GEOLOGY OF THE PROSPECTUS "BLACK HOLES" LAJON

REGION PROVINCE OTUSCO-LIBERTAD-PERU

INDEX

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COAL PROJECT GEOLOGY

"Black Holes"

Petitions	:"Black Holes MA-AG"
	: "The Time Tunnel 1"
	: "The Time Tunnel 2"
Site Location	: Caserío Lajon-Huayobamba
District	: Huaranchal
Province	: Otuzco
Department	: La Libertad
Republic	: Peru

By: **CSIMLSAC**

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Lima, May 28, 2012

COAL PROJECT GEOLOGY
"Black Holes"

1. GENERAL

1.1. Introduction

This study has been prepared for and at the request of the Company SAC PERU MINING PERCANA in order to develop fixed parameter determining the feasibility of the proposed coal "Black Holes."

The preparation of this work was done by a group of engineers, technicians and workers who contributed to the development of the different stages of the study, topography, geology and physical work of trenches and / or pits which led us to know more local geology of the coal deposit.

Waiting for the study and geological interpretations have sufficient information and technical value to the company are proposing what we think and show of the carbon "black holes".

1.2. Objectives

◊ Perform detailed survey of 1,000 hectares.
◊ Make lifting the detailed geology, physical work of trenches in order to link the main and important coal structures.

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1.3. Location

Geographical location and political project

◊ Republic : Peru
◊ Department : La Libertad.
◊ Province : Otuzco.
◊ District : Huaranchal
◊ Spot : Between Huayobamba and Lajon.

Access roads

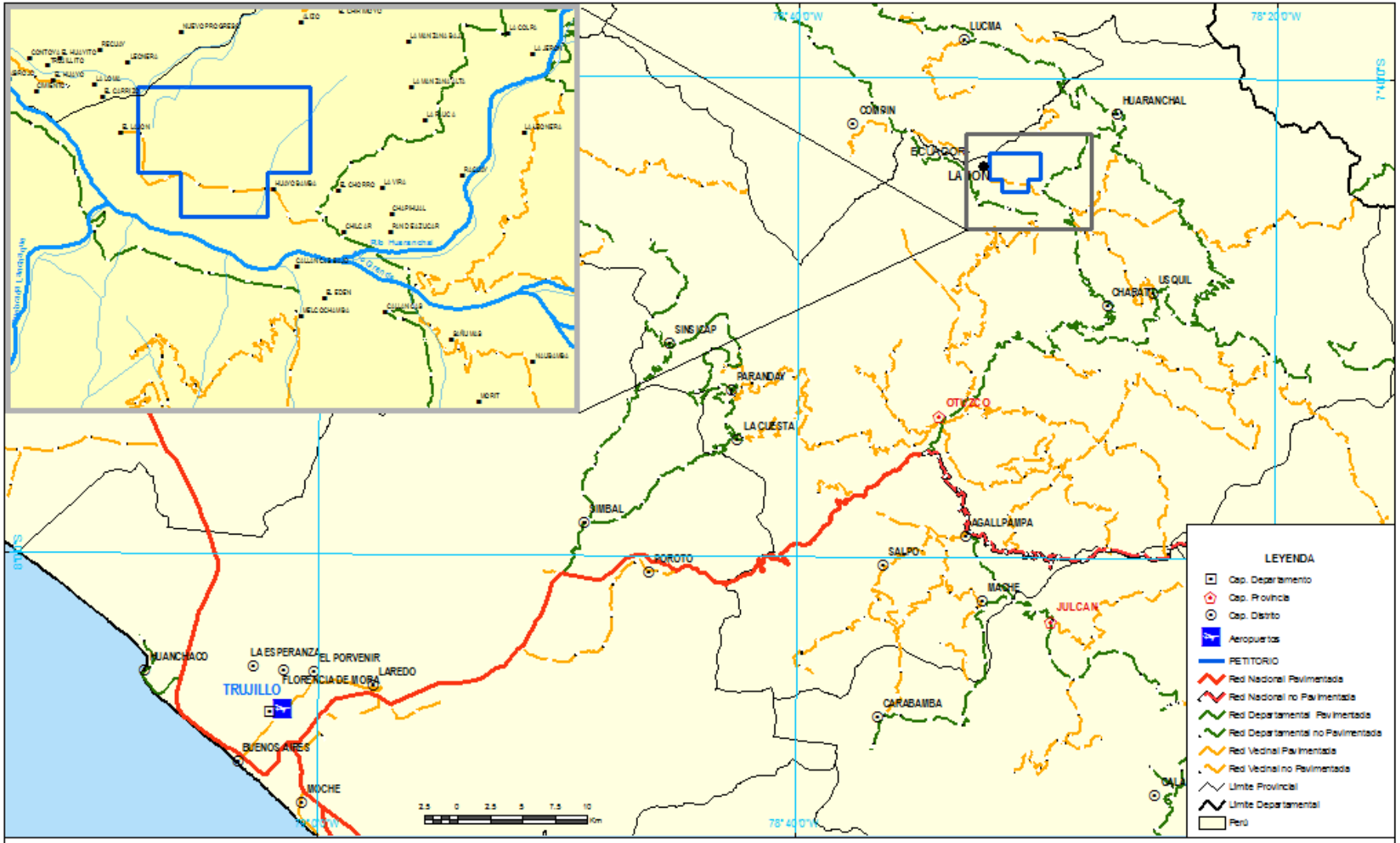
The project boundary is communicated by these two ways:

- By Land

Nº	Stretch	Distance (Km)	Time	Road Type
1	Lima -Trujillo	557	8 Hours	Panam North Highway
2	Trujillo-Otuzco	74	1 Hours	Asphalt Road
3	Otuzco-Callancas	150	3 Hours	Asphalt Road
4	Callancas-Huayobamba	7	30 Minutes	Rough Road
5	Huayobamba-Lajon,Mina	9	30 Minutes	Rough Road
Total	**Lima-Mina**	**797**	**13 Hours**	**By land**

- By Other Means

Nº	Stretch	Distance (Km)	Time	Road Type
1	Lima -Trujillo	300	1 Hour	Plane
2	Trujillo-Otuzco	74	1 Hour	Asphalt road
3	Otuzco-Callancas	150	3 Hour	Asphalt Road
4	Callancas-Huayobamba	7	30 Minutes	Rough Roads
5	Huayobamba-Lajon,Mina	9	30 Minutes	Rough Roads
Total	**Lima-Mina**	**540**	**6 Hours**	**By Other Means**



MTC Ministerio de Transportes y Comunicaciones | PROVIAS DESCENTRALIZADO

PLANO UBICACIÓN

ELABORADO : CSIMLSAC
REVISADO : Ing. Lindorfo E. Tito Torres.
DIBUJO : Ing. Carlos Flores Caceres.

II. TOPOGRAPHY

2.1. Overview

The topography of the area is steep and rugged with deep canyons and plateaus at small plateaus way recognized the important and main prospectus within the 1000 hectares and around where the outcrops and small exploration work.

2.2. Boundaries and perimeter measurements

The land has the shape of an irregular polygon with 04 sides with boundaries and perimeter measurements following:

In North ◊ 4000.00 ml., Bordering town of El Aliso.

◊ To the East with 4000.00 ml. Adjoining town of Huayobamba.

◊ the south by 2000.00 ml. abutting the Chicama River.

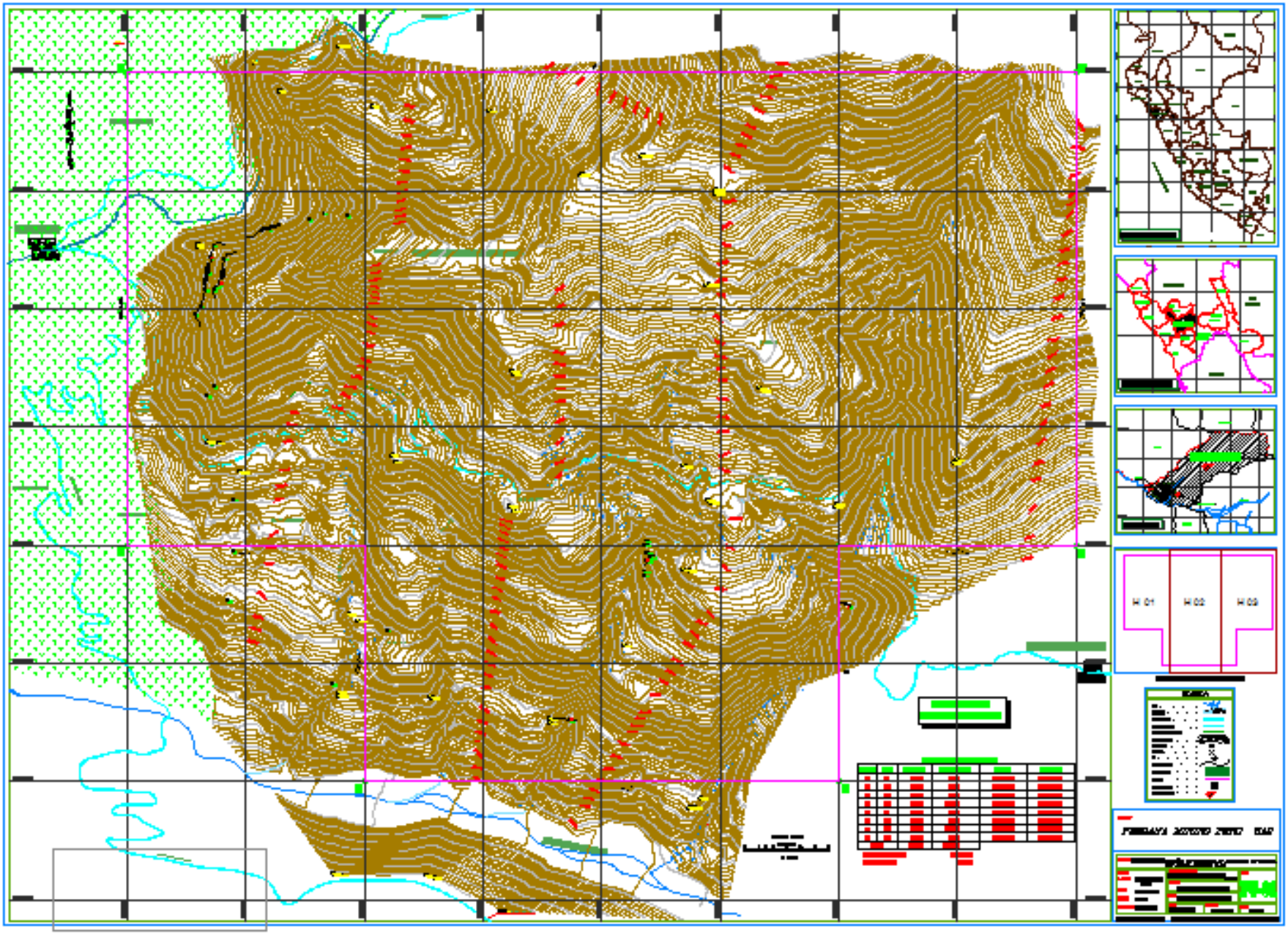
◊ For the West to 4000.00 ml. With Lajon Town Center.

2.3. Climate and topographical relief

The climate is typical of deep mountain valley hot from April to December and January to March rainy relief of the region is hilly and has deep ravines, so drawn on their car to show the Quina-Quina creek, and the creek Shangala Lajon etc. In the upper parts typically found in flats or peneplain plateaus small way it shows in the topographic map attached as well: the Pampa del Viejo, Corralitos and the Pampa Wind Loma, etc. Heights vary from 1220 up to 2215 m, and in this case all streams converge towards the side of the great river coast forming the Alto Chicama basin that is fairly long and wide.

2.4. Topography of request

Currently there is a survey of the entire area of the request, with the development of a topographic map of scale 1/5000 with contours every 5 meters as shown in Figure below.


H 01
H 02
H 03

III. GENERAL COAL GEOLOGY

3.1 General Geology

The area occupied by the study area and surrounding areas in general have a regional stratigraphy, composed in large percentage of sequences of Mesozoic sedimentary rocks ranging from Jurassic very conspicuous to the sector W, then the Lower Cretaceous superior and in the NW-NE himself Tertiary volcanic sequences and bottom, which cover much of the region, the alluvial deposits for the recent quaternary. There are likewise some Tertiary intrusive bodies that outcrop in the SW area of the region and represent the Andean batholith, with stocks and plutons of dioritic nature, located towards the SW and W industry Quad Otuzco and that intrude the mesozoic rocks already mention.

In Peru there paleocuencas coal distributed in several different ages from oldest to youngest briefly described below in order to locate the general geological context.

• Paleozoic Basin

The Mississippian coals found in Ambo training molazas distributed in the Cordillera Oriental in central and southern coals have high ash content and its potential is unknown.
These coals are representative outcrops in the Paracas Peninsula (Lagunillas) in Huanuco and Mother of God, are of Humic those that would have resulted in limnic environments.

• Mesozoic Basin

Mesozoic coals are distributed in Peru, from south to north and are of Late Jurassic to Late Cretaceous, are indigenously humic coals and some allochthonous almost all basins, which are described below:

Basin-Oyon In the most representative are the Lower Cretaceous clastic formations to superior and widely folded as a result of Tertiary magmatism.

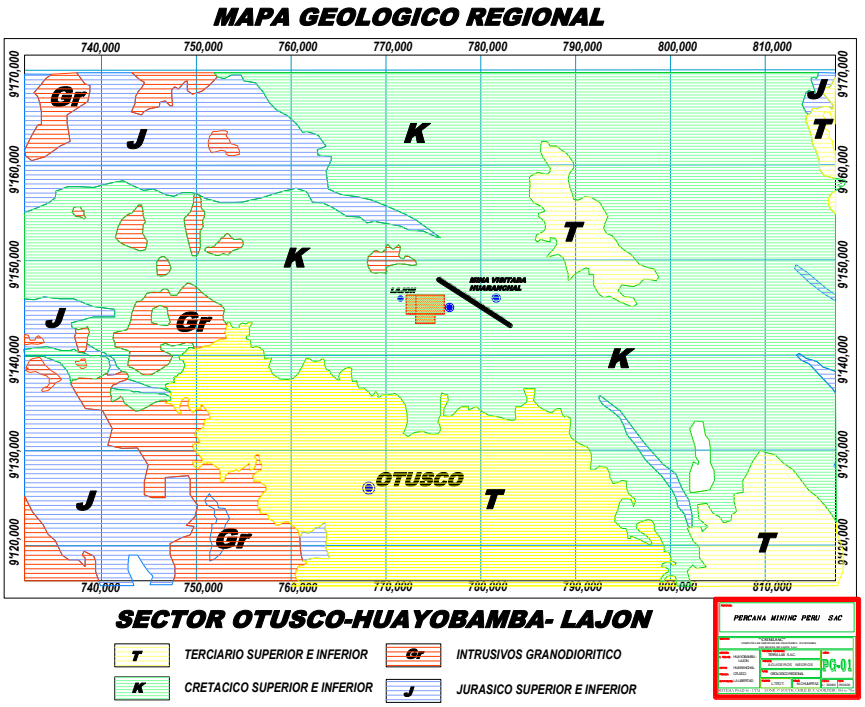
The Holy Basin is located in the upper part of the formation Oyón and has approximately 300 meters thick, the upper row of the Holy Basin is located in the lower part of the formation of about 500 meters thick, were recognized here 12 Humic carbonaceous type levels, bituminous, and rarely semi-antracíticos antracíticos.

•Alto Chicama Basin Cenozoic Basin

Alto Chicama basin is divided into two sectors, sector-Ambara Bathrooms Chimu north and south Callacuyán Coina both stationed in training early Chimu balanginiana old (Cretaceous) and consists of three members: the lower member of 350 meters and the upper 700 meters thick packages consisting of quartzite and sandstone beds of shale stratified slate with six coal layers interbedded with carbonaceous shale.
The average member of 650 meters consists of a sequence of siltstones intercalated shales sandstones and shales with plant remains in poor condition. The presence of vegetable indicate that it is a continental training was generated in which sedimentation and lower regions near the sea under emergency subsidence and why the coal seams of varying thickness and quality in relatively short distances.

• Cenozoic Basin

The paleogeographic distribution of this geological age is very limited and restricted to Yanacancha in Cajamarca, El Tambo, in Piura and the North East Loreto and Amazonas, age is Lower Tertiary medium, the coals are humic type, and autochthonous origin originated in a fluvio-lacustrine environment, the coals are the range of sub-bituminous shale. (ref. Carrascal economic geology, and Silva Matos INGEMMET).



3.2 Regional Tectonics

The area is comprised of materials and surface materials quaternary Mesozoic coverage below this which in turn are related to the existing topography. It marked the presence of large regional faults, if the Callancas reverse fault, which controls the direction of the river and more local normal faults, also is notorious development of anticlines and synclines that are distributed throughout the industry and whose axes generally oriented in the direction Andean dominate the development of their areas of weakness with hinges and transverse fractures, bit mapped due to the large coverage quaternary.
The area visited contains carbonaceous levels that need to be evaluated in detail, especially in the field of Lajon, exhibiting interesting horizons below quartzites or highly fractured and altered sandstones and structures present at the south area, making the complex location of carbon levels, which are shown by open trenches on purpose in order to keep track of carbonaceous levels, this program was of great importance trenches in concept and development, being apparently the next step to continue the drilling to the extent that target-exploitation exploration work in the North of the property. Towards the sector Lajon these trenches have clarified the presence of anthracite coal seams and semi-bituminous, with guidance from NE and dipping SE direction, just as it has failed to distinguish other Mantos WE orientations and dip to the N, to Shangala area and Quina Quina.

• Structural Aspects

◊ While the regional aspect is that the sedimentary sequence of the Cretaceous western basin was tectonically affected forming a series of anticlines and synclines with axes orientations and axis deformation of the compressive forces corresponding to the direction the axes of the formation of the Andes, in the specific area of interest, all this is true but with a twist, that the fact of being in the distal part of the basin or extreme, the folds are tightened forming a sinclinorium disturbing the local geology. What if there is no well-defined floors and roof of the layers could lead to repeat the count of the number of coal seams in this area, so it is advisable to check several times the original polarity of the strata and complement this with a thorough sediment logical work.

◊ The location of the intrusive body, lifted sedimentary Tertiary sequence and sobrescurrimiento faulting occurred along bedding planes in the southwestern flank of the anticline sinclinorium component, has been failing and inversely failure resulting Callancas on which course would be located later the river Alto Chicama (also denominations in Huancay en per sector). The direction of the fault is N 85 ° W ° and dip 35 ° SE. In the mirror of failure was found that the block went away to the west.

- ◊ Occurred subsequently to reverse faulting course secondary streams that controls that limit the block, which moved 20 meters south. these streams are: NW-side Shangala and Quina-Quina in his side. It is important to consider this faulting for mining purposes. The main or regional failure corresponds to a reverse fault, causing the appearance of transverse and longitudinal faulting. Towards
- ◊ Left Bank Alto Chicama, also called Huancay work, a bituminous coal seam diaclasado of 3.50 m. thick, forming part of the fault gap in a rock box carbonaceous shales of 6.80 meters thick, containing sulfate salts. About the mirror reverse fault, in a dark gray sandstone 60 cm thick iron nodules were found with traces of gold? (Au) and copper (Cu).

• Regional Stratigraphy.

◊ The local stratigraphy is but a reflection of what happened in the regional aspect, however as observed in the field, the study area is highly disturbed and affected by the local tectonism, which has triggered very tight structures with almost vertical flanks dip quite fractured and lithological units are forming systems with recognized guidelines 3-4, giving this a sense of the magnitude of the efforts that have acted on the area.
◊ The study area is located within a Mesozoic basin paleo, with units ranging from the Late Jurassic to Late Cretaceous and whose shape is elongated, with the characteristic Andean orientation of existing structures with NW-SE direction. It is recognized in the study area as a zone of contribution or positive area for the NE sector of the Marañón Geoanticlinal positive area and the other is located towards the west, ie towards the SW and is the former Cordillera de la Costa.

IV. LOCAL GEOLOGY PROJECT "BLACK HOLES"

4.1. Summary

The local geology consists of sedimentary units, corresponding to the Chimu Chicama formations, Santa, Carhuaz and Farrat, likewise the Alto Chicama River basin is characterized by outcrops of Mesozoic rocks that have been disrupted by regional intrusions, they have folding and fracturing caused major, also seen Jurassic sedimentary rocks (Chicama formation) at lower levels near the river. Chicama Formation is characterized by the presence of dark gray shales with interbedded sandstones slate gray tuffaceous quartz and some levels. Chimu Formation is observed in most of the study area, and is the most conspicuous towards the south west, while south Chicama formation exposed near the river. They are all that and a strip or horizon is the area of greatest interest because of the presence of coal seams levels or, by size, in some cases with the presence of sub-anthracite and anthracite, occurring in other sectors as "lenses" bituminous coal. Following are sedimentary sequence sandstones, siltstones, shales, and black shales (Cobbing et al., 1996: 73-74). These two formations are exposed mostly in streams and Quina Quina Shangala, covering most Chimú training area, second Santa and Carhuaz formations, are not fully differentiated in the study area, having found areas with shales, siltstones, limestones, sandstones, quartzites and in some sectors have small "lenses" of bituminous coal, of much smaller magnitude. In summary these formations, especially the formation Chimú, are of great interest, as possible sources of economic development prospect "Black Holes".

On the other hand there granodioritic intrusive rocks in nature, that outcrop in the form of stocks, is notorious for the presence of a large intrusive towards the left bank Lajon front, this area is heavily disturbed altered, and has the presence of metallic minerals, this is a feature of the coal deposits of the basin Chicama, which is always related to the presence of this type of mineralization. (usually Au.).

They've been called Shangala sectors corresponding to a creek that dissects perpendicular to the outcrops surrounding the river Alto Chicama, like the broken-Quina Quina, both sectors have significant levels of bituminous coal, quite broken, which could be of great expectations economic exploration to exploitation. The oldest rocks in the prospect of coal formations are Upper Jurassic Chicama and overlie rocks of the Chimu formation, this being the one with the anthracite coal seams (trenches T-1 and T-Q1) and sub-anthracites and other sedimentary horizons with bituminous coal (T-SH 5). Briefly these formations and above Chimú training is of great interest as a source of possible development of the mining project because they are the carriers of coal in the prospectus as seen in the accompanying geological map PG1, is this geological unit which covers 80% of the study area.

4.2. Local Stratigraphy

In the study area stratigraphic units have been recognized widely known coal deposits in Peru and that the lithology described in columns appended the following formations are recognized.

• Chicama Formation

This formation crops out in the southwestern part of the study area as a strip parallel to Chicama River.
This formation is characterized by the presence of dark gray shales with interbedded sandstones pizarrozas gray tuffaceous quartz and some levels they do to differentiate this training.

• Chimu Formation

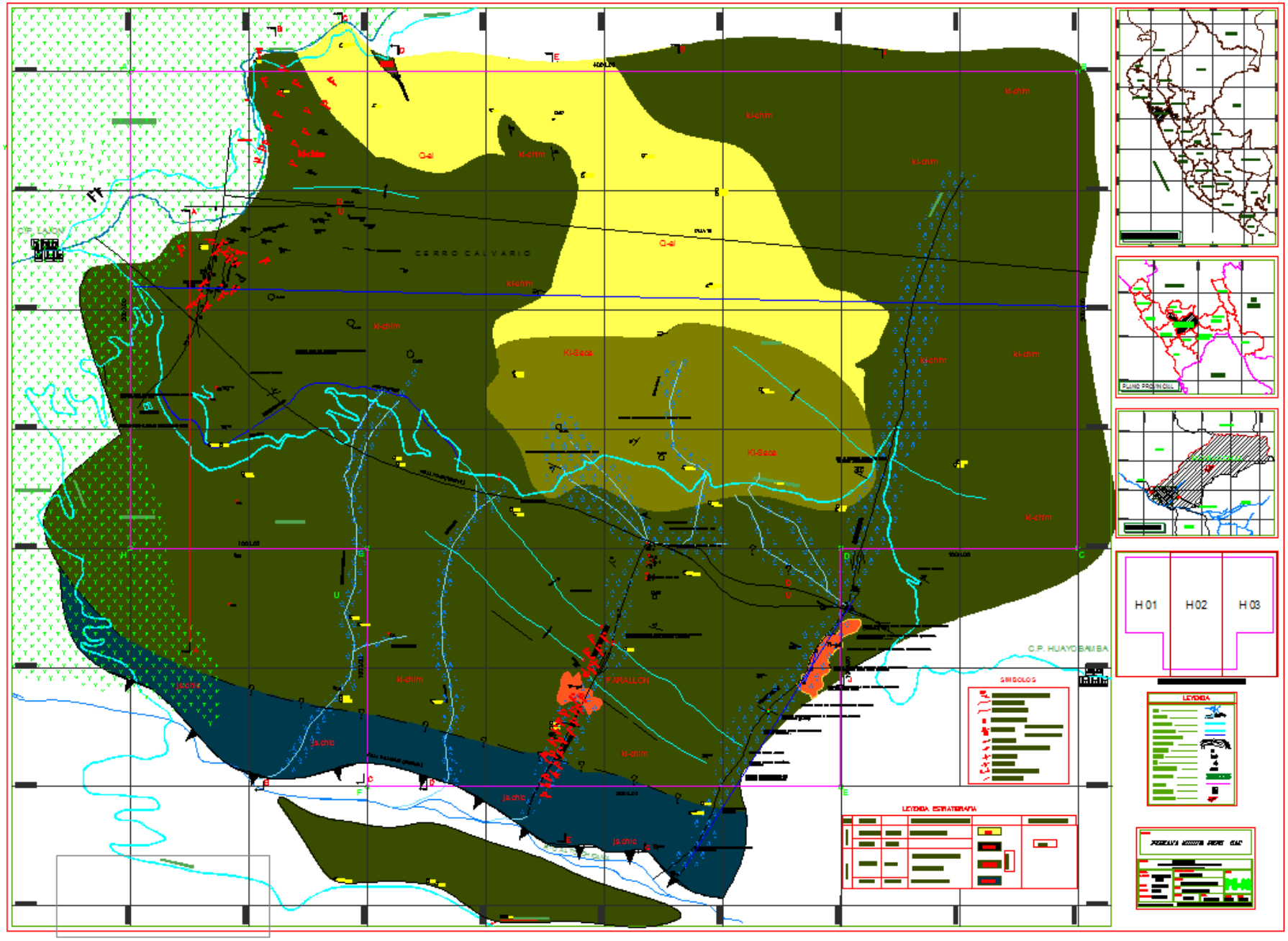
This training in prospect "Black Holes" are two well-marked lithological horizons are called:

The first horizon called the Lower Chimú collation consists of a gray shale and quartzite with interbedded shales and highly fractured coal seams as they ascend to the roof of another formation strongly fractured quartzite horizon in thin layers of 10-20 cm. power with interbedded coal seams.

The second horizon interbedded with shales presents dark gray limestone horizons smaller than 20 cm. thick with limestone nodules and also carbonaceous slates levels calcareous nodules 50 cm. thick, these horizons are also related to better coal seams power of 10 cm. to 1.70m, the other area recognized in the field and taken to the stratigraphic column is training Superior Chimú fully differentiated from the former by having layers of quartzite gray fine grained light brown other highly compacted, low-fracturing 6 to 10 m thick, the layers are located at the base near the Lower Chimú training with some coal and shale interbedded carbonaceous

• Training St. Carhuaz

This training has also been recognized in the area many times by the presence of interbedded layers of limestone with dark gray quartzite interbedded shales and thin at the base, and not unlike the final contact between the two formations.


CERRO CALVARIO
C.P. LAYON
C.P. HUAYOBAMBA
PARALLON
Ki-chim
Ki-Saca
Q-al
Ja-chic
SIMBOLOS
LEYENDA
LEYENDA ESTRATIGRAFIA
H 01
H 02
H 03

4.3. Structures

The local stratigraphy mentioned that this is closely related to the nature of the exposed rocks, sedimentary units outcropping in the study area are strongly folded and faulted due to tectonism also the presence of some outcrops of intrusive bodies have influenced by the deformation of the "packages" sedimentary producing microfold that have been mapped on the western flank of the anticline.
Below is a brief description of the most important structures have been mapped and recognized in the field:

- Anticline Lajon

This is the largest single fold recognition and structure that is located in the NE corner of the study area and the measured length of approximately 3 km., The most notorious face both flanges and shaft are exposed to the people of Lajon and has a strike of approximately N85 ° W, inflections make east-west travel between certain Huayobamba Lajon and undulations. See structural section B-B 'longitudinal.
This is an anticlinal fold symmetric but apparently follows that interpretation is a recumbent fold is thrown to the east, the top is covered with the presence of quartzite upper Chimu formation.
The core of the anticline is also constituted by ortocuarcitas Chimu Formation. This fold are cut longitudinally by two faults, normal, and for 3 subvertical faults also cross subvertical normal and which have led to a large number of blocks that divide the prospectus "Black Holes", and consequently has divided the "packages" of mineralized structures.
Another aspect of the anticline is therefore important to be missed recumbent and very close to the compression axis has been strong and has caused a fracturing of thin layers or power that are near the coal seams, exposing the guise of "bricks" overlapping, and provide guidance of one of the coal seams (the Manto No. 2).
The western flank of the anticline Lajon a result of tight folding originated in the great sinclinorium to distorted this flank creating big waves or microfold them that have distorted the coal seams, which when eroded give the appearance of a sequence of many cloaks being a our knowledge only three or four? (See cross section Quina-Quina creek bottom).

- Faults

The sedimentary outcrops in "Black Holes" are affected by failures of normal and reverse type.
The reverse faulting is important because it is the direction of the folds, and fault planes that are inclined to the SW generally coinciding with the axes of the folds suggesting that the compressive stresses were south-west to south-east.
Normal faults are bound type variable north-east to south-west and affect the folds causing displacement, it appears that normal faults are younger than the thrust faults.
The major faults in the study area are divided into two groups:

- Longitudinal Faults

- **Callancas Faults.**

This fault has features sinuous and is the Chicama River which saves parallelism and course average is N 85 º W and dip 35 ° S, the planes of tilt and slip lean towards the south, are structures syntectonic and produced overlapping training Farrat Chimú the formation for example.

- **Huayo Faults**

It is a regional fault that has been mapped in the area 1.5km. also determined in the national chart of geology. Failure is heading N 74 º W is a normal and high angle of interpretation is recognized on a stretch of 1 km. in the middle of the western flank of the anticline Lajon.

- **Faults 12.**

It is a fault parallel to the fault Huayo that runs from NE to SW is normal and is dipping 75 ° SW this fails to cut the eastern flank of the anticline Lajon disappearing all the continuity of the outcrops of coal (Manto one and Manto two) to the side this, apparently deepening and / or sinking with respect to the currently viewed outcrops.

• Cross Faults

• Lajon Fault

It is a fault that cuts across the axis of the anticline Lajon and has traveled N25 ° E, dip 60 ° E is normal fault to cause the collapse of the roof of it has allowed to reveal the main outcrops of coal (Manto one, two and three?) and similarly seems to have a big break that has disappeared and / or depth continuity of the coal seams towards the SW, (would be under the village Lajon).

• Shangala Fault.

Has N19 º E direction, dipping vertically, follows the direction of the creek of the same name and has much the appearance of intrusive, to be determined in the field running horizontally but presumably are vertical movements.

• Quina fault

Has N19 º E direction, dipping vertically and also follows the direction of the creek of the same name, this failure also has to do with the appearance of intrusive.

4.4 Understanding Coal outcrops

Different major study outcrops were discovered in the trenches, test pits as described below on the coal seams in detail and will serve to verify carbon structures recognized measure their wealth and power to make a calculation of potential and proven reserves of the carbon, which are listed below in order of importance in the following table:criben a continuación sobre los mantos de carbón en detalle y que servirán para verificar las estructuras de carbón reconocidas, medir su riqueza y poder hacer un cálculo de reservas potenciales y probadas del depósito de carbón, que a continuación se detallan en orden de importancia en el siguiente cuadro:

	Characteristics			
Name	Longitude	Power	% C.F.	Quality
1.-Manto Uno	143	0.6	77.96	Charcoal
2.-Manto Dos	330	1.6	85.48	Charcoal
3.-Manto Quina-Superior	250	0.5	68.41	Charcoal
4.-Manto Shangala Inferior	50	7.57	44.07	bituminous
5.-Manto Quina-Inferior	30	1	45.95	bituminous
6.-Manto Shangala Superior	30	0.8	15.55	lignite

• Mantos outcrops in the Front Zone.

This area has revealed through the work of two coal seams trenches defined Manto called one, two and correlation Manto Manto Shangala three or less? The spacing and / or vertical distance between the Manto is one two 65m.

Aerial view of Coal Afloranientos

• Manto one (Trenches: T-7, T-13, T N and T-9)
This coal seam is located in the town of exploration versus Lajon and has the following features:

or Course: N 75 º W
or Dip: 10 ° SW
o Power: 0.60m
o Length: (T7 to T-9): 143m
or Cota: 1920 m.s.n.m.

• Manto two (MAIN, trenches T1, T2, T3, T4 and T5)
This robe is located in the town of exploration versus Lajon and has the following features:
or Bearing: N55 º E
or Dip: 15 ° SW
o Power: 1.60m-0.15m
or T1 to T5 Length: 330m
or Cota: 1875m

This Manto of sampling for chemical analysis of the trench was number one and gave the following results:
or 3.56 percentage moisture
or 4.89 percentage ash
o Percentage of volatile matter 07.06
o Percentage of fixed carbon 85.48
or 0.28 percent sulfur
iron or 0.14 Percent
hydrogen or 0.69 Percent
or Calorific Kcal. / Kg. 7735.0

The photographs show the trenches T1 and T2 show the anthracite coal seam with their different powers (1.60, 0.30m)

• Mantos outcrop in the North-East Zone

• Upwelling Manto three (trench T-8)

You have been identified as three-Manto structure this to fine-textured soft shales two meters thick with traces of coal but stratigraphically infrayacen cloaks the sequence.

The panoramic photograph shows the anticline failed which caused the packet flexing sedimentation, possibly strangling the coal seams and strata leaving the west side upright.

• Mantos outcrop in Northwest Area

• Outcrop Lajon (T-14, T-15)

Two major trenches worked in northwestern flank of the frontal zone shown here slates smooth texture with hints of charcoal fragments contaminated by an apparent destruction of the main structures (Manto one two or extension of three)

• Outcrops, Shangala Superior (TSH-1, TSH-2, TSH-3)

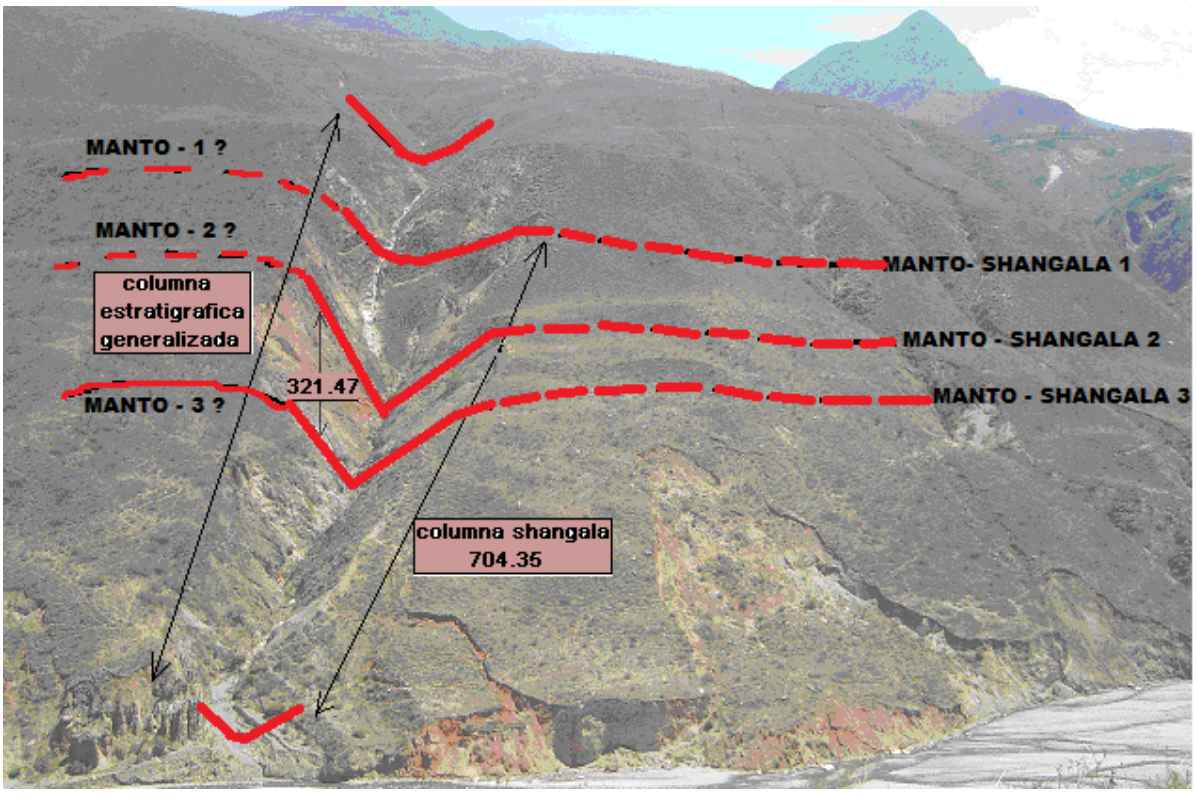
The Shangala outcrop is located in the valley of the same name at the bottom of this, at elevation 1755 m.
The general characteristics of the coal seam are:

General Characteristics of Coal Seam	
Power Structure	0.80 to 2.00 meters
Average Rumbo	N 65º E
Roof Box	Fractured Quartzites "Bricks"
Box Floor	Slates and Shales

• Lower Shangala Outcrop (TSH and TSH-8-9)

This robe was found and recognized by walking path from the work planning.
In this part of the mining project ranks as one of the important and deserve special mention coal outcrops because they produce powerful coal outcrops.
The stratigraphic column of lower Shangala measures from description above 704.35 meters, here are marked February 2 recognized horizons defined as:-The stratigraphic horizon known productive Lower CHIMU 321.47 meters that has 5 crushed coal seams (cisco) with ash content. Another upper stratigraphic horizon known upper productive CHIMU 102.36 meters in this part is the probable location of the coal seams Lajon (Manto and Manto one two).

This package of "321.47m" slate with interbedded coal Mantos with total trade is 7.57 m. anthracite coal-fired power and that the first sample taken from the Manto of 1.50 for the following results.



The photograph taken from the trenches and TSH TSH-8-9 showing the main part of one of the best outcrops that has the coal mining project "black holes."

• Outcrop Quina Quina-Superior (TQ-1 and TQ-2)

At the top of Quina-Quina and at the bottom of the gorge there is an outcrop of a blanket no evidence of exploration and exploitation is unique and has the following features:
or Course: N5 ° E
or Dip: 25 SE
o Power: 1.8m
or commercial coal power: 0.50m.

The presence of an anthracite coal trade is crystallized from 2.50 mt power boxes located in shale and / or slates and quartzites of the floor and heavily fractured thin layers on top of the outcrop.

4.5. Determining the Power of Mantos.

The power of the various coal seams recognized in prospect "Black Holes", is variable in most outcrops exploration trenches powers coals show altered the order of centimeters to 7.00 meters.
Furthermore the undersigned on the experience of exploring the area in the 90 verified Manto power # 2 of 2.00 meters hard anthracite coal.

V. ECONOMIC GEOLOGY

5.1. Overview

The economically important area is within the boundaries of the mining area respondent that develops in the NE flank of C ° Calvary and projected coal horizons extend to the NNW. These coal horizons are developed mostly in the Chimu Formation, intercalated in clastic sequence of quartzites, sandstones and shales, forming the lower member of this formation occur as irregular lenses interruption, disturbed in part due to the orogeny occurred in the area and the plasticity of sedimentary packages that host mineralization. It is also important factor for the presence of basic intrusive bodies, which provide the degree of contact metamorphism and are economically relevant by the addition of metal percentages that print to the sequence. However with the knowledge of the geology of "black holes" and measurable parameters of the outcrops has prepared a table reservation, as indicative of the potential, the prospect coal, to that end, we have worked considering within the entire section two horizons, which are the most prominent, both in power (more than 5 m. in Shangala) and content (anthracite) are manifested by more than 300 linear meters, it was also found wealth and as laboratory data, we :

5.2. Criteria for the calculation of reserves

Tabla N°1	Chemical Analysis-Samples of Coal							
Samples	H2o %	Ash %	Volatil Material	Fixed Carbón %	S %	Fe%	H%	Calorific Value Kcal/ Kg
Manto Two T-1	3.56	4.89	6.07	85.48	0.28	0.14	0.69	7735
Manto One T-13	4.68	6.84	10.52	77.96	0.65	0.21	0.88	8236
Manto High Quina Quina	8.98	10.25	12.36	68.41	0.72	0.36	1.32	6898
Manto Low Quina Quina Tq-3	5.28	23.41	25.36	45.95	1.78	1.98	1.46	5845
Manto Low Shangala Tsh-8	5.12	32.58	18.23	44.07	2.49	2.84	2.34	7789
Manto High Shangala Tsh-5	7.89	56.24	20.32	15.55	5.89	12.46	6.32	2456

5.3.-Determination of potential reserves

For the calculation of reserves of coal prospect "black holes" used parameters and technical criteria for geological deposits known mineralized and mineralized manto structures are:
Reservations geologically potential.
According to the description of the mapping in the field have recognized three coal beds, verified with pits and located within 1.000 acres in parallel to each other in the front and side (NE) of the carbon. Thus we have:

- MANTO ONE.

  - (LA) = Width of Manto upwelling toward the 2,000 m.
  - (LB) = length coat, dip towards the 5,000 m.
  - (P) = Power, 2.0 m thick Manto.
  - (bp) = specific gravity of coal. 1.6

  It has:

  - Tn. = L.A x L.B. x P x P.E
  - Tn. = 2,000 m. x 5.000 m. x 2.0 m. x 1.6
  - **Tn. = 32'000, 000.00 tons.**

- MANTO TWO (Main).

  - (LA) = Width of Manto upwelling toward the 2,000 m.
  - (LB) = length coat, dip towards the 5,000 m.
  - (P) = Power, 2.5 m thick Manto.
  - (bp) = Specific gravity of coal. 1.6

  It has:

  - Tn. = L.A x L.B. x P x bp
  - Tn. = 2,000 m. x 5.000 m. x 2.5 m. x 1.6
  - **Tn. = 40'000, 000.00 tons.**

- MANTO THREE (Lower Secondary).

  - (LA) = Width of Manto upwelling toward the 2,000 m.
  - (LB) = length coat, dip towards the 5,000 m.
  - (P) = Power, 2.0 m thick Manto.
  - (bp) = Specific gravity of coal. 1.6

  It has:

  - Tn. = L.A x L.B. x P x bp
  - Tn. = 2,000 m. x 5.000 m. x 2.0 m. x 1.6
  - **Tn. = 32'000, 000.00 tons.**

The summary of this leaflet "Black Holes" has the following potential mineral geologically:

Chart Nº 4: Summary of Potential Reserves

Zone	Name	Potential Tonnage	Total Tonnage
Frontal	Manto One	32'000,000.00	
Frontal	Manto Two	40'000,000.00	
Frontal	Manto Three	32'000,000.00	
Total Potential Reserves		**104'000,000.00**	***104'000,000.00***

With the criteria explained above worked the assay to determine a percentage of proven quality indices as described and tested in exploration work already worked

5.4. - Determination of Proved Reserves

• BROKEN MANTO SHANGALA and BROKEN QUINAA MACHINE

In demonstrating the kindness of surface outcrops and assuming the continuity we have:

- o Outcrop length. = 300 m.
- o Inferred Manto depth. = 50.0 m.
- o Manto or power (measurable). = 5.0 m.
- o Specific gravity = 1.6
- o 70% recovery factor
- o Punishment by dispersing 25%
- o Mineralization or depth no greater than 50m. We can build a box potential as follows.

Chart Nº 5: Proven Mineral

Zone	Name	Geological Assumption 300m. x 50m.x5.0m.x 1.6	% Dispersión 25%	% Recovery 75 %	Tm
Qda. Shangala	Horizon 1	120,000.0 T.M.	30,000.0	90,000.0	
Qda.Quina Quina	Horizon 2	120,000.0 T.M.	30.000.0	90,000.0	
Total		240,000.0 T.M.	60,000.0	180,000.0	180,000.0 T.M

Also in the outcrops of the front of the carbon is the presence of three coats of measurable and detailed knowledge of the geology, interpretation of structural sections of which has been possible to determine the following parameters for the calculation of reserves geologically tested.
The parameters are taken in the "zone one" sectional investigation function and which has the following characteristics:

- ◊ Length about the direction of the Manto (LR) in this parameter was considered the direction in which carbon structures displayed in sections and sampling considerations ..
- ◊ Manto width measured in the direction of the outcrop (A) this parameter has been considered in the main outcrop and structural sections and is limited between the fault and the fault huayo 12.
- ◊ Power and / or Manto thickness (h) In the main trench T-1 and T-Q1 trench located at both ends powers have been measured and are of the order of 2.60 m and 0.60m respectively and also plotted on structural sections.
- ◊ The specific gravity (eg) that is 1.6 calculated for the coals.

- FRONTAL (ONE COAT)

We have taken the following parameters:

◊ Length about the direction of Manto LA = 3000m
◊ Manto width measured in the direction of dip A = 800m
◊ Power and / or coal thickness h = 0.60m
◊ Specific gravity coal pe = 1.60

LA x A x H x p. e. = 2'304,000. T.N.

♣ FRONTAL (TWO MANTO, MAIN)

We have taken the following parameters:

◊ Largo, heading Manto. LA = 3000m
◊ W, dip direction. A = 800m
◊ Power and / or coal thickness h = 1.60 m.
◊ Specific gravity coal. b.p. = 1.60

$$LA \times A \times h \times PE = TN$$
$$3000 \times 800 \times 1.60 \times 1.60 = 6'144,000 TN$$

Chart Nº 6: Proven Mineral

Zone	Name	Geológical Assumption	% Dispersión	% Recovery	Tm
Frontal	Manto One	2´304,000.00	25%	75%	
Frontal	Manto Dos	6´144,000.00			
Total		**8´448,000.00**	**2'112,000.0**	**6'336,000.00**	**6'336,000.0**

Chart Nº 7: Proven Mineral Summary

Zone	Name	Potential Tonnage	% Dispersión	% Recovery	T. M.
Qda. Shangala	Horizon -1	120,000.0	25%	75 %	
Qda. Quina	Horizon -2	120,000.0	25%	75%	
Frontal	Manto One	2'304,000.0	25%	75%	
Frontal	Manto Two	6'144,000.0	25%	75%	
Total Proven Mineral		**8'688,000.0**	**2'172,000.0**	**6'516,000.0**	***6'516,000.0***

VI. CONCLUSIONS AND RECOMMENDATIONS.

6.1 Conclusions

◊ Chimu Formation of Upper Jurassic and Lower Cretaceous concentrated regionally 2 series production of coal, which have numerous coats of commercial value.

◊ The Alto Chicama basin area where the study area is located within the strip called a meta antracítica antracítica.

◊ The surface geological mapping and reconnaissance of 1200 hectares in research are covered by 80% by Chimu formation lithology (receiving 2 series production of coal) and 20% consists of lithology formations Chicama, Santa, Carhuaz quaternary intrusive as shown in the accompanying geological map, is clearly defined in the prospectus "Black Holes" producers shows two horizons (upper and lower Chimú) each with commercial coal seams.

◊ The work of trenches and / or pits allowed knowledge and exploration of key outcrops were discovered for geological work knowledge and these are:

One-Manto outcrop 143 meters above surface.
Manto-two outcrop 330 meters above surface.
Manto-this-two (three) of 100 meters from surface outcrop.
Outcrop Shangala-low, 300 m. surface.
Outcrop Shangala-high (important)
Outcrop Quina-height 100 meters above ground.

◊ The trenches and pits work has allowed to reveal the main coal seams to conduct geological research and to identify areas of importance within the 1000 hectares studied.

◊ The faulting in this leaflet carefully coal is vital because the presence of three longitudinal and three transverse faults all have recognized the coal visectado blocks sunken and raised in complicating the investigation and their effect on the trajectory of the robes the same that have been projected structural sections to recognize their actual location in the basement.

◊ longitudinal faults have allowed to better define zones and other structural tranquility within the prospect completely disturbed "Black Holes"

◊ According to the structural interpretation ◊ Mantos find one and two are distributed approximately 1000 hectares and the projection of these cloaks match Shangala outcrops and Quina-Quina Alta Alta which leads us to think that there are two large sheets of north-east to south west with travel nearly 3km reason enough to continue exploring and recognizing such structures within the prospect coal "black holes."

◊ Outcrops of Shangala ◊ low and low Quina Quina-producing horizon are the lower Chimu, which are apparently only 2 or 3 coats of tectonism reasons that have been deformed causing micro successive folds bisected by erosion that give the appearance of multiple sheets successive. .

◊ It can be concluded that the project "Black Holes" are defined four coal seams and fractured by faulting and deformed by impact of intrusive, and possibly two or three more to recognize Mantos.

◊ The trend of the Chimu formation is best exposed to the north and northeast along the same structural characteristics and appearance of minor faulting is greater structural tranquility allowing to consider new projects with carbon presence. For calculations of geological mineral has been considered potential knowledge of geology and outcrops and are calculated in 104'000, 000.0 tons of coal mineral. And within this calculation tonnage structural interpretation and sizing of the outcrops give a total of 6'516, 000.00 metric tons of proven coal.

6.2.-Recommendations

◊ If the Company so determines is recommended to continue with the next stage of geological research in order to verify the accuracy of the interpretation and the project will actually prioritizing Zoning plan submitted

◊ It is recommended, if the company so requires coal acquire more properties in these should be at North and northeast of the project 'taking into account that to continue where groundwater.

◊ It recommends specifying the execution of mining exploration in strategic locations to verify the path of the coal beds and / or diamond drilling with continuous recovery of witnesses to confirm the information provided in this report you agree to table proposed exploration drilling .

◊ Lima, May 31, 2012.

VII. ANNEXES

7.1. BLOCK DIAGRAM