.3	0.52	2.04	7.83	2.80	7.21	17.30	8.8

Upper and Lower Zone composite concentrate samples were submitted for POX testing. Variables evaluated included the effects of POX temperature between 200 and 220 degrees C and feed percent solids between 10 and 15 percent solids on cyanidation results. Gold recovery from the POX residue was excellent at over 98%. POX conditions were found to have an effect on the POX oxidation kinetics, the residue gold-leach kinetics, and cyanide and lime consumption. Lime consumption for the washed residue ranged from 48 to 227 g/t, and cyanide consumption ranged from 5.5 to 11 kg/t depending on conditions. Additional testing was recommended to optimize autoclave conditions.

13.8 Astur Gold Corp. 2013

13.8.1 ALS Metallurgy Testing 2013

In 2013, ALS Metallurgy Kamloops ("ALS-Met"), on behalf of Metal Edge Solutions (Craig Smith) who is acting for Astur on the Salave project, completed comminution testing, flotation flow sheet development testing, limited grind and flotation optimization testing, aging testing, and locked cycle testing on samples from the Salave deposit (Pojhan and Johnston, 2014). Primary focus of the work at ALS-Met was to confirm the base information reported in the 2006 Ausenco final metallurgical report (Ausenco Ltd., 2006b). ALS-Met also sent samples of flotation tailings to other laboratories for solid-liquid separation tests, geotechnical characterization in support of planned dry stack tailings placements (Intermountain GeoEnvironmental Services, Inc., 2013), environmental tests, and mine-paste back-fill tests (Pavlovic and Palkovits, 2013).

Bond abrasion and SAG Mill Comminution ("SMC") testing was completed on six composite samples that were available in May 2013 (Contract Support Services, 2013). The samples tested represented 98.9 meters of quarter-core from both the Upper and Lower zones. Results, summarized in Table 13.8, indicate the Bond abrasion index averaged 0.076 grams, indicating the material is mildly abrasive. The SMC derived A x b values ranged from 33 to 47, indicating the material is medium to hard with respect to breakage in a SAG mill.

Table 13.8 SMC and Bond Abrasion Index Test Results

Sample ID	Size Fraction Tested (mm)	DWi kWh/m3	DWi %	Mia kWh/t	Mih kWh/t	Mic kWh/t	A	b	sg	ta	A x b	Interval Length meters	Abrasion Index
Lower Zone Average Grade	22.4 - 19.0	6.48	61	18.7	13.8	7.1	65.2	0.65	2.73	0.4	**42.4**	15.3	0.075
Lower Zone High Grade	22.4 - 19.0	6.3	58	18	13.1	6.8	69.3	0.64	2.79	0.41	**44.4**	16.9	0.061
Lower Zone Low Grade	22.4 - 19.0	7.45	72	21	15.9	8.2	75.4	0.48	2.72	0.35	**36.2**	12.1	0.136
Upper Zone Average Grade	22.4 - 19.0	8.14	79	22.7	17.5	9	88.1	0.38	2.7	0.32	**33.5**	17.5	0.082
Upper Zone High Grade	22.4 - 19.0	5.77	51	17.1	12.3	6.4	65.1	0.72	2.72	0.45	**46.9**	18.1	0.034
Upper Zone Low Grade	22.4 - 19.0	6.93	66	19.9	14.8	7.7	71.5	0.55	2.71	0.37	**39.3**	19.1	0.066
Average / Total	22.4 - 19.0	6.85	64.5	19.6	14.6	7.5	72.4	0.57	2.73	0.38	**40.4**	98.9	0.076

A second set of six similar samples from core that was available later was submitted for Bond ball-mill work-index testing. Results, shown in Table 13.9, indicate that the Lower Zone has a slightly higher work index than the Upper Zone. The Lower Zone is considered to be of average hardness, and the Upper Zone is considered softer than average. Previous reported work was weak on comminution test work, a focus of Astur through ALS-Met in support of design criteria development.

Table 13.9 Bond Ball Mill Work Index Test Results

Sample ID	Closing Screen um	F80 µm	P80 µm	Gpr	WiBM kW-hr/tonne	Interval Length meters
Upper Zone Hi Grade B2	150	2282	112	1.65	13.94	11.8
Upper Zone AverageGrade B4	150	2396	114	1.70	13.68	9.6
Upper Zone Low Grade B2	150	2323	117	1.80	13.37	10.0
Lower Zone Hi Grade B5	150	2376	113	1.79	13.06	11.1
Lower Zone AverageGrade B4	150	2501	113	1.53	14.76	8.3
Lower Zone Low Grade B6	150	2372	112	1.60	14.25	8.6
Average / Total	150	2375	114	1.68	13.84	59.3
	Note: All tests were conducted using a closing screen size of 150 microns.					

Head assays from the various ALS-Met composite samples are shown in Table 13.10. Significant gold concentrations are present in all composites. The sulfur is primarily present as sulfide sulfur. Arsenic in the feed is relatively higher in the Lower Zone and in the high-grade samples.

Table 13.10 ALS-Met Composite Head Assay Comparison
(Pojhan and Johnston, 2014)

Composite	Assay – percent or g/tonne						
	Fe	Ag	Au	S(t)	S(s)	As	Sb
Lower Zone Avg Grade	2.8	<1	4.75	2.205	2.18	1.42	-
Lower Zone Low Grade	2.2	<1	2.205	1.21	1.19	0.49	-
Lower Zone High Grade	2.8	<1	18.2	1.67	1.66	1.90	-
Upper Zone Avg Grade	3.4	<1	5.05	3.285	3.255	0.63	-
Upper Zone Low Grade	2.5	1	3.54	1.9	1.86	0.44	-
Upper Zone High Grade	5.2	3	25.7	3.65	3.625	1.70	-
Upper Zone Master Composite	3.4	-	5.68	2.51	-	0.62	-
Lower Zone Master Composite	2.7	-	6.98	1.57	-	1.14	-
Lower Zone 2004-2005 Drill Core Barrel 3	3.4	1	7.51	0.90	0.86	0.84	-
Lower Zone 1981-1983 Drill Core Barrel 3	2.3	<1	9.05	1.33	1.30	1.19	-
Upper Zone 2004-2005 Drill Core Barrel 1	2.0	1	3.41	1.15	1.13	0.42	-
Upper Zone 1981-1983 Drill Core Barrel 1	2.7	1	4.08	1.51	1.47	0.41	-
Master Composite 2	3.2	1	11.0	2.07	2.02	1.30	0.07

Note: Au and Ag values are in g/t; all other values are in percent.

ALS-Met completed limited optimization testing to confirm earlier work reported on grind size, gravity recovery, and flotation conditions. The following summarize results obtained:

- Overall, metallurgical response to flotation was excellent. From the six composites tested initially, batch flotation test gold recovery ranged from 85 to 95 percent into a cleaner concentrate that graded from 68 to 299 g Au/t. Limited testing indicated that primary grinding finer than 106 µm did not significantly improve flotation response.
- Evaluation of two flotation schemes indicated that a simple flow sheet using potassium amyl xanthate (“PAX”) as a collector, instead of copper sulfate as an activator and SIBX/3477 as collectors, was recommended.
- A series of tests at primary grind P80 sizes ranging from 73 to 167 microns indicated that primary grind size does not have a significant effect on gold recovery.
- The natural pH of the pulp ranged from 8.5 to 9.0. Tests at higher pH showed that gold recovery did decrease as the pH approached 10.5. Flotation at natural pH was recommended.
- Limited testing to evaluate regrind size showed that some regrinding improved metallurgical performance. A target regrind P80 size of 39 microns was noted.
- Tests to evaluate sample aging were conducted on two similarly positioned Upper and Lower Zone drill-hole composites collected from core drilled in the 1981-1983 period, and later drilling in the 2004-2005 period. No conclusive variation in flotation response could be confirmed given the head-grade variability; however, the older core generally demonstrated a lower recovery response than the freshest core available at the time, between 1.4% and 0.8%.
- Overall gold recovery from tests that included gravity and flotation was not higher than that from tests with flotation only. Gravity concentrates produced contained from 24 to 30 percent of the

gold and were relatively high grade so some economic benefit to separate marketing of the higher-grade concentrate could be realized.

- Locked cycle test gold recovery on the Lower and Upper Zone composites as well as the Master Composite 2 resulted in gold recoveries of 85 to 91 percent to a cleaner concentrate that graded 86 to 156 g Au/t. Master Composite 2 was assembled from pre-2005 drill samples representing six composites of Upper and Lower Zone samples.
- The concentrates from the locked cycle tests were assayed for deleterious elements. Arsenic content ranged from 9.5 to 21.8 percent. Antimony ranged from 1.5 to 2.8 percent. Both arsenic and antimony were above the concentration normally considered marketable. Fluorine content of the concentrate produced from the Lower Zone Master Composite was also high at 170 g/t. It is recommended that advice from concentrate marketing experts be sought during feasibility studies.
- Mineralogical analysis of a gravity concentrate from one of the composites indicated that gold recovered to the gravity concentrate was either liberated or in multi-phase particles containing over 50 percent gold by mass that could be recovered by gravity or flotation.

13.8.2 Pocock Industrial, Inc. Solid-Liquid Separation Test 2013

Pocock Industrial Inc. (“Pocock”) conducted tests to support sizing of solid-liquid separation equipment on test products from the ALS-Met test program (Pocock Industrial, Inc., 2013). Tests on products from both Upper and Lower zones were conducted. Settling rates for concentrate and tailing samples were measured to allow thickener sizing. Results from dynamic tests to simulate high-rate thickening on the flotation tailing indicate that underflow percent solids of 61 to 67 percent solids were achieved at loading rates of 3.5 to 5.0 (m^3/m^2 hr) with 25 to 40 g/t flocculant addition.

For the flotation concentrate, underflow percent solids of approximately 64 to 68% were obtained as 0.125 to 0.15 (m^2/t per day) loading rates with 10 to 20 g/t flocculant addition in conventional thickening tests.

Tailing filtration tests conducted by Pocock indicate a filter cake with 11.5 to 18.4% moisture was produced. Sizing basis was 0.828 to 0.855 (m^3/t). An air blow time of 5.5 to 6.0 minutes and a total cycle time of 14 to 15 minutes were estimated. Pocock filter sizing data are summarized in Table 13.11, with the notation that “*cake moistures may be from 2% to 4% lower than shown in the table…if a membrane press is used with hydraulic squeeze capability*”.

Concentrate filtration tests conducted by Pocock indicate a filter cake with 9.9% moisture was produced. Sizing basis was 0.577 (m^3/t). An air blow time of 6.0 minutes and a total cycle time of 15 minutes were estimated. Pocock concentrate filter sizing data are also summarized in Table 13.11.

Table 13.11 Pocock Filter Sizing Summary
(from Pocock Industrial, Inc., 2013)

Material / Filter Feed Solids	Filter Feed Solids (%)	Design Tonnage (MTPD)	Dry Bulk Cake Density, (kg/m3)	Sizing Basis(1) (m3/MT)	Recess Plate Depth(2) (mm)	Chamber Spec.(3) (Len./Vol./Area) (mm/m3/m2)	Air Blow (min)/ Filter Cycle Time(4) (min)	Filter Cake Moist. (%)(5, 7)	Pressure Filter Chambers Required/ Number of Presses Required(6)
KM 3823 Test 24 Rougher Tails	65.5%	2,100	1,462.3	0.855	30	2,000/0.183/7.29	1.0 / 12.0	18.4%	99 / 1 (P/11)
					20	1500/0.07/3.62	5.5 / 14.5	12.8%	309 / 2 (P/13)
KM 3823 Test 25 Rougher Tails	65.1%	2,100	1,509.9	0.828	30	2,000/0.183/7.29	1.0 / 12.0	16.0%	96 / 1 (P/11)
					20	1500/0.07/3.62	6.0 / 15.0	11.5%	310 / 2 (P/13)
KM 3823 Bulk Concentrate	67.6%	100	2,164.8	0.577	25	630/0.009/0.43	1.0 / 10.0	10.9%	54 / 1 (P/4.45)
					20	800/0.015/0.86	6.0 / 15.0	7.7%	47 / 1 (P/3.52)

Samples from the Pocock thickening and filtering test work were provided to Intermountain GeoEnvironmental Services in Salt Lake City to perform geotechnical characterization of the product for use in design consideration of the proposed dry stack tailings facility.

Splits of the tailings material provided to Pocock were sent to Kovits Engineering to investigate paste fill material characteristics for underground back-fill activites.

13.9 Summary

The objective of the 2013 test program was to verify the test work completed by AMMTEC and others from 2005 to 2006. As summarized below, the results from tests at both labs are very similar.

The samples submitted to ALS-Met for the 2013 test program were selected by Astur geologists to be as representative as possible, given core availability and the focus on an underground mineable resource. For the AMMTEC samples, all continuous core intervals inside the planned mine zone with a grade over 2.0 g Au/t were selected. The 2006 AMMTEC metallurgical samples are considered representative.

Summary statistics for the metallurgical composite samples tested from the AMMTEC and ALS-Met programs are shown in Table 13.12. Review of Table 13.12 indicates that the 2006 AMMTEC pilot and variability test programs were conducted on approximately 1,700 meters of core and the 2013 ALS-Met composites totaled approximately 200 meters in interval length. The 2006 samples are considered the most representative of the deposit, and the 2013 ALS-Met samples provide a sample base to confirm the earlier test program results. It is noted that the samples tested and reported by ALS-Met in 2013 were drilled prior to 2006 and stored at site.

Table 13.12 Summary of Metallurgical Composites

Year	Report	Sample	Number of Holes	Number of Intervals	Interval Length	Sample kg
2005	AMMTEC LTD A9416	Upper	10	50	85.2	210.9
2005	AMMTEC LTD A9416	Lower	6	63	105.2	207.3
2005	AMMTEC LTD A9416	Subtotal (1)	15	113	190.4	418.2
	Total Sample Received for Pilot and Variability Testing					
2006	AMMTEC LTD A9665	Upper	32	66	759.7	3,022.7
2006	AMMTEC LTD A9665	Lower	38	81	784.4	3,047.0
2006	AMMTEC LTD A9665	Underground	18	27	160.3	501.3
2006	AMMTEC LTD A9665	Subtotal (1)	56	174	1,704.3	6,571.0
	Variability Subset of Total Received					
2006	AMMTEC LTD A9665	Upper	20	25	166.8	175.0
2006	AMMTEC LTD A9665	Lower	23	25	187.4	175.0
2006	AMMTEC LTD A9665	Underground	15	16	96.4	184.6
2006	AMMTEC LTD A9665	Subtotal (1)	44	66	450.5	534.6
2013	ALS April 2013		13	76	98.9	155.3
2013	ALS June 2013		17	54	99.9	178.6
2013	ALS	Subtotal (1)	30	130	198.8	333.9
Total (1) Not Including Variability Subset			**84**	**417**	**2,093.5**	**7,323.1**

The composite sample test head assays, summarized in Table 13.10 were compared to data from the geologic database summarized in Table 13.13. The drill-hole data have been filtered so that only data observations that include sulfur analysis and are above 2.0 g Au/t are shown. Comparison of the composite head values and the range and average values noted in Table 13.13 indicates that the 2013 ALS-Met composite gold, arsenic, and sulfur grades are typical of the grades to be expected.

Table 13.13 Drill-Hole Database Summary

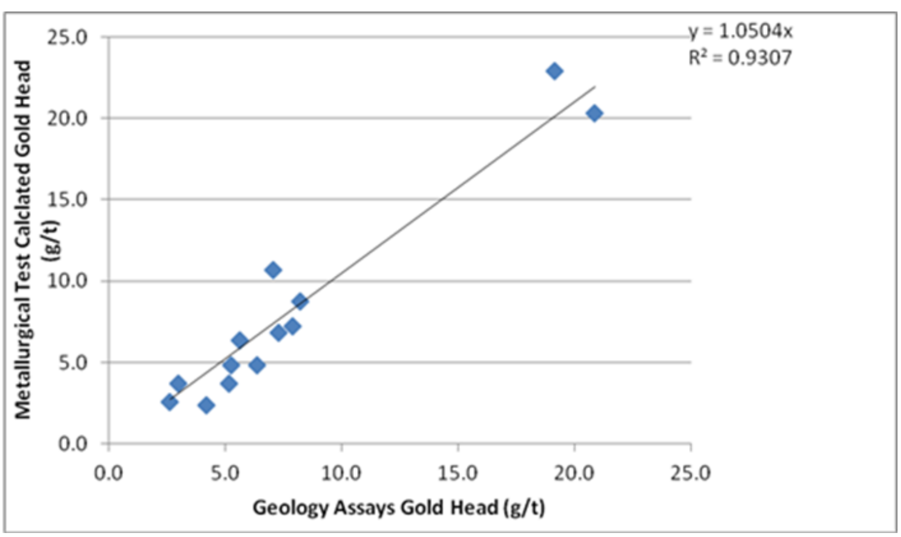
Hole #	Number of Intervals	Sum of Interval Length (meters)	Average of ppm_Au	Average of ppm_Ag	Average of ppm_As	Average of ppm_Sb	Average of ppm_Mo	Average of pct_S	Average of pct_CO3
AA0/3	6	11.43	3.18	0.74	5,000	50	32	1.7	6.0
AA1/1	16	32.00	3.44	0.35	3,925	553	27	1.6	
AA1/2	2	3.56	3.05	0.28	7,500	50	35	1.5	
AA1/3	13	25.12	3.67	0.27	10,900	50	43	2.6	
AA13/1	13	25.85	6.83	0.12	5,462	50	81	0.8	7.4
AA13/2	12	24.26	4.16	0.68	18,192	496	48	1.0	3.8
AA13/3	2	3.80	2.43	0.27	1,800	50	5	1.0	5.8
AA13/4	4	8.06	2.94	0.29	3,775	950	39	0.6	7.2
AA13/7	2	4.16	10.18	0.45	4,050	50	31	0.7	2.2
AA17/1	5	10.24	2.97	0.53	4,220	50	29	1.1	5.0
AA17/2	5	7.75	4.99	0.93	1,680	50	18	0.4	3.0
AA17/3	7	13.76	3.19	0.54	2,329	114	53	0.7	7.3
AA1W/1	11	20.80	3.59	1.08	3,281	985	149	2.7	4.3
AA2/1	28	56.00	4.14	0.29	6,895	341	92	2.1	
AA2/2	5	10.49	2.86	0.14	5,260	570	49	0.9	5.3
AA2/4	11	21.46	3.87	0.29	3,545	64	89	0.8	5.6
AA2/5	18	36.53	5.72	0.57	11,356	308	37	1.6	5.2
AA21/2	1	2.00	9.65	0.15	2,500	50	47	0.9	3.5
AA3/1	12	23.75	4.68	0.38	8,292	971	60	2.1	
AA3/2	32	64.19	11.35	0.24	21,372	1,078	79	1.9	5.9
AA3/3	28	55.30	3.55	0.38	6,461	480	83	3.6	9.2
AA4/1	39	74.35	4.15	0.36	6,513	1,033	51	1.8	
AA4/2	43	82.16	5.40	0.40	8,977	360	96	2.1	
AA4/2A	14	27.19	3.45	0.41	4,986	121	143	2.5	
AA4/3	13	25.05	3.57	0.27	2,777	77	75	1.5	
AA4/4	17	28.90	8.65	0.77	13,271	653	88	2.4	4.7
AA5/1	25	47.91	5.39	0.67	7,160	1,112	75	1.7	
AA5/3	34	69.18	5.45	0.41	6,132	284	85	1.9	4.5
AA5/4	14	28.00	6.95	0.46	6,657	61	36	0.2	
AA5/5	2	3.92	3.43	1.18	3,050	50	9	0.7	
AA5/6	26	50.80	3.35	0.45	6,977	713	37	1.2	9.8
AA5/7	1	1.00	5.15	0.40	200	50	52	0.1	0.1
AA6/1	17	32.44	3.44	0.39	4,182	2,147	32	1.2	2.1
AA6/3	16	30.86	3.19	0.30	5,527	137	33	1.6	
AA6/4	1	2.25	2.40	0.10	7,800	50	110	5.7	
AA6/5	8	15.94	4.89	0.28	2,425	169	13	1.3	
AA6/6	6	12.76	4.23	0.32	5,433	50	19	0.7	4.7
AA7/1	6	10.86	3.48	0.30	4,883	100	20	1.4	
AA7/2	5	10.91	5.18	0.59	3,780	2,680	15	2.5	6.1
AA7/3	10	18.27	5.08	0.67	3,220	850	98	1.5	6.0
AA7/5	7	14.61	3.14	0.44	1,971	71	33	1.4	6.6
AA8/1	8	16.00	8.01	0.94	2,313	281	21	2.1	
AA8/2	10	17.88	3.40	0.25	2,600	50	24	1.0	
AA8/3	13	26.08	3.88	0.49	3,915	354	43	1.4	6.6
AA8/4	11	22.30	4.90	0.63	3,282	273		1.1	6.2
AA8/5	7	14.77	3.91	0.34	2,743	71	48	0.7	7.9
AA9/2	13	24.97	4.97	0.77	4,423	131	14	2.4	
AA9/3	19	35.96	6.25	0.77	5,605	650	14	2.4	
AA9/4	15	28.88	4.28	0.63	4,560	1,180	24	1.1	9.3
AA9/5	8	16.50	4.60	0.39	3,588	500	110	0.9	5.3
AA9/6	3	6.00	2.60	0.20	1,967	50	17	1.1	10.6
Grand Total / Average	**644**	**1,257.21**	**4.94**	**0.46**	**6,909**	**540**	**60**	**1.7**	**6.2**

Comparison of the metallurgical assayed and average calculated heads for gold, arsenic, and sulfur was made to verify laboratory procedures and assays. Results for gold are summarized in Table 13.14. The comparison of the average metallurgical calculated test head and the geology test head are shown in Figure 13.1. Results for gold, arsenic, and sulfur correlated within acceptable ranges.

Table 13.14 Metallurgical Test Head and Calculated Geologic Grade Comparisons

	Met Sample	Met Sample	Geology	Composite
Composite	Assayed Head g Au / t	Test Calculated Head g Au / t	Calculated Head g Au / t	Interval Length (meters)
Lower Zone Avg Grade Barrel 5	4.8	4.8	6.4	15.25
Lower Zone High Grade Barrel 4	18.2	20.3	20.9	14.9
Lower Zone Low Grade Barrel 6	2.2	2.6	2.6	14.1
Upper Zone Avg Grade Barrel 2	5.1	3.7	5.2	17.5
Upper Zone High Grade Barrel 1	25.7	22.9	19.1	18.07
Upper Zone Low Grade Barrel 3	3.5	3.7	3.0	19.1
Lower Zone 1981 - 1983 Drill	9.1	8.8	8.2	9.75
Lower Zone 2004 - 2005 Drill	7.5	6.8	7.3	7.6
Upper Zone 1981 - 1983 Drill	4.1	4.8	5.3	13.76
Upper Zone 2004 - 2005 Drill	3.4	2.3	4.2	9.45
Upper Zone Master Composite	5.7	6.4	5.6	54.7
Lower Zone Master Composite	7.0	7.2	7.9	44.3
Master Composite 2	11.0	10.7	7.1	103.9

Figure 13.1 Metallurgical Calculated Gold Head vs. Geologic Calculated Gold Head



Comparison of rougher flotation test results from 2013 ALS-Met and 2005 and 2006 AMMTEC results is shown in Table 13.15. Review of Table 13.15 indicates similar gold recovery to the rougher concentrate, but at higher mass pulls for the ALS-Met tests. Previous grade-recovery curves from AMMTEC Upper Zone tests are shown in Figure 13.2, and ALS-Met grade-recovery curves for cleaning tests are shown in Figure 13.3. Comparison of the two figures shows that they have a similar shape in the region of interest. Gold recovery will be a function of the concentrate grade produced and will decrease as gold concentrate grade is increased. The concentrate grade produced will also be dependent on the head grade. The actual gold recovery estimate to use for the study will depend on the target concentrate grade, which will depend on the concentrate marketing terms and conditions.

Table 13.15 Comparison of Rougher Flotation Test Results

	Calculated Head			Grind P80	Rougher Concentrate					Ro Tail
	g Au / t	S (%)	As (%)	microns	Wt %	g Au / t	S (%)	As (%)	Au Dist (%)	g Au / t
2005 Upper Test 9	4.22	2.11	0.60	106	6.30	64.87	33.27	9.52	96.27	0.17
2006 Pilot Upper Test RG6781	4.21	2.38	0.61	106	9.10	44.90	26.00	6.45	97.00	0.14
2013 ALS Upper Master Test 19R	7.08	2.70	0.64	101	19.80	34.21	13.19	3.14	95.58	0.39
2005 Lower Test 11	12.40	1.40	1.47		7.40	163.80	18.54	19.20	98.20	0.24
2006 Pilot Lower RG6776	4.90	1.67	0.75	106	8.10	63.90	22.20	9.81	96.30	0.19
2013 ALS Lower Master Test 20R	7.98	1.76	1.10	105	15.10	51.53	11.13	7.08	97.77	0.21

Figure 13.2 AMMTEC Upper Zone Grade-Recovery Curve

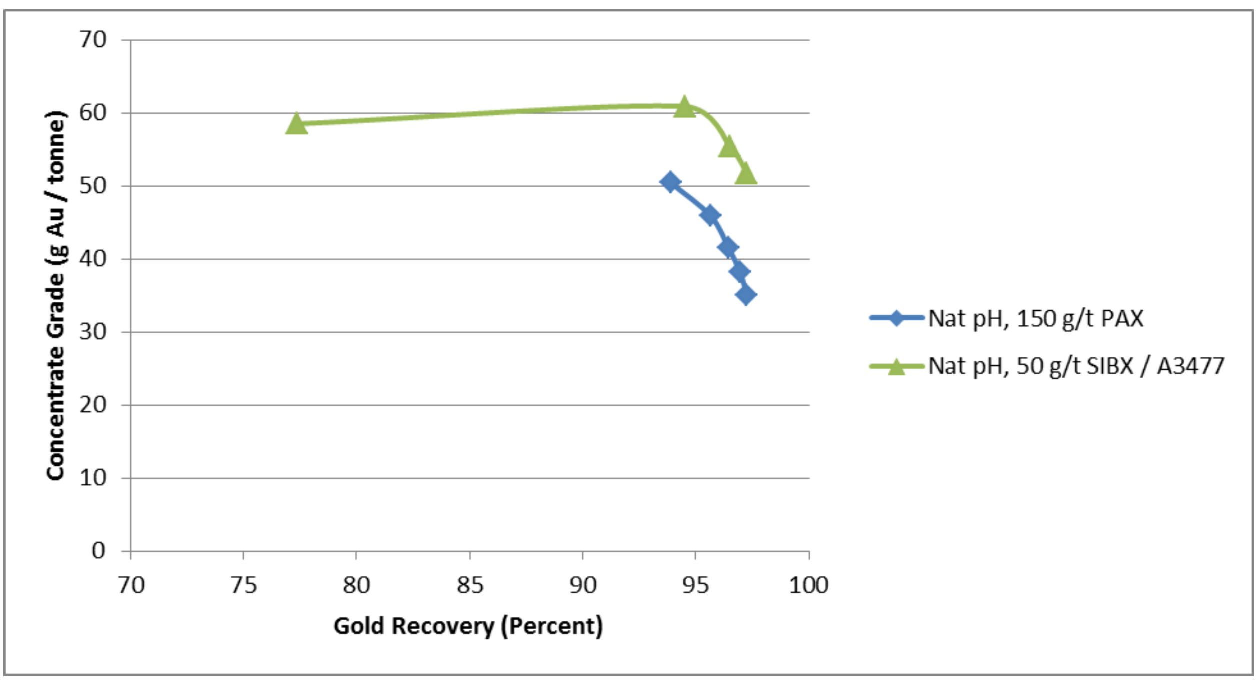
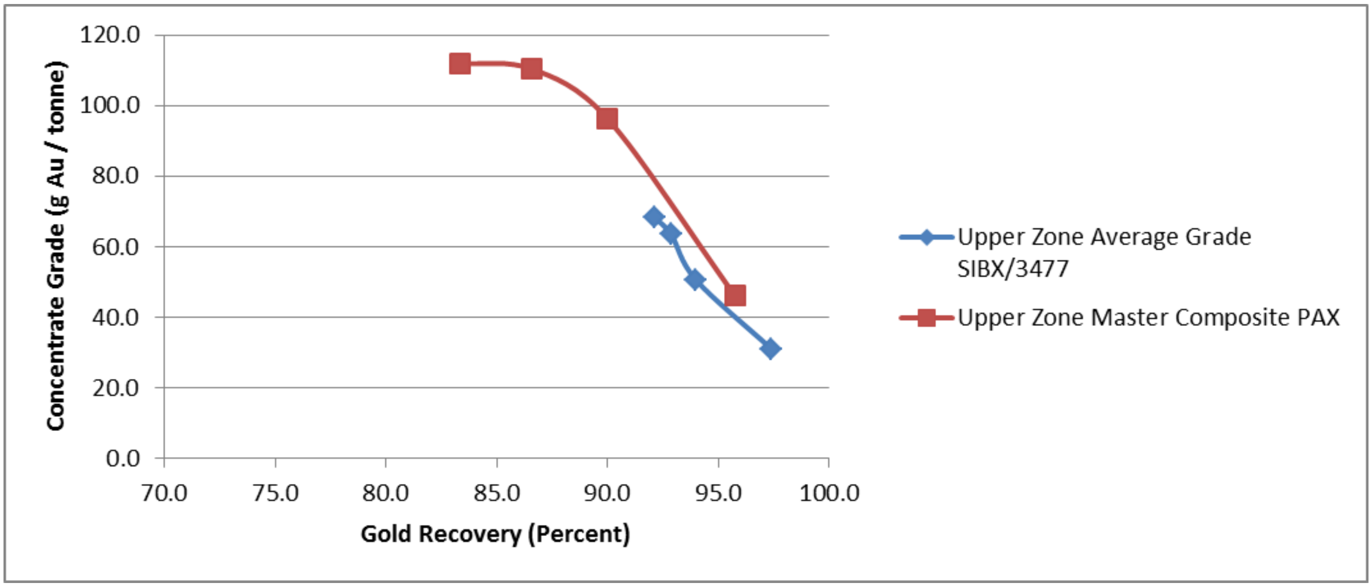


Figure 13.3 ALS-Met Upper Zone Grade-Recovery Curve



The locked cycle tests conducted in 2013 at ALS-Met provide the best available gold recovery estimates for a project that envisions potential underground extraction. Gold recovery from the Lower and Upper Zone composites ranged from 85 to 91 percent to a cleaner concentrate that graded 86 to 156 g Au/t. Concentrates from the locked cycle tests were assayed for deleterious elements. Arsenic content ranged from 9.5 to 21.8 percent. Antimony ranged from 1.5 to 2.8 percent. Both arsenic and antimony are well above the concentration considered marketable to traditional concentrate buyers. Astur is exploring other alternatives, including joint ventures with or marketing to mine operators who produce and process similar concentrates. Results from all available metallurgical test programs including those conducted by Astur are summarized in the technical report filed by Astur in March of 2014. The proceeding portion of Section 13 is as Section 13 appeared in the March 2014 report (Prenn, 2014).

The test results indicate:

- Mineralized material is refractory to conventional cyanidation;
- A high percentage of gold can be recovered by flotation to a concentrate;
- Oxidation of the flotation concentrate in an autoclave or by bio-oxidation improves gold recovery by cyanidation; and
- Flotation concentrate produced contains elevated concentrations of arsenic and antimony well above the concentration considered marketable to traditional concentrate buyers.

Astur's previous management explored marketing flotation concentrate to brokers, other mine operators or joint ventures with mine operators who produce and process similar concentrates. Although preliminary in nature, no encouraging arrangement was identified during the exploratory discussions.

Additional work is required to evaluate the economics of the concentrate oxidation processes, and to evaluate other concentrate marketing or business opportunities that may develop.

14.0 MINERAL RESOURCE ESTIMATE

14.1 Introduction

The modeling and estimation of the resources were done under the supervision of Neil Prenn, a qualified person with respect to mineral resource estimations under NI 43-101. Mr. Prenn is independent of Black Dragon by the definitions and criteria set forth in NI 43-101; there is no affiliation between Mr. Prenn and Black Dragon except that of an independent consultant/client relationship. Mr. Prenn has determined that the resource estimate complies with the 2014 CIM Definition Standards.

Mr. Prenn classifies resources in order of increasing geological and quantitative confidence into Inferred, Indicated, and Measured categories to be in compliance with the "CIM Definition Standards For Mineral Resources and Mineral Reserves" (2014) and therefore Canadian National Instrument 43-101. CIM mineral resource definitions are given below, with CIM's explanatory text shown in italics:

Mineral Resource

Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. An Inferred Mineral Resource has a lower level of confidence than that applied to an Indicated Mineral Resource. An Indicated Mineral Resource has a higher level of confidence than an Inferred Mineral Resource but has a lower level of confidence than a Measured Mineral Resource.

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.

The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.

Material of economic interest refers to diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, coal, and industrial minerals.

The term Mineral Resource covers mineralization and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of Modifying Factors. The phrase 'reasonable prospects for eventual economic extraction' implies a judgment by the Qualified Person in respect of the technical and economic factors likely to influence the prospect of economic extraction. The Qualified Person should consider and clearly state the basis for determining that the material has reasonable prospects for eventual economic extraction. Assumptions should include estimates of cutoff grade and geological continuity at the selected cut-off, metallurgical recovery, smelter payments, commodity price or product value, mining and processing method and mining, processing and general and administrative costs. The Qualified Person should state if the assessment is based on any direct evidence and testing.

Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. For example, for some coal, iron, potash deposits and other bulk minerals or commodities, it may be reasonable to envisage 'eventual economic extraction' as covering time periods in excess of 50 years. However, for many gold deposits, application of the concept would normally be restricted to perhaps 10 to 15 years, and frequently to much shorter periods of time.

Inferred Mineral Resource

An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.

An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

An Inferred Mineral Resource is based on limited information and sampling gathered through appropriate sampling techniques from locations such as outcrops, trenches, pits, workings and drill holes. Inferred Mineral Resources must not be included in the economic analysis, production schedules, or estimated mine life in publicly disclosed Pre-Feasibility or Feasibility Studies, or in the Life of Mine plans and cash flow models of developed mines. Inferred Mineral Resources can only be used in economic studies as provided under NI 43-101.

There may be circumstances, where appropriate sampling, testing, and other measurements are sufficient to demonstrate data integrity, geological and grade/quality continuity of a Measured or Indicated Mineral Resource, however, quality assurance and quality control, or other information may not meet all industry norms for the disclosure of an Indicated or Measured Mineral Resource. Under these circumstances, it may be reasonable for the Qualified Person to report an Inferred Mineral Resource if the Qualified Person has taken steps to verify the information meets the requirements of an Inferred Mineral Resource.

Indicated Mineral Resource

An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.

Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.

An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Pre-Feasibility Study which can serve as the basis for major development decisions.

Measured Mineral Resource

A Measured Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit.

Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation.

A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.

Mineralization or other natural material of economic interest may be classified as a Measured Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such that the tonnage and grade or quality of the mineralization can be estimated to within close limits and that variation from the estimate would not significantly affect potential economic viability of the deposit. This category requires a high level of confidence in, and understanding of, the geology and controls of The mineral deposit.

Modifying Factors

Modifying Factors are considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors.

Mr. Prenn reports resources at cutoffs that are reasonable for deposits of this nature given anticipated mining methods and plant processing costs, while also considering economic conditions, to fulfill the requirement stated above that a resource exists "in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction."

14.2 Resource Modeling

14.2.1 Data

A three-dimensional block model was created for estimating the gold resources at the Salave deposit from data generated by Rio Tinto, Gold Fields, Anglo, Oromet, Newmont, Lyndex, Rio Narcea, and Astur, including percussion, RC, and core drill data. These data, as well as digital topography of the project area, were provided to Mr. Prenn by Astur and incorporated into a digital database in UTM Zone 29 coordinates using the ETRS89 datum.

14.2.2 Deposit Geology Pertinent to Resource Modeling

Gold mineralization at Salave occurs within the granodiorite and overlying package of metasedimentary rocks (see Section 7.0); the gold resources reported herein are restricted to mineralization hosted within the granodiorite. The bulk of the modeled gold mineralization is contained within thick zones of albitized and sericitized granodiorite that generally dip 10 to 20° to the west-southwest, more-or-less sub-parallel to the contact between granodiorite and metasedimentary rocks.

14.2.3 Gold Modeling

The gold resources at the Salave deposit were modeled and estimated by:

- determining statistical and geological criteria to aid in the modeling of gold mineral domains;
- interpreting gold mineral-domain polygons on a set of 26 northwest-looking cross sections (292.7°) spaced at 20-meter intervals;
- rectifying the mineral-domain interpretations on northeast-looking long sections spaced at four-meter intervals;
- analyzing the modeled mineralization geostatistically to aid in the establishment of estimation and classification parameters;
- interpolating grades into a three-dimensional block model, using the gold mineral domains to control estimation; and
- undertaking various checks and re-interpolation runs until optimal results were generated.

Arsenic was modeled in addition to gold, due to potential penalties associated with the processing of arsenic-rich gold concentrates. The arsenic was modeled independently of gold, but in an identical manner.

All modeling of the Salave project gold resources was performed using GEOVIA Surpac™ mining software. Astur personnel worked in concert with MDA in all aspects of the gold and arsenic modeling, except for the final grade interpolations. Astur's participation was invaluable in developing a model that respects the geology of the deposit as it is presently understood.

14.2.3.1 Mineral Domains

A mineral domain encompasses a volume of rock that ideally is characterized by a single, natural, grade population of a metal (or metals) that is associated with a set of specific geologic criteria. In order to define the mineral domains at the Salave deposit, the natural populations of gold were first identified on a quantile graph that shows the gold-grade distribution of all Salave drill-hole assays. Natural populations are manifested on the graph as changes in the slope of the plotted assay data. Low-grade (~0.1 to ~0.9 g Au/t), medium-grade (~0.9 to ~8 g Au/t), and high-grade (>~8 g Au/t) populations can be distinguished on the quantile plot. Ideally, each of these populations can be correlated with specific geologic characteristics that are captured in the project data to aid in the definition of the mineral domains.

In order to identify the geologic characteristics that aid in the modeling of the domains, a set of northwest-looking paper cross sections were plotted at 20-meter intervals (the sections match the orientation of those in use at the project). The present-day topographic profiles and drill-hole data are also plotted, including gold assays color-coded to match the grade-domain population ranges as well as lithologic and alteration codes. After an initial review of these sections, it became clear that drill-hole intervals dominated by assays within the mid-grade population defined in the quantile plot (~0.9 to ~ 8 g Au/t) are strongly correlated to zones of intense albite-sericite alteration in the granodiorite. This alteration type was therefore modeled on several sections in the central portion of the deposit and, as has been the case in previous modeling, the alteration is interpreted to form zones of highly variable widths that dip gently to the west-southwest. The alteration modeling then served to control subsequent mid-grade mineral-domain interpretations on these sections. However, it became clear that the correlation between the alteration and mid-grade gold interpretations is so strong that gold can be modeled directly using the alteration codes posted on the drill holes (alleviating the need to first model alteration). Other data that aided in the interpretation of the mid-grade domain included arsenic values (positively correlated with gold) and angles-to-core-axis of structural features (found on copies of handwritten drill logs). The combination of the gently dipping zones of strong albite-sericite alteration, higher-grade arsenic values, structural angles-to-core-axes, and the statistically defined mid-grade gold population served to guide the sectional modeling of the mid-grade gold mineral-domain polygons, which are assigned a code of mineral domain 200.

A number of samples within the high-grade population (>~8 g Au/t) occur sporadically within the mid-grade domain 200 but could not be modeled separately due to the lack of continuity. There is, however, a cluster of high- to very high-grade samples in the northwestern quadrant of the deposit. A number of structures are intersected by holes in this area, and drill logs indicate moderate- to high-angles-to-core-axes for some structural features in these holes (as opposed to low- to moderate-dipping core-axes measurements that characterize the thick, gently dipping zones of domain 200). These data led to the interpretation of several zones of sub-vertical high-grade mineralization (mineral domain 300), with limited across-strike width and irregular vertical continuity. These sub-vertical high-grade structures have associated ‘branches’ of high-grade mineralization that lie within much broader zones of the gently dipping mid-grade domains, although the high-grade branches, as interpreted, extend for only limited distances away from the high-angle zones (see Figure 14.2). It should be noted that the interpretation of the high-grade ‘feeder’-like domain-300 mineralization is hampered by the preponderance of vertical holes, but it is felt that the modeling reasonably represents the actual volume of high-grade mineralization in this zone based on the data presently available.

The low-grade gold domain was modeled as envelopes around the mid- and high-grade domains, sometimes including the fringes of the albite-sericite zones, but usually incorporating alteration zones of lesser intensity (*e.g.*, chloritic to relatively unaltered granodiorite); this low-grade gold is assigned to domain 100.

The interpreted mineral domains only model zones with demonstrable continuity. In addition to the gold domains, the contact of the granodiorite with the metasedimentary rocks was modeled on the sections. Mineralization within the metasedimentary rocks was explicitly excluded from the mineral-domain modeling, which means that the mineral resources reported herein are derived entirely from gold mineralization hosted by granodiorite.

Essentially all blocks that meet the resource cutoff, and therefore report to the project gold resources, are derived from the mid- and high-grade domains (domains 200 and 300, respectively). The low-grade gold domain (domain 100) serves largely to estimate dilution into blocks that are only partly coded to the mid-grade and high-grade domains (*i.e.*, into blocks that lie along the outer edges of the two higher-grade domains).

Two domains were also modeled for arsenic after the sectional gold domains were completed. The higher-grade arsenic domain mimics gold domain 200 closely, while the low-grade arsenic domain is more extensive than the low-grade gold domain.

Representative cross sections showing gold mineral-domain interpretations of the Salave deposit are shown in Figure 14.1 and Figure 14.2.

Figure 14.1 Salave Deposit Cross Section 360NW Showing Gold Mineral Domains

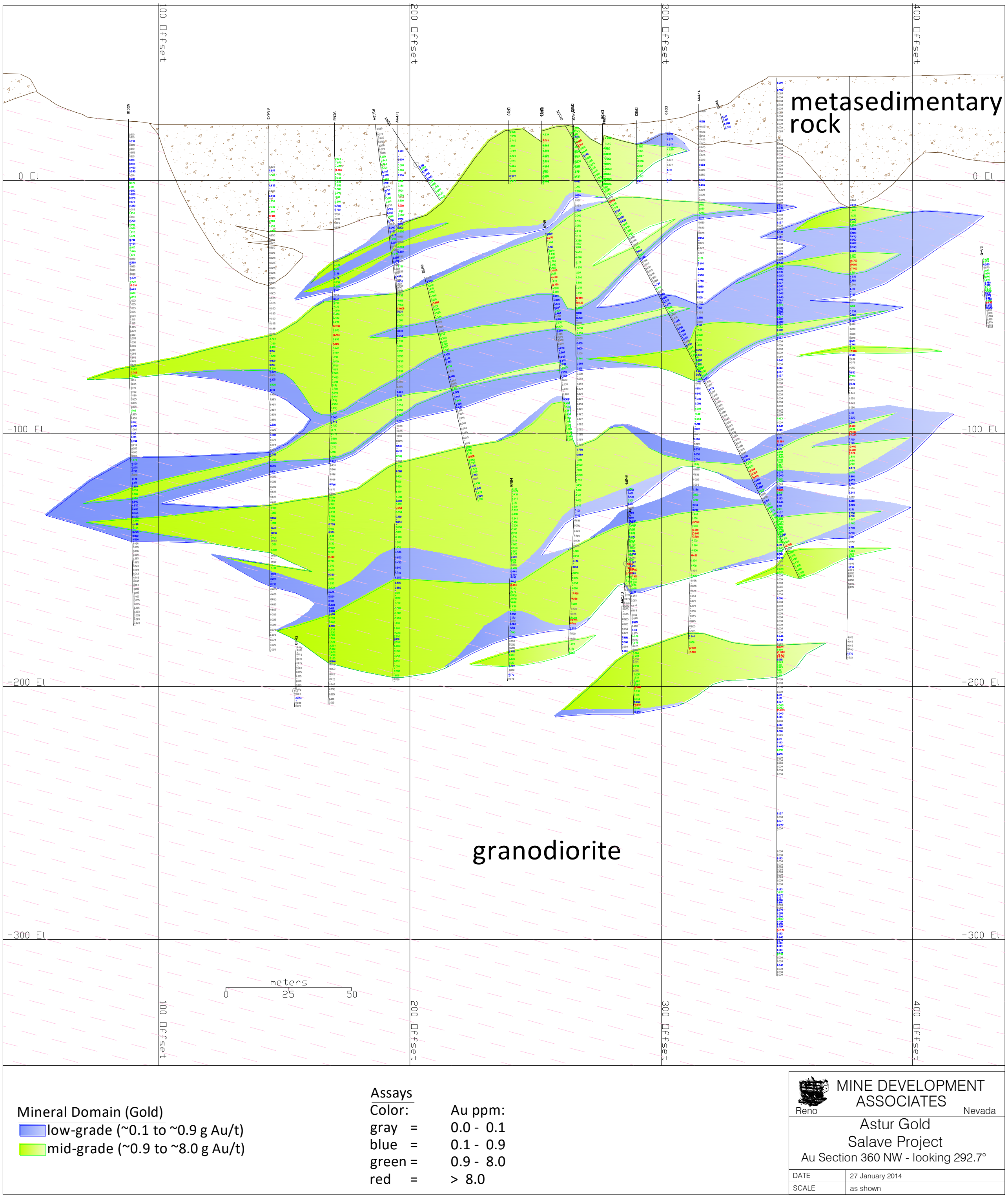
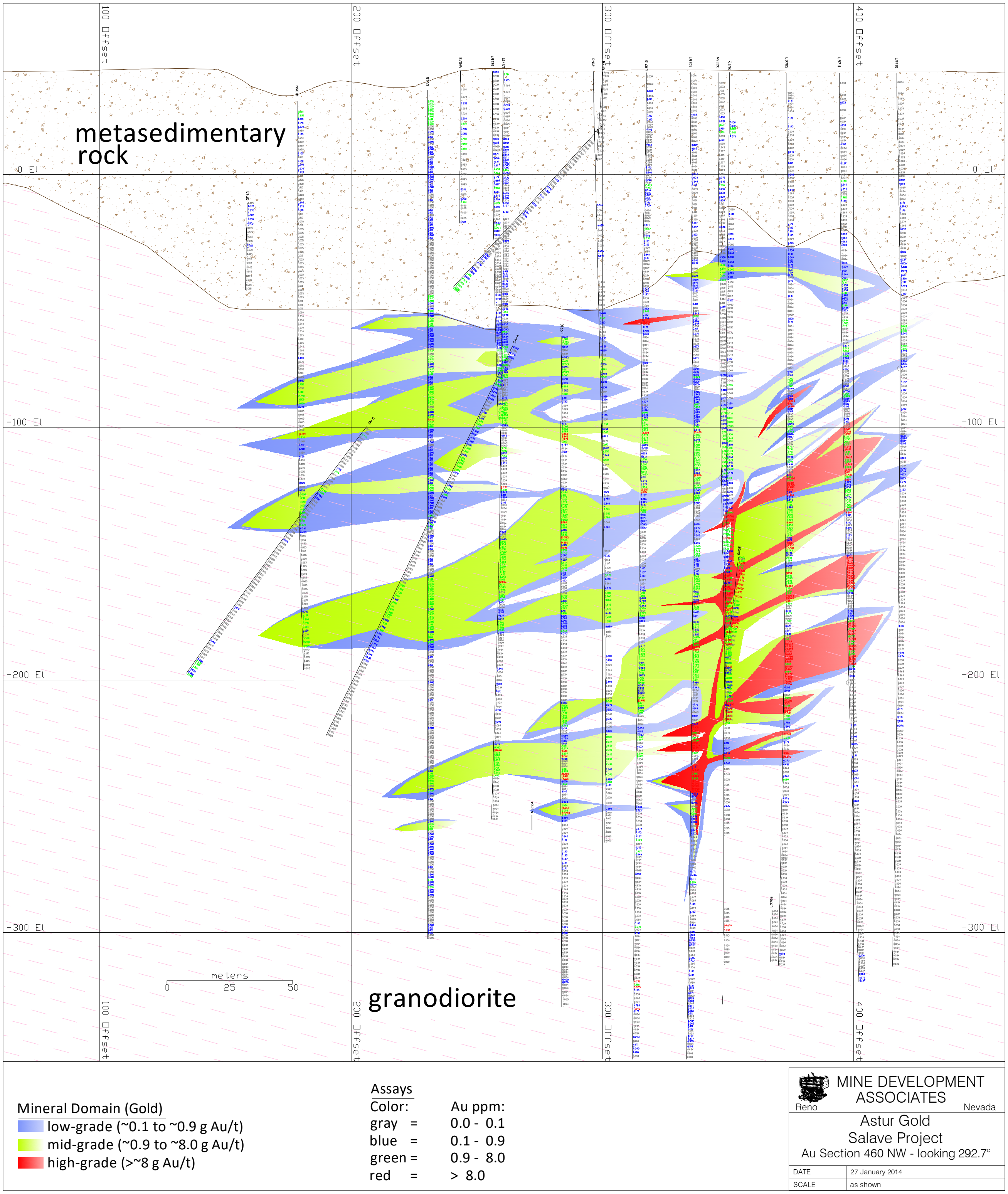


Figure 14.2 Salave Deposit Cross Section 460NW Showing Gold Mineral Domains



During the sectional mineral-domain modeling, the IMEBESA holes were often found to be anomalous in terms of grade, often being higher grade than adjacent holes drilled by other operators, as well as in location of the mineralized zones, which, if honored, would lead to irregularities in the domain modeling that appear to be artificial. One of the IMEBESA core holes is angled to the northeast, while the remaining holes were drilled to the southeast, and most of the holes were drilled at angles between -35° and -47.5°; these orientations generally cut the gently west-southwest dipping zones at relatively poor angles, which could lead to unrepresentative samples. Several previous operators of the Salave project have questioned the reliability of the IMEBESA drill-sample assays (see Sections 6.1.3 and 6.1.4). In consideration of all of these factors, Astur and MDA decided to exclude the IMEBESA holes from the resource modeling. The 24 RC holes drilled by Lyndex in 1997 were also excluded, due to concerns of potential down-hole contamination below the shallow water table at Salave, although only a small amount of data were thereby removed due to the shallow depths of these vertical holes (average of 28 meters in depth, with minimum of three meters and maximum of 60 meters). Excluding all the IMEBESA holes and the Lyndex RC holes, 265 holes for a total of 51,556 meters of drilling by operators prior to Astur were used for the resource estimate; these holes exclude any holes lacking assay data (e.g., some geotechnical holes). Of the 265 holes, two are RC holes, 13 are combination RC-core holes, and 250 are core holes.

The cross-sectional mineral-domain envelopes were digitized, pressed three-dimensionally to the drill holes, and then sliced vertically at four-meter intervals. These slices were used to guide the refinement of the gold and arsenic mineral-domain interpretations on four-meter-spaced long sections oriented orthogonally to the original cross sections.

14.2.3.2 Assay Coding, Capping, and Compositing

Drill-hole gold and arsenic assays were coded to their respective mineral domains using the original cross-sectional mineral-domain envelopes. No samples from the IMEBESA holes and Lyndex RC holes were allowed to be coded. Descriptive statistics of the coded assays are provided for gold in Table 14.1 and arsenic in Table 14.2.

Table 14.1 Descriptive Statistics of Coded Gold Assays

Domain	Assays	Count	Mean (g Au/t)	Median (g Au/t)	Std. Dev.	CV	Min. (g Au/t)	Max. (g Au/t)
100	Au	3609	0.45	0.30	0.72	1.60	0.00	13.87
	Au Cap	3609	0.42	0.30	0.42	1.02	0.00	2.50
200	Au	6152	2.80	1.85	3.55	1.27	0.01	104.00
	Au Cap	6152	2.78	1.85	3.21	1.16	0.01	35.00
300	Au	502	18.78	13.80	16.91	0.90	0.12	166.00
	Au Cap	502	18.50	13.80	15.07	0.81	0.12	85.00
All	*Au*	*10263*	*2.61*	*1.10*	*5.64*	*2.16*	*0.00*	*166.00*
	Au Cap	*10263*	*2.57*	*1.10*	*5.26*	*2.04*	*0.00*	*85.00*

Table 14.2 Descriptive Statistics of Coded Arsenic Assays

Domain	Assays	Count	Mean (ppm)	Median (ppm)	Std. Dev.	CV	Min. (ppm)	Max. (ppm)
100	As	3466	1028	700	1383	1.4	20	24300
	As Cap	3466	1008	700	1181	1.2	20	10000
200	As	4379	6180	4060	7686	1.2	25	200000
	As Cap	4379	6111	4060	6645	1.1	25	70000
All	*As*	*7845*	*3930*	*2200*	*6375*	*1.6*	*20*	*200000*
	As Cap	*7845*	*3883*	*2200*	*5647*	*1.5*	*20*	*70000*

The coded assays were plotted on quantile distribution plots by mineral domain to evaluate if multiple populations may exist in any of the domains, as well as to identify possible high-grade outliers that might be appropriate for capping. The spatial relationships of the potential outlier samples with all of the drill data were then evaluated to determine their potential impacts during grade interpolation. This process led to the capping of coded assays as summarized in Table 14.3.

Table 14.3 Assay Caps by Mineral Domain

Domain	Gold		Arsenic	
	g Au/t	Number of Samples Capped (% of Samples)	As ppm	Number of Samples Capped (% of Samples)
100	2.5	59 (~1.5%)	10,000	13 (<1%)
200	35	8 (<1%)	70,000	5 (<1%)
300	85	1 (<1%)	n/a	n/a

The capped assays were composited at two-meter down-hole intervals that respect the mineral domain boundaries. The two-meter length was chosen in an attempt to preserve inhomogeneities in grade, especially higher-grade intervals present sporadically within the mid-grade gold domain (domain 200). Descriptive statistics of the Salave composites are shown in Table 14.4 and Table 14.5 for gold and arsenic, respectively.

Table 14.4 Descriptive Statistics of Gold Composites

Domain	Count	Mean (g Au/t)	Median (g Au/t)	Std. Dev.	CV	Min. (g Au/t)	Max. (g Au/t)
100	3159	0.42	0.32	0.36	0.87	0.00	2.50
200	4943	2.78	1.98	2.83	1.02	0.02	35.00
300	364	18.50	14.36	13.26	0.72	0.14	85.00
All	*8466*	*2.57*	*1.20*	*4.91*	*1.91*	*0.00*	*85.00*

Table 14.5 Descriptive Statistics of Arsenic Composites

Domain	Count	Mean (ppm)	Median (ppm)	Std. Dev.	CV	Min. (ppm)	Max. (ppm)
100	3036	1008	760	1016	1.0	25	10000
200	3799	6111	4200	6039	1.0	50	70000
All	*6835*	*3883*	*2370*	*5235*	*1.4*	*25*	*70000*

14.2.3.3 Specific Gravity

Astur supplied Mr. Prenn with a set of Rio Narcea specific-gravity ("SG") measurements taken on drill core using the water-immersion method. MDA recalculated the SG values based on the raw data provided and loaded the results into the resource database. The SG values were then coded to the gold mineral domains for the purposes of statistical analysis, which is summarized in Table 14.6 (one anomalously high SG value from domain 300 is excluded).

Table 14.6 Specific-Gravity Statistics by Mineral Domain

Domain	Mean	Median	Min	Max	Count	*Model*
100	2.67	2.64	2.40	3.88	55	*2.65*
200	2.70	2.68	2.13	3.53	135	*2.70*
300	2.79	2.77	2.59	3.04	15	*2.75*
unmodeled granodiorite	2.65	2.62	2.09	5.66	149	*2.65*
unmodeled metasediments	2.64	2.65	1.98	2.94	41	*2.65*

The specific-gravity values increase with increasing gold-grade domain. This is an expected result, as the gold mineralization is positively correlated with sulfide content (*e.g.*, arsenopyrite, stibnite, and pyrite). Astur's independent analysis of the SG data, completed prior to the resource modeling, showed a similar positive correlation between gold grade and SG values. It should be noted that there are insufficient SG data derived from domain 300 to be confident in the statistical values.

14.2.3.4 Block Model Coding

The four-meter-spaced long-section mineral-domain polygons were used to code the block model, which is comprised of four-meter-wide x four-meter-long x 4.5-meter-high blocks. The block dimensions were chosen in consideration of potential mining by underground methods. The model is rotated around the z-axis to a bearing of 292.7˚ to match the orientation of the project cross sections. In order for the block model to better reflect the irregularly shaped limits of the mineral-domain polygons, as well as to explicitly model dilution, the percentage volume of each mineral domain within each block is stored in the block (the "partial percentages"). The partial percentages of each block that lies below surface topography were also coded into each block, and a solid was used to code the block's lithology (metasedimentary rocks or granodiorite).

For the purpose of the block model, a single SG value was assigned to each gold domain, as well as for the granodiorite and metasedimentary units that lie outside of the modeled mineral domains; these values are shown in the "Model" column of Table 14.6. A slightly lower SG value than is indicated by the statistics was chosen for domain 300 in order to account for void spaces that are likely present in this high-grade domain, which is thought to be related to a structural zone.

The bulk of the gold (and related arsenic) mineralization at the Salave deposit occurs in relatively shallow-dipping zones, although much of the modeled high-grade mineralization is related to sub-vertical structures. In order to apply an appropriate search ellipse to each portion of the model, estimation area solids were constructed and used to code model blocks. Three model areas were identified: (i) shallowly west-southwest-dipping zones, which dominate the model; (ii) a more-or-less east-west-striking, vertically dipping high-grade structural zone; and (iii) moderately west-southwest-dipping zones, which primarily occur adjacent to the vertically dipping zones.

14.2.3.5 Grade Interpolation

A variographic study was performed using the gold composites from each mineral domain, collectively and separately, at various azimuths, dips, and lags. The study was complicated by the fact that the mineralization occurs in multiple orientations. The most reliable structures modeled on the variograms were obtained with a strike of 350° and a shallow west-southwesterly dip (-15°), using composites from all domains jointly, as well as composites solely from domain 200 (the volumetrically most important domain). Maximum ranges of about 50 meters along strike and 75 meters in the dip direction were obtained using this orientation and domain 200 composites, although most of the correlation between composites occurs at distances less than 15 meters (dip) to 25 meters (strike). The results from the variography study were used to provide information relevant to estimation parameters and resource classification.

The Salave gold resource grades were estimated using inverse-distance methods. A number of gold interpolations were run using various parameters in an attempt to optimize the estimation. A summary of the final parameters used in grade estimation is provided in in Table 14.7.

Table 14.7 Summary of Gold Estimation Parameters

Search Ellipse Orientations

Estimation Domain	Major Bearing	Major Plunge	Tilt
Shallowly dipping	350°	0°	15°
Moderately dipping	350°	0°	30°
Vertical to steeply-dipping	260°	0°	-90°

Au Domains 100, 200, 300

Estimation Pass	Search Ranges (m)			Composite Constraints		
	Major	S-Major	Minor	Min	Max	Max/hole
1	75	75	30	1	12	3
2	150	150	60	1	12	3

Ordinary Krige Parameters[1]

Model	Domain	Nugget	First Structure				Second Structure			
		C_0	C_1	Ranges (m)			C_2	Ranges (m)		
SPH-Normal	100, 200, & 300	0.089	0.135	15	10	6	0.043	75	50	30

[1] krige interpolation used as a check against the reported inverse-distance interpolation

The major and semi-major axes of the search ellipses approximate the average strike and dip directions of the gold mineralization. The first-pass search distances take into consideration the results of the variography, the drill spacing, and the results of multiple interpolation iterations to obtain optimal ranges. The second pass was designed to estimate grade into all blocks coded to the mineral domains that were not estimated in the first pass.

The estimation passes were performed independently for each of the mineral domains, so that only composites coded to a particular domain were used to estimate grade into blocks coded by that domain. The estimated grades were coupled with the partial percentages of the mineral domains to enable the calculation of a single weight-averaged undiluted grade for each block. All estimations used length-weighted composites.

Gold grades for all domains were initially interpolated using inverse-distance to the third power. In an attempt to control the effects of some outlier grades within the low-grade domain, the inverse-distance power was increased to the fourth power for this domain.

The constraint of a maximum of three composites from a single drill hole was imposed, along with the relatively short composite length of two meters, to attempt to preserve local grade variations in the domains, especially those for high-grade intervals lying within the mid-grade domain.

Arsenic was estimated identically as gold, with the exception that a third estimation pass was added. The third pass was needed to fully populate grades into the modeled domains because there are fewer arsenic composites than gold (not all drill samples were analyzed for arsenic).

Figure 14.3 and Figure 14.4 show cross sections through the block model that correspond to the mineral-domain cross sections in Figure 14.1, Figure 14.2, respectively.

Figure 14.3 Salave Deposit Cross Section 360NW Showing Block Model Gold Grades

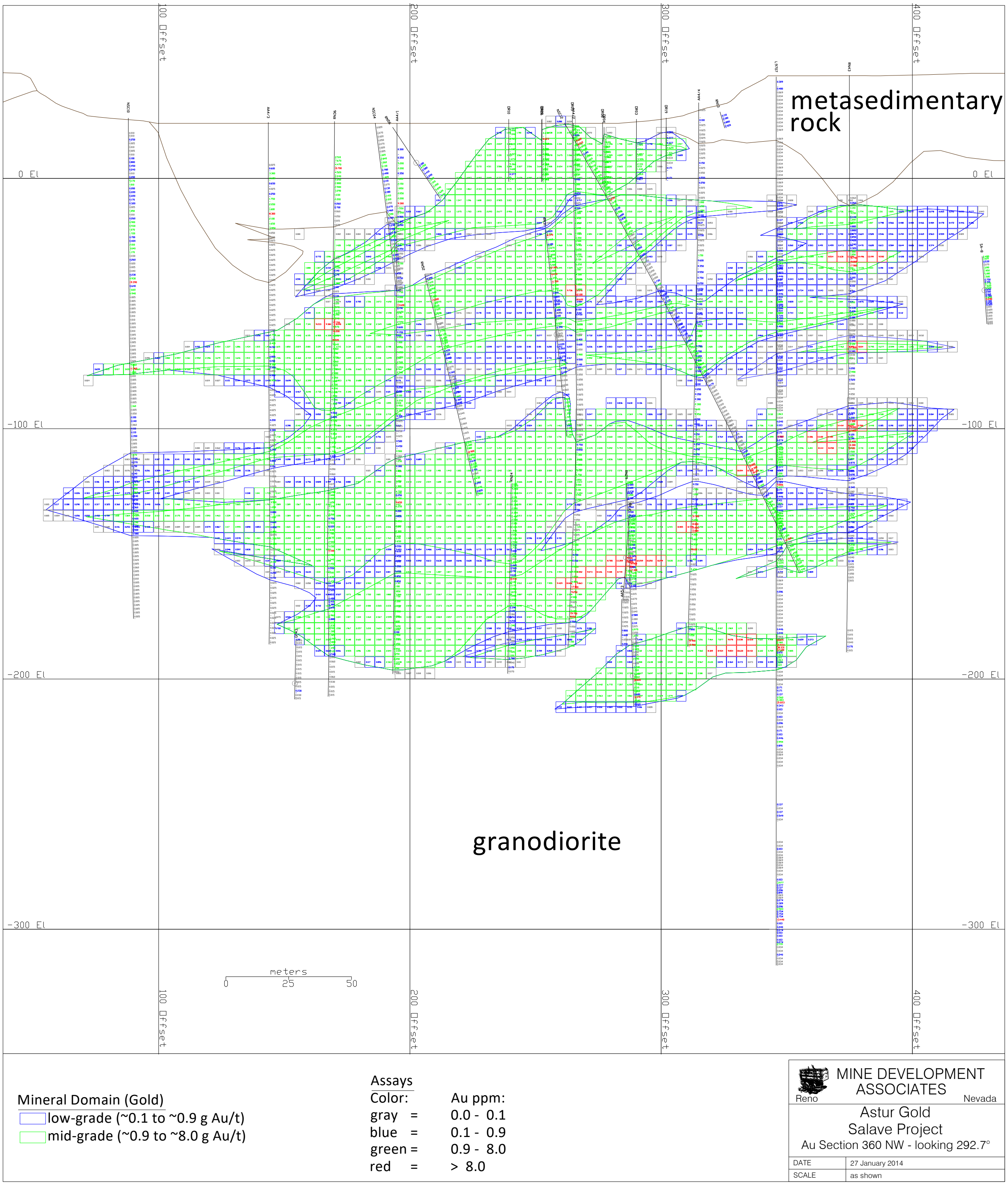
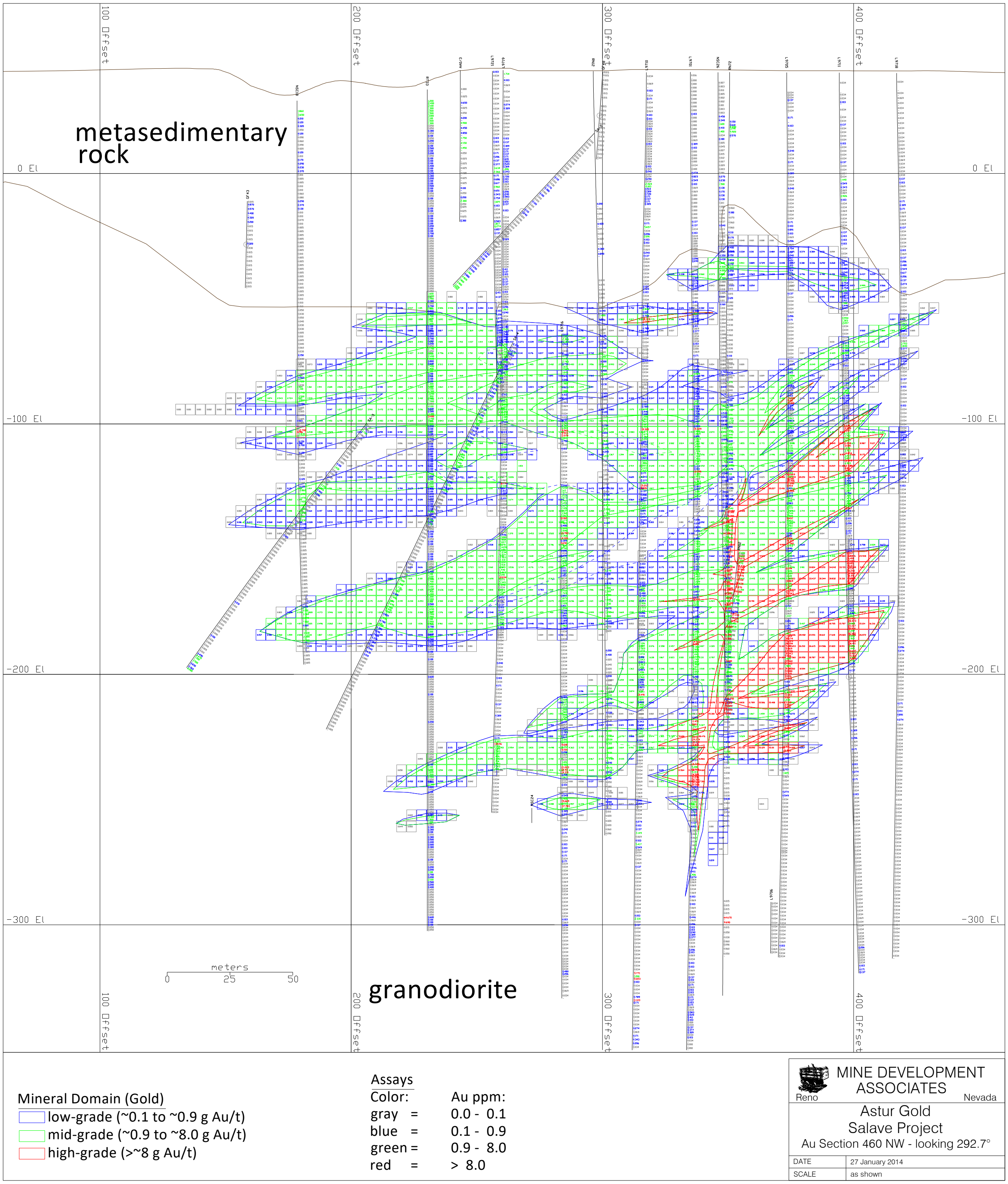


Figure 14.4 Salave Deposit Cross Section 460NW Showing Block Model Gold Grades



14.2.3.6 Model Checks

Volumes derived from the mineral-domain polygons of the original set of cross sections were compared to both the long-sectional and coded block-model volumes to assure close agreement. All block-model coding was checked visually on the computer. Nearest-neighbor and ordinary-krige estimates of the modeled resources were undertaken as a check on the inverse-distance estimation results. Various grade-distribution plots of assays and composites *versus* the nearest neighbor, krige, and inverse-distance block grades were evaluated as a check on the estimation. Finally, the inverse-distance grades were visually compared to the drill-hole assay data to assure that reasonable results were obtained.

14.3 Salave Project Estimated Gold Resources

The Salave block-diluted gold resources are presented in Table 14.8 using a cutoff grade of 2.0 g Au/t. This cutoff was chosen to capture mineralization that is potentially available to underground mining, sulfide concentration, and gold recovery using off-site processing. This cutoff grade was selected based on a gold price of $1,300 per ounce, a gold recovery of 92%, a mining cost of $50 per tonne, a processing cost of $18/tonne, and a G & A cost of $6/tonne. These costs equate to a total calculated cutoff grade of 1.92 grams Au/t, which was rounded up to 2.0 grams Au/t.

Table 14.8 Salave Project Gold Resources at a Cutoff Grade of 2.0g Au/t

Measured			Indicated			Measured + Indicated		
Tonnes	g Au/t	oz Au	Tonnes	g Au/t	oz Au	Tonnes	g Au/t	oz Au
514,000	5.87	97,000	6,008,000	4.39	847,000	6,522,000	4.51	944,000

Inferred		
Tonnes	g Au/t	oz Au
1,078,000	3.05	106,000

Note: Rounding may cause apparent discrepancies

The estimated resources exclude mineralized material that lies between the surface and a depth of 40 meters. This is due to the necessity to maintain a surficial crown pillar in a potential underground operation.

Model blocks meeting the resource cutoff of 2 g Au/t were inspected three dimensionally and found to occur in groups of sufficient size and continuity to meet the requirement of having reasonable prospects for eventual economic extraction.

The Salave resources are classified on the basis of the number and distance of composites used in the interpolation of a block, as well as the number of holes that contributed (Table 14.9).

Table 14.9 Salave Classification Parameters

Classification	Constraints
Measured	Block grade interpolated from a minimum of three composites derived from a minimum of two holes, whose average distance to the block does not exceed eight meters.
Indicated	Block grade interpolated from a minimum of three composites derived from a minimum of two holes, whose average distance to the block does not exceed 18 meters.
Inferred	All estimated blocks not assigned to the Measured or Indicated categories.

It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

The modeled extents of the Salave gold resources are approximately 525 meters in a northwesterly direction and 375 meters in a southwesterly direction. The domains were modeled over a vertical extent of about 340 meters.

The arsenic modeling allows for a general assessment of arsenic grades that are associated with the gold resources. Measured and Indicated gold resources have an associated arsenic grade of about 0.7% As, while the Inferred gold resources have an associated arsenic grade of about 0.5%.

Grade-distribution information at different cutoffs is provided in Table 14.10, which allows for an evaluation of the sensitivity of the resources to economic conditions or mining scenarios other than those envisioned by the reportable cutoff.

Table 14.10 Salave Modeled Mineralization at Various Cutoffs

Cutoff (g Au/t)	Measured		
	Tonnes	g Au/t	oz Au
0.7	947,000	3.77	115,000
1.0	826,000	4.20	112,000
2.0	***514,000***	***5.87***	***97,000***
2.5	409,000	6.81	89,000
3.0	338,000	7.65	83,000
5.0	191,000	10.56	65,000
7.0	129,000	12.78	53,000
10.0	78,000	15.67	40,000

Cutoff (g Au/t)	Indicated		
	Tonnes	g Au/t	oz Au
0.7	12,730,000	2.77	1,132,000
1.0	11,041,000	3.06	1,086,000
2.0	***6,008,000***	***4.39***	***847,000***
2.5	4,338,000	5.21	727,000
3.0	3,257,000	6.04	632,000
5.0	1,251,000	9.68	389,000
7.0	704,000	12.66	286,000
10.0	387,000	16.22	202,000

Cutoff (g Au/t)	Measured + Indicated		
	Tonnes	g Au/t	oz Au
0.7	13,677,000	2.84	1,247,000
1.0	11,867,000	3.14	1,198,000
2.0	***6,522,000***	***4.51***	***944,000***
2.5	4,747,000	5.35	816,000
3.0	3,595,000	6.19	715,000
5.0	1,442,000	9.80	454,000
7.0	833,000	12.68	339,000
10.0	465,000	16.13	242,000

Cutoff (g Au/t)	Inferred		
	Tonnes	g Au/t	oz Au
0.7	3,915,000	1.73	218,000
1.0	2,960,000	2.02	192,000
2.0	***1,078,000***	***3.05***	***106,000***
2.5	631,000	3.63	74,000
3.0	378,000	4.24	52,000
5.0	69,000	6.89	15,000
7.0	22,000	9.30	7,000
10.0	6,000	12.69	2,000

Note: Rounding may cause apparent discrepancies

14.4 Comments on the Resource Modeling

Mr. Prenn initially completed the Salave resource model in mid-December 2013. Subsequent to this, Astur received final assays for a sequence of 10 holes drilled in late 2013, which were primarily drilled internal to the deposit as modeled in 2013. These holes were added to the resource database, and the resource model was then updated in January 2014 to include the Astur core data, which created the opportunity to evaluate the initial 2013 modeling. The late 2013 holes broadly confirmed the modeling of the Salave resources. As was expected, there were several instances where the newer data led to small interpretational changes as to the correlation of one intercept of a shallowly dipping zone with that from an adjacent hole, but the most common changes in these zones were in the interpreted widths, in both positive and negative directions. Of particular interest is one hole that was drilled directly down the axis of the main sub-vertical high-grade domain. The results of this hole were remarkably consistent with the 2013 interpretations. The ultimate impact of the 10 holes drilled in 2013 was the addition of 6,000 ounces to the current resource model at the resource cutoff of 2.0 g Au/t.

Astur had originally received a positive environmental impact assessment for an underground mine and development decline only and resubmitted additional environmental studies to permit flotation and tailings facilities. Since 2014, all approvals related to the environmental impact assessment and project development permtis have been denied and are currently being appealed before the Asturias Supreme Court of Justice. The denial of the permits remains a risk to the project, however, Black Dragon is appealing these decisions.

As discussed above, the near-surface portion of the modeled deposit was excluded from the resources to account for a crown pillar in any potential underground operation. This excluded zone contains slightly less than 400,000 tonnes of modeled mineralized material.

In order to evaluate the impact of assay capping on the Salave resources, the model was re-estimated using composites of uncapped assays. The uncapped estimation resulted in a gain of 16,000 ounces in the Measured and Indicate categories (+2%) and 2,000 ounces in the Inferred category (+2%) at the 2.0 g Au/t resource cutoff.

The Salave gold mineralization is associated with arsenopyrite, which would be captured in flotation concentrates. Due to potential penalties that could be incurred for the processing of arsenic-rich concentrates, arsenic was estimated into the model in addition to gold. The arsenic values are derived from various multi-element ICP analyses whose accuracies have not been determined. Metallurgical results suggest that at least some of the arsenic analyses may be overstated by approximately 10%.

The drill data support the modeling of the broad zones of strongly altered granodiorite and associated gold mineralization as shallow-dipping zones, and this interpretation is consistent with those of numerous previous geologists who have worked at the project. The presence of multiple altered/mineralized intervals in each drill hole presents challenges, however, as to which interval in one hole should be correlated with another of the several intervals in an adjacent hole. This challenge is exacerbated by abrupt changes in volume and/or location of some zones from section to section. Another uncertainty exists with the modeling of the sub-vertical high-grade domains using drill data from predominantly vertical holes, as was previously noted in Section 14.2.3.1. While MDA is confident in the present interpretations, it is possible that the details of some of the correlations of mineralized zones, especially those of relatively limited continuity, may create local inaccuracies.

However, if there are errors, they are mitigated by the high density of drilling, *i.e.*, the extents of any such errors are significantly constrained by the drill data, especially within the Measured and Indicated resources. An analogous mitigative effect is demonstrated in the insignificant change in resource ounces that would occur were assay caps removed.

There are a number of significant differences between the current mineral resource estimate described herein and the one reported by RPA in 2010 (Agnerian, 2010) (see brief description in Section 6.2 of this report), as well as the "inventory of mineral resources" for the underground-mining scenario summarized in Golder's Preliminary Economic Assessment (Tenorio, 2011; Tenorio *et al*., 2013) (see brief descriptions in Sections 6.2 and 17.0 of this report). Some of these differences include:

- The current mineral resource is based on an underground-only mining scenario. The 2010 mineral resource estimate was based on open-pit mining of most of the resource with underground mining of an Inferred underground resource located outside of the open pit shell.
- The current estimate uses a single 2.0 g Au/t cutoff, whereas the 2010 estimate used a cutoff of 2.5 g Au/t for the underground resource and a cutoff of 0.7 g Au/t for the open-pit resource. The 2011 "inventory of mineral resources" in the Preliminary Economic Assessment for the underground-mining scenario used variable cutoff grades.
- The current estimate excluded the IMEBESA core holes and the 24 RC holes drilled by Lyndex in 1997 but included all of Rio Narcea's drilling and the 2013 drilling by Astur. The 2010 estimate included the IMEBESA and Lyndex holes but 70 of 79 Rio Narcea holes and none of Astur's subsequent drilling; the 2011 Preliminary Economic Assessment was based on the 2010 estimate.
- The current estimate includes high-grade mineralization in sub-vertical fracture/fault zones located in the northwestern part of the deposit. Although Rio Narcea had recognized the presence of this type of mineralization in the deposit, it was not included in the model used for the 2010 estimate.
- The 2010 modeling capped high-grade values of four-meter composites. The current estimated capped original high-grade assays and then composited the samples into two-meter composites. The relatively short composites were chosen in an attempt to preserve inhomogeneities in grade, especially higher-grade intervals present sporadically within the mid-grade gold domain.
- The current resources are stated on a fully block-diluted basis, while the 2010 resources were reported undiluted.
- The current estimate excludes material from the surface to a depth of 40 meters for a crown pillar. No such exclusion was made in the 2010 resource estimate because the open pit would mine this material.

Subsequent resource modeling could be improved by the incorporation of detailed logging of new or existing core holes, with the specific goal of compiling structural observations (carefully documented angles-to-core-axes) that will aid in the creation of a structural model of the Salave deposit. Angled core holes that cut the high-grade, high-angle gold mineralization would be particularly useful. Upon completion of a structural model, the present resource model could be evaluated and updated if warranted.

15.0 MINERAL RESERVE ESTIMATES

No estimate of mineral reserves has been made for this report.

16.0 MINING METHODS

Studies of mining methods have not been completed for this report.

17.0 RECOVERY METHODS

Studies of recovery methods have not been completed for this report.

18.0 PROJECT INFRASTRUCTURE

Project infrastructure has not been defined for this report.

19.0 MARKET STUDIES AND CONTRACTS

There have been no studies of commodity markets or contracts for this report.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Environmental permitting status and requirements for the Salave project are summarized in Section 4.5. Aspects of possible social or community impact have not been studied for this report.

21.0 CAPITAL AND OPERATING COSTS

Studies of capital and operating costs for the Salave project have not been carried out for this report.

22.0 ECONOMIC ANALYSIS

An economic analysis has not been conducted for this report.

23.0 ADJACENT PROPERTIES

The authors are not aware of current information from adjacent properties that is relevant to the mineral resources described in this report.

24.0 OTHER RELEVANT DATA AND INFORMATION

The authors are not aware of any other relevant data.

25.0 INTERPRETATION AND CONCLUSIONS

Mr. Prenn verified the Salave project database used in the resource estimation and Mr. Prenn visited the project site. It is Mr. Prenn's opinon that the data provided by Astur (now Black Dragon) are generally an accurate and reasonable representation of the Salave project.

Although the Salave area was mined for gold by the Romans in the first century AD, drilling by IMEBESA, a subsidiary of Northgate Exploration Ltd., in 1970-1971 was the first modern exploration of the property to identify gold mineralization. Including Astur's drilling in September 2013, nine companies have drilled at least 345 core holes and 139 percussion-RC (113 RC and 26 shallow percussion) holes on and near the current Salave project.

The gold mineralization at Salave occurs in a series of stacked, north- to north-northwest-trending, shallowly west-dipping irregular lenses related to faults and fracture zones that are parallel to the contact of intrusive and metasedimentary rocks. The mineralization in these lenses appears to be related to one or more vertical structures, at least some of which contain high-grade mineralization. The dimensions of the individual mineralized zones range from 50 meters to 300 meters in length, 10 meters to 150 meters in width, and five meters to 60 meters in thickness, with an average thickness on the order of 20 meters. The mineralized zones occur within an area approximately 400 meters wide, 500 meters long, and at least 350 meters deep.

The Salave gold deposit is primarily hosted by granodiorite that has yielded radiometric ages of 292 and 287 Ma. Gold occurs both disseminated and in veins and is primarily associated with acicular disseminated arsenopyrite, variable amounts of pyrite and stibnite and with intense albite-sericite-carbonate alteration.

The current mineral resource estimate used a cutoff grade of 2.0 g Au/t, which was chosen to capture mineralization that is potentially available to underground mining, sulfide concentration, and gold recovery using off-site processing. Arsenic was estimated into the model in addition to gold because of the association of the gold mineralization with arsenopyrite, which would be captured in flotation concentrates. To account for a surficial crown pillar in a potential underground operation, all mineralized material from the surface to a depth of 40 meters is not included in the Salave resources.

Current Measured and Indicated resources total 6,522,000 tonnes averaging 4.51 g Au/t for a total of 944,000 ounces of gold, with an additional 1,078,000 tonnes averaging 3.05 g Au/t for a total of 106,000 ounces of gold in the Inferred category.

Despite Astur's wholly owned subsidiary EMC receiving a positive environmental impact assessment for the underground mine and access decline components of its development plan in December of 2012, Astur subsequently received a negative decision on its final Amended EIA from the Commission for Environmental Affairs of the Principality of Asturias ("CAMA") for the Company's complete development proposal of the Salave gold deposit. This decision ultimately influenced the Ministry of Economy and Employment of the Principality of Asturias to issue a resolution dated February 10, 2015 denying the proposed underground mine submitted by EMC for the Salave.

In April of 2015, EMC filed a lawsuit before the Asturias Superior Court of Justice, challenging the resolution of the Ministry of Economy and Employment of the Principality of Asturias and subsequently filed a Statement of Claim before the Court on November 10, 2105. The Statement of Claim requests that the Court revoke the Resolution by the Ministry that denied the proposed development of Salave and includes a petition to recover all costs incurred by EMC on the project since May 2010.

26.0 RECOMMENDATIONS

There are two main recommendations for the project to continue on a path toward development. First, if a resolution to the current impasse on project permitting can be achieved, a feasibility study should be completed. Given a final project plan has not been approved, the scope of a final feasibility study remains undetermined and we are unable to include an estimate at this time.

Second, the deposit has not been completely drilled out and is open to the west; in addition, as described in Section 9.0, there are untested geophysical anomalies and mineralized, steeply dipping structural zones on the ocean cliff faces that should be explored. In addition, some of the drilled areas require infill development drilling to prove Inferred materials. These areas cannot be drilled from the surface due to permitting constraints and surface ownership issues of some areas. Planning for a potential underground mine is at an advanced stage. The originally proposed decline and level development could be used for both underground development drilling and during actual mine operations, should the feasibility study prove positive.

As per the orginal proposal and based on estimates in the 2014 Technical Report, the time required and cost of gaining access to complete the development drilling are significant. About 18 to 24 months of development are required prior to drilling. Table 19.1 shows the estimated cost of this program.

Table 26.1 Cost Estimate for the Recommended Program

Item	Meters	Estimated Cost
Decline	2,500	$10,000,000
Drifts and Drill Stations	1,185	$2,500,000
Ramps	180	$500,000
Vent Raise	400	$800,000
Drilling & Assaying	7,500	$1,500,000
Owners Costs	Lump Sum	$2,000,000
Subtotals		$17,300,000
Contingency		$1,800,000
Totals		**$19,100,000**

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28.0 DATE AND SIGNATURE PAGE

Effective Date of report: October 7, 2016

The effective date of the mineral resource estimate is October 7, 2016.

Completion Date of report: January 31, 2017

"Neil Prenn"
Neil B. Prenn, P.E.

Date Signed:
January 31, 2017

"Michael M. Gustin"
Michael M. Gustin, C.P.G.

Date Signed:
January 31, 2017

"Allen R. Anderson"
Allen R. Anderson, P.E.

Date Signed:
January 31, 2017

29.0 CERTIFICATE OF QUALIFIED PERSONS

I, Neil B. Prenn, P.E., do hereby certify that:

1. I am currently employed as Principal Engineer by:
   Mine Development Associates, 210 South Rock Blvd., Reno, Nevada 89502.

2. I graduated with an Engineer of Mines degree from the Colorado School of Mines in 1967 and I have worked as an engineer for a total of 46 years since my graduation from university.

3. I am a Registered Professional Mining Engineer in the state of Nevada (#7844) and a member of the Society of Mining Engineers and the Mining and Metallurgical Society of America. My relevant work experience includes 16 years with Cyprus Mines Corporation, two years with California Silver, and 26 years with Mine Development Associates, completing numerous resource and reserve estimates and evaluations, open-pit and underground mine designs, and economic analyses of mining projects in North and South America, and Europe.

4. 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 purposes of NI 43-101.

5. I am a co-author of the Technical Report titled "*Amended Technical Report on the Salave Gold Project, Asturias, Spain*" prepared for Black Dragon Gold Corporation with an Effective Date of October 7, 2016 (the "Technical Report"). With the exception of Section 7, Section 8, Section 13 and Section 1.5, I take responsibility for all other sections of this report.

6. I personally visited and inspected the subject property on September 16 to 20, 2013, and again on November 27 to 28, 2013. Prior to that, I have had no involvement with the property that is the subject of this Technical Report.

7. As of the Effective Date of this Technical Report, to the best of my knowledge, information, and belief, the portions of the Technical Report for which I am responsible contain all the scientific and technical information that is required to be disclosed to make this technical report not misleading.

8. I am independent of Black Dragon Gold Corporation and their subsidiaries as defined in Section 1.5 of NI 43-101 and in Section 1.5 of the Companion Policy to NI 43-101.

9. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Dated this day January 31, 2017.

Neil B. Prenn, P.E.
Mine Development Associates

Certificate of Qualified Person

I, Michael M. Gustin, C.P.G., do hereby certify that I am currently employed as Senior Geologist by Mine Development Associates, Inc., 210 South Rock Blvd., Reno, Nevada 89502, and:

1. I graduated with a Bachelor of Science degree in Geology from Northeastern University in 1979 and a Doctor of Philosophy degree in Economic Geology from the University of Arizona in 1990. I have worked as a geologist in the mining industry for more than 30 years. I am a Licensed Professional Geologist in the state of Utah (#5541396-2250), a Licensed Geologist in the state of Washington (# 2297), a Registered Member of the Society of Mining Engineers (#4037854RM), and a Certified Professional Geologist of the American Institute of Professional Geologists (#CPG-11462).

2. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101"). I have previously explored, drilled, evaluated and modelled gold and porphyry deposits in North and South America, and Europe. I certify that by reason of my education, affiliation with certified professional associations, and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

3. I have not visited the Salave project.

4. I am responsible for Section 7 and Section 8 of this report titled, "*Amended Technical Report on the Salave Gold Project, Asturias, Spain*" prepared for Black Dragon Gold Corporation with an Effective Date of October 7, 2016 (the "Technical Report").

5. I have had no prior involvement with the Salave property or project that is the subject of this Technical Report, and I am independent of Black Dragon Gold Corp. and all of its affiliates and subsidiaries as defined in Section 1.5 of NI 43-101 and in Section 1.5 of the Companion Policy to NI 43-101.

6. As of the Effective Date of this Technical Report, to the best of my knowledge, information, and belief, this Technical Report contains all the scientific and technical information that is required to be disclosed to make those parts of this Technical Report for which I am responsible for not misleading.

7. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Dated this 31st day of January 2017.

"Michael M. Gustin"
Michael M. Gustin, C.P.G.

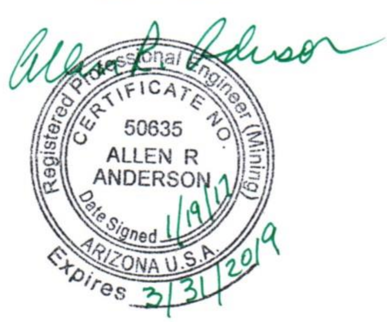
Allen R. Anderson Metallurgical Engineer Inc.
11050 E. Ft. Lowell Rd.
Tucson AZ 85749

CERTIFICATE OF QUALIFIED PERSON

I, Allen Ray Anderson, P.E., residing in Tucson, Arizona do hereby certify that:

1) I am currently employed as President of Allen R. Anderson Metallurgical Engineer Inc. located at 11050 E. Ft. Lowell Rd.; Tucson AZ; 85749.
2) I am a graduate of South Dakota School of Mines and Technology May 1977, and hold Bachelor of Science degree in Metallurgical Engineering.
3) I am a Registered Professional Engineer / Mining - Registration Number 50635 with the Arizona State Board of Technical Registration; and a member of the Society for Mining, Metallurgy, and Exploration, Inc.
4) I have worked as a professional engineer in the mining process industry for a total of 38 years since my graduation from university. My experience includes process and engineering support and management for numerous concentrator, precious metal heap-leach and CIP operations, most recently in Nevada, Arizona, New Mexico, and previously in Bolivia.
5) I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* ("NI 43-101") 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 NI 43-101.
6) I am a co-author of the Technical Report titled "*Amended Technical Report on the Salave Gold Project, Asturias Region, Spain*", with an Effective Date of October 7, 2016, prepared for Black Dragon Gold Corporation. I am responsible for Sections 1.5 and 13.
7) I do have prior involvement with the property as the QP for the same sections of the Technical Reports prepared in 2014 and 2016 entitled "*Technical Report on the Salave Gold Project, Asturias Region, Spain*" and "*Updated Technical Report on the Salave Gold Project, Asturias Region, Spain*", respectively. I have not visited the property.
8) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the Sections of the Technical Report for which I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
9) I am independent of Black Dragon Gold Corporation and their subsidiaries as defined in Section 1.5 of National Instrument (NI) 43-101 and in Section 1.5 of the Companion Policy to NI 43-101.
10) I have read NI 43-101 and the Sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

Tucson, Arizona



"Original Signed and Sealed"
Allen Ray Anderson, P.E.
President
Allen R. Anderson Metallurgical Engineer Inc.
11050 E. Ft. Lowell Rd.
Tucson, AZ 85749

Dated this 31st day of January 2017.

"Allen Ray Anderson"
Allen Ray Anderson, P.E.