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IVANHOE MINES MONGOLIA INC

OYU TOLGOI EXPLORATION PROJECT

**KHANBOGD SOUM OF UMNUGOBI AIMAG**

**ENVIRONMENTAL PROTECTION  
PLAN FOR 2005**

**JANUARY, 2005**

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**January, 2005**

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## **ENVIRONMENTAL PROTECTION PLAN FOR OYU TOLGOI DEPOSIT AREA**

### **1. MAIN CONCEPT AND OBJECTIVE**

#### **1.1. Objective**

The main objective of the IMMI Environmental Protection Plan (EPP) is to conduct the geological and exploration activities undertaken in the country within the scope of international and Mongolian environmental laws as well as in accordance with the company's principal policy on environmental management.

Every year, the company plans and implements environmental protection measures in order to establish appropriate environmental management in exploration areas.

In 2005, the company will develop and get approval for supplementary EPPs whenever additional exploration activities are planned under the EPP; adhere to the requirements of the State Environmental Monitoring Inspector as well as environmental standards, rules and regulations approved by relevant authorities; and improve internal control.

#### **1.2. Basis**

This EPP is developed as the company will continue to operate the Oyu Tolgoi project located in Khanbogd soum of Umnugobi aimag in 2005.

### **2. MAIN PRINCIPLES FOR ENVIRONMENTAL PROTECTION**

#### **2.1. Coordination**

Environmental officers of the project are responsible for ensuring IMMI comply with current provisions of environmental and mineral laws of Mongolia that relate to environmental protection, and fulfill its obligations under the laws and commitments undertaken.

IMMI will introduce, obtain approvals, decisions and permits on any environmental issues from authorized state officials and maintain harmonized relation with the community and other land owners under the legal framework.

Also, the company will identify and monitor areas that require special attention before commencing any minerals exploration activities. These may include:

- Easily impacted areas (e.g. springs)
- Water resources currently in use and its protection
- Residential locations of herders and pastures (winter, spring quarters)
- Archaeological, historical and cultural sites
- Mutual respect for interests of neighboring land owners and users, etc.

#### **2.2. Planning**

The company shall focus on environmental and social issues throughout its exploration works and develop supplementary plans whenever necessary.

The company shall plan in advance for possible environmental impacts and social issues as follows:

- Formation of new road networks
- Camp locations and construction of civil facilities
- Water resources
- Refueling, combustibles and lubricants areas
- Waste disposal facilities
- Relocation of local families out of the license area, etc.

Land disturbance must be minimized during any exploration activities and the plan should reflect measures to be taken to reduce rehabilitation expenses.

### **3. ENVIRONMENTAL PROTECTION PLAN REPORT**

Under the Minerals Law of Mongolia, a license holder shall prepare and submit in every December Report of the Environmental Protection Plan to the Environmental Inspection Office and the governor of the relevant aimag (city), or soum (district). The report shall include the following:

- Measures taken in regard of environmental protection, amendments to the EPP and the performance of such measures
- Disturbed land as result of the exploration works conducted in the license area during the last 12 months
- Reclamation of the disturbed land
- Estimation of water used for exploration
- Potential environmental impact from adopting new technology and equipment for exploration
- Reduction of dusts
- Rehabilitation efforts such as planting and
- The environmental monitoring program.

### **4. PROJECT SPECIFICATIONS**

#### **4.1. Project name**

Detailed Geological Study for Oyu Tolgoi deposit area, Khanbogd soum, Umnugobi aimag.

#### **4.2. Project objective**

Study in detail the geological structure of Oyu Tolgoi deposit and determine the mineralization distribution system and prognostic reserve.

In order to gather additional information necessary to develop the technology for mining Oyu Tolgoi deposit, a 6.7 meter diameter, 1300 meter deep vertical development in Hugo North it has been planned to commence in July 2005. As stated in 1.1 of this plan, an additional EPP will be prepared and applied for the vertical development.

#### **4.3. Final output of the Project**

- Geological Report of Oyu Tolgoi Deposit
- Mineral Reserve Report of the Deposit

#### **4.4. Project location**

Oyu Tolgoi Project of IMMI is located at Oyu Tolgoi in the territory of Javkhlant Bagh of Khanbogd soum, Umnugobi aimag. It is located:

- 640 km south of Ulaanbaatar
- 210 km east of Dalanzadgad
- 45 km west of Khanbogd soum.

#### **4.5. Project owner's address**

The project will be implemented by Ivanhoe Mines Mongolia Inc. Address of the company:

Ikh Zasag Avenue, Building 6, Sukhbaatar District

Tel: 310785, 312289, 310775

Fax: 976-11-312337

#### **4.6. Equipment**

The company uses the following equipment and technology for the geological studies conducted in the company's license areas:

- Drilling rigs such as RD 1500, UDR 650, UDR 5000, Canadian JKS 300, CS 1000, and Longyear 44 and 55 and the wireline method (core retrieval method without withdrawal of drilling pipes) for diamond drilling.
- Trimble 4700 Dual frequency GPS, Trimble Trimark III radio modem for topographic and geodesy surveys.
- Tools and equipment for magnetic, induced polarization and electromagnetic (TEM) surveys
- PIMA SP to analyse infrared active clay minerals
- Sample workshop etc.
- Geochemical analysis of log core and rock outcrops shall be carried out by Australian SGS Analabs, Environmental Geochemistry International, Intec Ltd, James Cook University Laboratory, Assayers Canada, CDN Resource Laboratories and Activation Laboratories etc.

#### **4.7. Current infrastructure**

The project implementation place is not connected to the integrated power system and is isolated at a distance of 450km west of the railroad network with poor infrastructure development.

#### **4.8. Current projects and other projects to be implemented**

IMMI is conducting geological exploration in the area of Javkhlant, Khokh Khad, Manakht and Ulaan Uul. These license areas are:

- Oyu Tolgoi license 6709A
- Manakht 6708A

- Khokh Khad 6710A
- Ulaan Uul 6711A
- Javkhlant Uul 3677X

#### **4.9. Project terms**

Exploration operation is anticipated to be carried out through the year 2005. A notice shall be delivered to relevant ministries and agencies each time when change and amendment occurs in the geological exploration plan.

### **5. OYU TOLGOI PROJECT OPERATIONS**

#### **5.1. Exploration**

Within the framework of its exploration IMMI shall continue and planning the followings:

- Geological mapping
- Geochemical sampling
- Geodesy measurements
- Sampling
- Geophysical survey
- Magnetic and Gravity survey
- Electro-magnetic survey
- Drilling
  - Percussive and rotary drilling
  - Diamond drilling
  - Clay solution percussive drilling
  - Wide diameter drilling
- Trenching
- Commissioning a new mine camp etc shall be continued.
- Geophysical and geological surveys and a few drilling shall be continued to study geological structural features and mineralization distribution of Javkhlant Uul, Manakht, Khokh Khad, Ulaan Uul license areas.
- Preparatory operation of Shaft Sinking 6.7m diameter and 1300m deep at Hugo North of Oyu Tolgoi shall commence from July, 2005.

#### **5.2. DRILLING**

In the frame of OT tolgoi project, drilling machine on a vehicle are mainly used and impacts on environment are varying, which depend on capacity of drilling machines and drilling diameter.

In this year, about 10 drilling machines will work and in the frame of Oyu Tolgoi project 98 boreholes with approximately 1000 m in depth or 98000 linear meters in total are planned to be drilled.



### **5.3. TRENCHING**

Excavation of trench shall be executed by means of bulldozers and heavy duty machinery. While digging a channel, top soil shall be stockpiled on two sides of a channel, separately from lower layer soil. Total of 10 000 m<sup>3</sup> trenches are estimated to be excavated.

### **5.4. Water exploration**

Since 2002 that IMMI has been conducting hydrological exploration works and surveys in order to determine water resource for gold-copper ore process plant at Oyu Tolgoi.

Underground water exploration was carried out in 2004 in the deposit vicinity 100-200km and the report on the underground water reserve estimation of Galbin Gobi and Gunii Khooloi water butts and was submitted to the Ministry of Environment. Further, in connection with it, report of EIA of project on the utilization of Galbiin Gobi and Gunii Khooloi groundwater resource is basically completed and then will be submitted to Ministry of Nature and Environment in first half of this year.

In order to increase water supply resource for industrial technology of Oyu Tolgoi deleving and prosessing plant IMMI is planning to conduct hydrological surveys in Gurvan Tes and Nomgon soum areas.

### **5.5. Bulk sample shaft**

Bulk sample shaft process with size of 76 m deep and 3.5 m in diameter is fully completed in time in september 2004 in order to take 250 tonnes technological sample from ore body of Oyu Tolgoi deposit to determine its mineral contents capacity to dissolve.

Such bulk sample shaft shall be closed and rehabilitated in accordance with environmental protection plan addendum approved in september 2004.

### **5.6. Coal exploration**

Detailed coal exploration work will continue during 2005 in Nariin Sukhait coal deposit within Gurvan Tes sum, Umnugobi aimag. During the coal exploration work following activities are planned to be implemented:

- Rotary drilling
- Trenching
- Geological mapping
- Sampling etc
- Environmental protection plan have been specially prepared and submitted to the relevant authorities and shall be implemented.

### **5.7. Environmental impact assessment**

Environmental impact assessment work have been done in accordance with General conclusion of EIA approved by Ministry of Nature and Environment in 12<sup>th</sup> February 2003.

The following works are planned to be implemented in 2005 as a part of environmental impact assessment work of Oyu Tolgoi project:

- To submit “the report of the ground water use within Galbyn Gobi and Gunii Khooloi ground water resource areas for Oyu Tolgoi deposit water supply” to Ministry of Nature and Environment and get approve it.
- To complete the report of environmental impact assessment of Oyu Tolgoi mine and submit it to Ministry of Nature and Environment and get approve it. Suggestions, environmental protection plan and environmental monitoring plan included in these reports will be obeyed item by item for further activities.

## 6. RAW MATERIALS AND SUPPLEMENTS

### 6.1. Use of natural resources

About 450 people will permanently work in the project activities. Household water use per person is estimated as 50 l/day per per person or 22.5 m<sup>3</sup> in total and productional water requirement is estimated as 326.5 m<sup>3</sup>/day. Bottled pure water is used only for drinking water needs.

#### Utilization of natural recourse

Table 6.1.1

Type	Quantity	Resource
Household use water	164250 person/day x 0.05 m <sup>3</sup> = 8 212.5 m <sup>3</sup> /year	Borehole, OTRC-218, groundwater
Industrial water	Drilling – 119 172.5 m <sup>3</sup> /year	Local wells, underground water
Total	127 385 m <sup>3</sup> /year	
Drinking water	A bottled pure water (0.35 l) x 6 pcs/day x 450 people x 365 day = 344.9 m <sup>3</sup> /year.	Bottled pure water only
Gravel	2000 m <sup>3</sup> sand and 6000 m <sup>3</sup> gravel shall be used for maintaining local roads and preparing required amount of mortar or other household purposes.	From Umdai river bed
Sand		

### 6.2. Water resources

IMMI must supply exploration project water needs with water using boreholes while not affecting on the area’s water resource prior to mine activities are commenced.

Shallow wells, springs and open water used by local herders are not used for household and productional water needs of exploration camps and will not be used further.

Previously used water boreholes are blocked and resulted in lack of Oyu Tolgoi project exploration water needs. Therefore, some additional boreholes were drilled in order to supply their water needs. (See Table 6.2.1)

The following boreholes will be used as project water supply in 2005:

**Oyu Tolgoi project household and productional water supply boreholes**

Table 6.2.1

№	Borehole	Coordinate	Depth (meter)	m <sup>3</sup> /day	Date drilling	of Supply
1	OTRC 218	649905 4763401	60	138	2002.06.17	Camp and drilling
2	OTRC 091	651423 4764681	110	69	2003	Drilling
3	OTRC 139	650822 4763994	134	69	2003	Drilling
4	OTRC 148	651328 4762688	114	138	2003	Drilling
5	CC01	648003 4767444	51	52.8	2004.04.25	Camp
6	CC02	647786 4767639	51	432	2004.05.13	Camp
7	OTRC 938	650087 4764473	60	86.4	2004.07.20	Major drilling Pontil

**7. EXPENSES, FEES AND CHARGES**

**7.1. Expenses for environmental protection measures**

Measurements for environmental protection plan of Oyu Tolgoi project requires 5 000 000 tugrug. Measurements for environmental protection plan and its required cost is summarized in the table on page 32. Which includes:

1. Burying drilling sump and channel

$$196 \text{ sump} \times 5 \text{ m}^3 \times 1500 \text{ tugrug/m}^3 = 1\,470\,000.0 \text{ tugrug}$$

$$10\,000 \text{ m}^3 \text{ channel} \times 280 \text{ tugrug/m}^3 = 2\,800\,000.0 \text{ tugrug}$$

2. For waste disposal and cleaning-up of surrounding area 130 000.0 tugrug
3. To spray water near camp sites, parking areas and some sections of the road by reusing productional waste water and water of mining seeping for reducing dust emission during the summer 500 000.0 tugrug
4. Protecting water resource 100 000.0 tugrug

In accordance with Article 30.11 of Mineral law of Mongolia, 50% or 2 500 000 tugrug of Environmental protection costs should be transferred to relevant account of local authority.

After completing environmental protection and rehabilitation work and submitting to local authority with notes that IMMI will get the deposit back according to article of "Regulation on leaving deposit for environmental protection during geological and mining operation".

## **7.2. Fees and charges for environmental pollution**

In accordance with Environmental protection plan and relevant laws and rules of Mongolia, the company will pay water use fees, gravel and sand use fees and local road use fees for local administration.

A contract made between the company and Khanbogd sum governor will be extended again this year and additional water resource is used for any exploration activities shall be estimated and it's relating fees shall be paid for local budget. This provision remains the same. (Contract on water use. Provisions 12.1 and 12.2)

## **8. EXPLORATION CAMPS AND WASTE**

### **8.1. EXPLORATION CAMPS**

There are 5 camp sites including Khanbogd for local workers and Oyu Tolgoi exploration camp for staff of Ivanhoe Mines, for drilling companies including Major Pontil, Gobi Drilling and Kan-Asia and also administration building, repair shops, sample preparation room, borehole sample preparation shop, airport and parking area.

In 2004 the company have occupied 16 000 m<sup>2</sup> area for new camp of mine and now total 346500 m<sup>2</sup> area is occupied for the project activities.

### **8.2. Waste categories**

All project activities of IMMI shall have waste disposal management and monitoring and run in accordance with main waste disposal policy of the company.

The following sort of wastes will release during the project operation:

- productional sewage
- solid waste
- liquid waste
- waste lubricant

Productional sewage is mainly drilling liquid and that liquid can be used for next after so remaining liquid is pumped out from sump. Residue of drilling liquid is left in sump because it is not possible to be pumped. (See Drilling section 5.2.)

Disposing of sewage within open area may cause harm to environment and people, therefore it should be avoided. Sewage from shower and laundry is disposed to specially prepared hole. Sewage holes with size of (3m x 3m x 4m) 36m<sup>3</sup> are built near laundries, showers and bathrooms of exploration camps in last few years. Inside of holes lined with wood and gravel is spread on the bottom and upper parts are covered. Also the opening is made for sewage pumping. Currently, there are 7 sewage holes and 4 butts with capacity of 25 tonnes being used within explorartion camps.

### 8.3. Waste, intermediate products

#### a/ Solid waste

Type	Volume	Source
Plastic and paper packs, bottles, construction material residue	81-100 m <sup>3</sup> /year	Food and construction material residue, containers, packs
Plastic container	344.9 m <sup>3</sup> /year	A bottle of a bottled pure water

#### b/ Liquid waste

Type	Volume	Source
Productional sewage	119 172.5 m <sup>3</sup> /year	Drilling
Household sewage	8 212.5 m <sup>3</sup> /year	Shower, laundry, bathroom

#### c/Waste lubricant

Type	Volume	Source
Lubricant	6m <sup>3</sup> or 6000 l	Heavy duty machinery and drilling machine

#### d/ intermediate product

no intermediate products

## 9. WASTE CONTROL AND MANAGEMENT

### 9.1. Waste clean-up and disposal methods

#### a/ Solid waste

Type	Clean-up	Disposal
Plastic and paper packs, bottles	everyday	Work positions have been provided with rubbish bag and wastes shall be disposed to central disposal point
Plastic bottles of pure water		Locals will collect approximately 80-90% or 310.41 tonnes of which.

#### b/ Liquid waste

Type	Clean-up	Disposal
Productional sewage: 70% - 83 420.75 m <sup>3</sup> 29% - 34 560.02 m <sup>3</sup> 1% - 1 191.7 m <sup>3</sup>	<ol style="list-style-type: none"> <li>70% of which will be pumped and used as drilling liquid,</li> <li>29% of which is remained in sump and reused for reducing dustiness near drilling field</li> </ol>	1% of which disposed to sewage disposal at central disposal point
Household sewage	22.5 tonnes sewage is disposed to sewage disposal hole everyday	Sewage pumped out from sewage hole and disposed to sewage disposal point

#### c/Waste lubricant

Type	Clean-up	Disposal
Waste lubricant	Barrel with capacity of 200 l shall be positioned in mechanical or repair	<ol style="list-style-type: none"> <li>in a butt with capacity of 25 tonnes which is located in</li> </ol>

shop  
500 l waste lubricant in a month

fence of mechanic shop of Major Pontil drilling company  
2. in a butt with capacity of 20 tonnes near Gas station

#### **d/ Radioactive wastes**

No wastes.

Waste oil is collected in a butt with capacity of 25 tonnes which was located in mechanic shop of Major Pontil drilling company 2002 through 2004. Since October 2004 butts with capacity of 10 tonnes are installed near gas station and put into operation. Exploration camp approximately disposes of 500-600 l waste lubricant in a month.

### **9.2. Waste disposal point**

Governor of Khanbogd sum granted permission to establish a new waste disposal point according IMMI request in 2003. In the frame of Oyu Tolgoi project, a total of 4000 m<sup>2</sup> waste disposal point is established and being used.

Waste are disposed separately to a new waste disposal point and channels for liquid waste and holes for solid waste are dug. A new waste disposal point is:

- 3.4 km from the south-east of OT exploration camp
- located 4 km from east of Umdain Gol
- Distant from cultural heritage
- Distant from wells and winter quarters of herdsman
- Soil dam was built in order to prevent prevailing wind direction
- Barrier and dam were built in order to prevent people and animal from entering
- That waste disposal point will be used as waste disposal area for concentration plant in the future.

Big and small trenches for waste liquid are built and which have sizes of 200 m long, 20 m wide, 1 m deep and 70 m long, 20 m wide, 1 m deep. Approximately 22.5 tonnes liquid waste will be disposed daily.

If the waste disposal hole is become full of wastes, that should be buried and its surrounding area should be cleaned-up and closed by written notes.

Also barrier and soil dam should be built in order to prevent people and animal from falling, if necessary,.

Drilling machine tool and other heavy duty machinery dispose of approximately 6000 l waste lubricant this year and such wastes shall be collected in barrel with capacity of 200 l, which positioned at work places. Barrels with full of waste lubricants shall be funneled into butt with capacity of 25 tonnes which located in mechanic shop fence of Major Pontil drilling company or butts with capacity of 10 tonnes which are installed near gas station.

If the locals or local authority wanted to use it then they can use it free of charge.

### **9.3. Recycling of waste**

Some sort of household wastes from exploration camps can be reused by local communities, herders. For instance, wastes of wood and metals are classified and placed in special point. Local communities still have been collecting cans and bottles of beer and beverages.

For example: It's estimated that the workers of Oyu Tolgoi project will use total of 344.9 m<sup>3</sup> bottled water for their drinking water needs and also such amount of pure water bottles will be discarded in 2005. To judge from previous years observations, 80-90% of such waste can be collected by locals and traded.

#### **9.4. Waste disposal containers**

Work positions have been provided with rubbish bag and wastes shall be disposed to central disposal point

Workers at Oyu Tolgoi project area are fully provided with rubbish bags and containers. Even remote work places widely use rubbish bags and wastes are transported to central waste disposal point.

### **10. SOCIAL ISSUES**

#### **10.1. Source, quantity and skill qualification of workforce**

About 450 people will work in the project area including administrative unit staff, financial unit staff, contracted suppliers, experts from foreign and domestic consulting companies, support workers, geological engineers and temporary local workers.

#### **10.2. Handling the social issues of employees**

Ivanhoe Mines Company will fully provide workers with accommodation, high quality 3 times meal, tele-communication system and as well as first aid during production period.

### **11. FUNDAMENTAL CONDITIONS OF THE PROJECT IMPLEMENTATION AREA**

#### **11.1. Basis parameters of the weather**

The climate and climatic data of the area is described in the Oyu Tolgoi Baseline Study (IMMI, 2003) and reflected in detail in report of environmental impact assessment.

Temperature variation is extreme; the lowest temperature in winter is -43° C, the warmest temperature in summer is above + 40° C. It has very arid climate and approximately 40 mm precipitation falls annually.

Air moisture is very poor, ranging between 40-50%. Evaporation rate is high because of shortage of moisture and precipitation. Mongolian climatic institution hasn't carried out determination of evaporation rate of the area but according to weather station of Haliut town of China the evaporation rate is expected to be in excess of 2000 mm/yr.

#### **11.2. Geography**



As geography, that area can be described as Gobi desert steppe and located in the lowest altitude of Mongolia. The ground surface has predominantly consists small mountain ranges (general altitude is ranging between 937,3 m and 1202 m ASL) and gradually lowered slopes of a mountain and valleys between mountains.

The surface features consist steppe with larger ravines, lower hills and valleys with low sandy ridges and also has surface drainage system and depressions where shallow groundwater closely exists.

### **11.3. Fundamental geology**

Geological structure of the area is quite compound and base sediment consists of cretaceous period conglomerat, sandy stone, alevrolit, neogen period clay and compound intrusive rocks which strongly affected by tectonic cut. Oyu Tolgoi deposit is located near boundaries of south Mongolia and tectonic regions of Umnugobi within south Mongolia and included into upper and middle Paleozoin volcanic, sedimentary or intrusive rocks, Gurvansaihan terrain where Mezozoin sediments is predominantly distributed. Deposits of Oyu Tolgoi are identified within this area included in copper-gold and copper-gold with more sulphid. Ore of Oyu Tolgoi with distribution of 3x4 km is distributed several areas and they are called Northern, Central, South-west and Hugo Dammet (Far North Zone) This accounts for approximately 20% of the area and loose sediment accounts for other percents. Terrace sediment with red clay, sand and gravel 40 m in thickness is distributed in western, north-western and central parts of the deposit.

### **11.4. Air quality**

The regional air quality of southern Mongolia is affected by regional dust storms. Mongolian observational data indicates that between 20 and 30 dust storms can be expected in an annual period, with the average storm lasting between 3 and 6 hours.

Monitoring at Oyu Tolgoi during June and July 2002, 2003 and 2004 recorded a maximum 24 hour average Total Suspended Particulate concentration of 530ug/m<sup>3</sup>. Which shows that region exists under permanent natural dusty sources.

However, that area is located in an area of low population and no major waste emissions to air occur within or surrounding the area. Apart from the periodic dust storm events, the air quality of the corridor is essentially pristine.

### **11.5. Water quality**

Flows after heavy summer rain storms often result in very turbulent high velocity mud flows, locally termed "Gobian wild floods". During that event, small particles originated on dry river beds and erosion surface are being carried by flows and accumulated in certain areas. Judging from last two year's observation or discussions with local herders indicate that, on average, four to six flow events occur in summer to autumn and high velocity flow events usually last between 30 to 90 minutes.

Several shallow springs along dry river beds occur where subsurface river bed flows are forced to the surface and result in shallow surface flows between 5 and 50 metres in length. These shallow surface water often remains in the playas for 7 to 10 days following heavy rain events and dry up again.



Actually, Gobian water has a lot of minerals. Ephemeral creek and river beds are slightly contaminated with excrement of livestock. Herdsmen dug well through the river bed and such wells recharged from ground water and also that wells are well protected. Since March 2003, the monitoring of some certain wells, springs, and boreholes is held every month and to judge from the result of measurement, there is no groundwater and surface water pollution investigated so far.

### **11.6. Soil quality**

Mongolian Gobi exists under influences of very arid wind; therefore the soils are often affected by wind erosion. In particular, surface of the soil are blown by wind in spring and autumn because of lack of precipitation and moisture. This result in shingled soil surface and low, sparse vegetation cover. It is commonly occurred that soil surface is blown by wind and that thin cover formed instead of it.

The field survey recorded the following four main soil types which belong to the Gobian brown soil type:

1. Small hill, light brown, poor developed soil
2. Aeolon sand
3. Carbonated and sand covered meadow soils
4. Semidesert-steppe light brown soil

However most soil of Mongolia affected by wind and pasture degradation, that Gobian soils contain plant seeds and such seeds are able to grow when sufficient moisture will be available in summer months.

### **11.7. Vegetation**

The vegetation of the Oyu Tolgoi area is typical of Central Asian semi desert and desert steppe flora types. The open flat desert plains and low hills are sparsely covered with small (<0.5m) drought tolerant shrub species. Ephemeral river beds, dry ravines or playa soil support some species of trees (elm trees, tamarix, poplar) to grow and shrubs mainly grow in areas where shallow water closely exists beneath surface. There is no forest cover.

There are no sufficient impacts on soil and vegetation cover of Oyu Tolgoi and its surrounding areas so far. Soil and vegetation condition of the area recorded in baseline study and monitoring measurements of the soil and vegetation have been carried out during 2002, 2003 and 2004. (13. see environmental monitoring)

### **11.8. Historical and cultural sites**

The Institute of Archaeology at the Mongolian Academy of Science has completed a survey of potentially significant archaeological sites including graves through Oyu Tolgoi license areas and its surrounding areas in accordance with the request of the company in 2002 and 2003 and prepared a report for that.

As a result of the survey, that project activities provided with essential information how to protect cultural heritage when such activities took place within those areas.

## 11.9. Level of social and economic development

Oyu Tolgoi and its surrounding area are generally unsuitable for pasture and supports few traditional herders. The herders that do use the area are nomadic and occupy widely dispersed pasture areas and shallow wells to support small grazing herds for cashmere, camel hair, meat and milk products.

## 12. ENVIRONMENTAL PROTECTION MEASURES

### 12.1. Drilling and trenching

During the drilling such activities should be done including preparation of drilling field, having enough water supply and preparation to dug sump in which clay, broken rocks and other liquids collected, which resulted from drilling. Sump is a hole which supports continuous activity of drilling process and stores drilling liquid.

Drilling liquid is made in Australia and classified as harmless in accordance with standardization of NOHSC such liquid include mixture for clay solution, viscous agent, lubricant, speed accelerator, and vibration reducer. These agents can be decayed itself by means of micro-organisms.

To judge from geological condition of the deposit, quite a thick red clay layer is commonly distributed therefore sump with approximate size of 5 m<sup>3</sup> (2m long x 1.5-2m deep x 1.5m wide) is excavated and filled with water. Also drilling agents added to it. It may cause leakage and likely to pollute groundwater.

Liquid samples are taken from drilling sumps and sent to Central Environmental laboratory in 2004 and compared with relating standard MNS 4943:2000 (Acceptable max content of pollutant agent in sewage which accepted by sewage standard). The result of drilling liquid analyzes were less than acceptable amount.

As mineral oil, 100% mixture of emulsion originated from vegetable mineral oil is used, but such agents can be decayed itself by means of micro-organisms, so they have no effect on environment.

After drilling a borehole, PVC pipe is installed in a borehole in order to protect against collapse and that is covered with concrete lid with number on it. This protects borehole from:

- entering of foreign body and bad quality water
- Mixing of water of different aquifers
- Waste of water of aquifer

Also sumps are buried and rehabilitation works are done all the time and such activities will be kept further.

### 12.2. Soil and vegetation

Oyu Tolgoi license area occupies 8496 hectare area and 96.69 hectare area are slightly disturbed due to essential activities of exploration such as drilling, opening of underground

mine mouth, vertical shaft, trenching, household use areas and upgraded or subroads. (Inspection note of rehabilitation work which have been done at camp site within Oyu Tolgoi area of IMMI. 2004.01.02)

Degraded area of soil and vegetation cover mainly occurs within Oyu Tolgoi area and if the exploration activities take place in those areas it is suggested that removal of top soil is considered not necessary.

However, during vertical shaft sinking top soil was scraped with 30 cm in thickness and separately stockpiled in prepared area.

Although during any trenching the top soil is separately stockpiled from lower layer soils.

In 2005, such activities will be carried out in same way and to determine existing erosion and disturbance of the land and planned to make work mapping.

Vegetation and soils of Oyu Tolgoi and its surrounding areas are recorded in environmental baseline study soil and vegetation monitoring took place in summer and autumn of 2002, 2003 and 2004.

In this year, vegetation and soil monitoring will continually take place on chosen areas with size of 25m x 25m. Apart from this, species and distribution of plants will be surveyed in detail again, which are determined during general and detailed surveys of environment impact assessment and that are likely to be affected during extraction activity.

### **12.3. Water quality**

IMMI is running its activities since 2003 it has made water use contract with sum governor since 2003. According to this contract, the company has planned to implement following works this year:

#### **Protecting water resource and quality:**

1. Productional and household activities should be avoided from central water supply resource area and minimum buffer widths should normally be 100 m
2. Ecologically important open water and springs within license area should be protected and hygienic conditions should be kept all the time.
3. To avoid use of unsuitable technology which is inappropriate for International and Mongolian standards.
4. According to water monitoring program, water of open water and well are measured for their physical characteristics and chemical test shall be taken quarterly.

#### **To protect water resource from deficiency:**

1. While using water resource for industrial purpose that certain amount of water should be left in nature in order to keep environmental balance

2. In accordance with provision 14.2 of law on water, that rehabilitation work of water resource should be taken at water user' own expence in case that water resource used by water user is decreased and lost its quality due disobeying for requirements of water facilities and technological extraction regime
3. If it is required to change river bed during the construction activities such changes should be rehabilitated and all related costs should be included to the design.
4. Gravels are taken from river bed should be not more 2 m in depth
- 5.

#### **Protecting water from being polluted**

1. To ensure pollutant wastes are not disposad near water resources, river beds, ravines and protection zones
2. To place sewage disposal well and butt
3. After finished using drilled borehole, then submit it to local governor
4. If aquifer found during the exploration of minerals, measurements should be taken to avoid water pollution
5. To accomplish request of state environmental agency to protect and use water resources and their rehabilitation

For example: Water test shall quarterly take place in state accredited laboratory in Dalanzadgad, Umnugobi aimag in this year.

During some subterranean excavation, leakage with rate of 1-17 l/sec will occur from cracks and ground water. Such water shall be accumulated in specially prepared sump. The water can be used for the purpose of reducing dustiness near excavation.

During subterranean excavation, shower, laundry and bath shall be installed at work places for workers needs and refer to 7.7 for sewage disposal.

#### **12.4. Dust**

Project area is located Gobian arid area of Mongolia and transportation takes place on the earth road. This may result in soil erosion and dustiness.

Therefore, is important that vehicles should reduce their speed while pass by camp sites. This may result in reduction in dustiness and accidents. Thus it is suggested road near camp sites should be repaired and signposted.

To ensure that dust level at exploration sites should be as low as possible and the following measures have been taken in order to reduce dustiness:

- Water from excavation and productional sewage can be reused for reducing dustiness by means of water transporting vehicles
- To reduce the speed of heavy duty trucks while travelling on the earth road

- To repair surface of the earth road where necessary

Total of 1368 m long road was treated with  $MgCl_2$  or  $CaCl_2$  water solutions several times in September 2004 in order to minimize dust emissions from it, which is located near the northern of Oyu Tolgoi camp. The observation of the experiment is still being taking place now.

### **12.5. Roads**

Approximately 100 km of the earth road have been created within Oyu Tolgoi license area. IMMI is paying attention to not using informal tracks and signpost them. All drivers are warned not to use informal tracks and should use signpost roads. Unnecessary informal tracks will be shallow ripped (scarified) to prevent further vehicle use and encourage revegetation. Maintenance and watering of roads will take place.

### **12.6. Exploration camps and waste**

The project workers will stay in exploration camp sites. Disposal of all sort of wastes are managed in accordance with waste disposal management of the company. Also as described in management plan, direct disposal of sewage shall be avoided. Sewage from shower, laundry and bathroom which are located near excavation shall be accumulated in butt. The accumulated sewage shall be pumped out with sewage vehicle and transported to liquid waste dam within the central disposal point of license area.

### **12.7. Fuel and lubricants**

Gasoline, diesel fuel and lubricants shall be transported to excavation field according to safety rules. All these products shall be stored in specially prepared condition which shall prevent any leakage to soil and water.

If leakage occurs, special material shall be used for cleaning the leakage and polluted parts shall be transported to solid waste disposal hole within the central disposal point.

### **12.8. Historical and cultural sites**

If previously unidentified and unrecorded historical and cultural sites will be found, then such historical and cultural sites shall directly be informed relevant institutes.

## **13. ENVIRONMENTAL MONITORING PROGRAM**

### **13.1. Objective and scope of the Environmental Monitoring Program**

The Environmental Monitoring Plan (EMP) includes a description and schedule for the measurement of environmental parameters required to ensure that IMMI's activities in relation to the Oyu Tolgoi deposit area are within the criteria, standards and limits established in the EPP and EIA.

In accordance with Mongolian Law on Environmental Protection, Law on Environmental Impact Assessment and Minerals Law, IMMI will undertake monitoring at its own expense using approved methods and accredited facilities. The monitoring information will be

submitted to relevant Soum, Aimag and Central Government Organisations on an annual basis for review.

The company is responsible for all activities such as full implementation of environmental monitoring program, including taking samples and making measurement with approved methods, the equipments used for testing are have to be met with relevant accuracy, and the result of the test should be calculated relevant units. Environmental inspector of the company will regularly attend in training programs which run in the frame of Oyu Tolgoi project.

The monitoring works of water, soil, vegetable, air had been taken place during 2003 and 2004 within Oyu Tolgoi area and its surrounding area in accordance with suggestions and main findings of environmental impacts assessment and such activities will take place for this year.

### 13.2. Water monitoring

Monthly water monitoring shall determine smell, colour and taste of open water and springs and measures depth of water level of borehole at certain point in 2005. Also photo monitoring shall take place. Chemical test of water shall take place quarterly and chemical test of water is take place in March, June, September and December, 2005.

Table 13.2.1 shows names and location of water monitoring point and parameters of physical and chemical tests.

#### Monitroing points for open water near Oyu Tolgoi

Table 13.2.1

Monitoring points	Location	Monitoring parameters
Bor ovoo hudag	650569, 4761727	<b>Quarterly:</b> pH, TDS (grav), TSS, hardness (CaCO <sub>3</sub> ), Ca, Mg, Na, K, SO <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , NH <sub>4</sub> , As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, <b>Monthly:</b> Measuring water level at certain point
Huh hadnii bulag	653128, 4757124	
Buuralin bulag/zadgai	659748, 4751517	
Maaniin bulag	660542, 4750617	
Hersiin hudag	648167, 4764452	<b>Quarterly:</b> pH, TDS (grav), hardness (CaCO <sub>3</sub> ) Ca, Mg, Na, K, SO <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , NH <sub>4</sub> ,
Ulaan tolgoiin hudag	643670, 4759400	
Huh hadnii hudag	653779, 4756656	

Hoyor modnii hudag	655201, 4765095	As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, Taste, smell, color <b>Monthly:</b> Measuring water level
Boreholes	650821, 4763994	<b>Quarterly:</b> pH, TDS (grav), hardness (CaCO <sub>3</sub> ) Ca, Mg, Na, K, SO <sub>4</sub> , As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, Taste, smell, color <b>Monthly:</b> Measuring water level
<a href="#">OTRC 047</a>	650526, 4763593	
<a href="#">OTRC 068</a>	650014, 4762272	
<a href="#">OTRC 081</a>	652023, 4762576	
<a href="#">OTRC 133</a>	651881, 4764683	
<a href="#">OTRC 104</a>	649907, 4763397	

### 13.3. Groundwater monitoring

Measurements shall be done in order to monitor aquifer levels within Galbyn Gobi and Gunii Khooloi ground water areas, which are investigated for solving Oyu Tolgoi copper-gold deposit project water needs.

However EIA report of the project has not been approved, but our company will carry out ground water monitoring in accordance with Environmental Monitoring Plan until June 2005.

This program involves 137 boreholes of monitoring and experimental which exist within 200 km radius area of Oyu Tolgoi.

Since 2003 these boreholes are being monitored on regular basis and the collected information shall be useful for construction of Oyu Tolgoi water supply facilities and further monitoring for comparing with other informations.

### 13.4. Air monitoring

4 times measurement of dust emission on 21 points were successfully done near Oyu Tolgoi July 2002 through June 2004. These results are summarized and used for creating a model for air quality parameters of Oyu Tolgoi project implementing area.

Table 13.4.1 shows monitoring points for air quality of Oyu Tolgoi and its surrounding area

#### Coordinates for air quality monitoring of Oyu Tolgoi and its surrounding area

Table 13.4.1

No	Measuring point coordinates	Covered areas
1	650990 / 4765357	East Oyu



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2	650842 / 4764801	North Oyu
3	650860 / 4764118	Central Oyu
4	650351 / 4763164	South-west Oyu
5	651280 / 4762876	Өмнөд Oyu
6	650220 / 4763397	Near OT camp
7	648981 / 4765216	Airport
8	651000 / 4767000	3 km from north of OT camp
9	654000 / 4764000	3 km from east of OT camp
10	651000 / 4760000	4 km from south of OT camp
11	648000 / 4764000	3 km from west of OT camp
12	648066 / 4764388	West of OT camp
13	650630 / 4767015	North of OT camp
14	654112 / 4764175	East of OT camp
15	652649 / 4759876	South of OT camp
16	650144 / 4763595	Near OT camp
17	648058 / 4765657	North-west
18	652610 / 4766652	North-east
19	654162 / 4762088	South-east
20	650700 / 4760869	South-west
21	650108 / 4764097	Climatic station

**13.5. Soil and vegetation monitoring**

Soil and vegetation monitoring take place near Oyu Tolgoi area every 6 months or in summer and autumn and such activity includes determination of plant species, vegetation cover, percentage, soil structure and erosion and recording of them.

In May 2003, total of 13 plots with size of 25 x 25 m were chosen for soil and vegetation monitoring in accordance with recommendation of Environmental impact assessment. Recording of plants' species and vegetation cover was taken place and documented with photos. 5 plots are chosen from above mentioned plots according to suggestions of experts in 2004 and further monitoring shall be continued in 2005.

**Soil and vegetation cover monitoring near Oyu Tolgoi**

Table 13.5.1.

Lat	Lon	Plot 25mx25m
4768004	654014	<b>Plot 4</b>
4768030	654015	
4768026	654039	
4768001	654037	
4759615	647504	<b>Plot 9</b>
4759628	647501	
4759637	647525	
4759613	647531	
4767018	648165	<b>Plot 12</b>



4767037	648153	
4767053	648174	
4767029	648185	
4767038	654987	
4767012	654990	<b>Plot 14</b>
4767011	655017	
4767037	655013	
4758952	655988	
4758926	655979	<b>Plot 15</b>
4758957	655962	
4758933	655955	

### 13.6. Rehabilitation

Some plots were prepared for experiment within rehabilitated and disturbed areas which disturbed by exploration activities near Oyu Tolgoi areas in order to study the possibility of plants to grow naturally on rehabilitated or distributed areas. Such plots include:

1. 2 plots with size of 30 m long and 4 m wide are located in south and north of stockpiles of Box cut.
2. A plot with size of 4 m long, 2 m wide within drilling field

#### Experimental plot

Table 13.6.1.

Location	Coordinates	
<b>Box cut - the northern section</b>	652367	652383
	4765421	4765416
<b>Box cut - southern section</b>	652451	652454
	4765303	4765305
<b>Drilling field</b>	650976	650977
	4763845	4763843

After finishing any exploration work, all used equipments and residue materials shall be moved. Disturbed areas must be cleaned-up and rehabilitated.

It had been observed during the monitoring of rehabilitated areas that plants grow naturally after a year within rehabilitated areas where drilling sumps were. However, it greatly depends on precipitation and summer conditions of the year.

## **ENVIRONMENTAL PROTECTION PLAN FOR THE VERTICAL SHAFT AT HUGO NORTH DEPOSIT OF OYU TOLGOI**

### **General section**

Exploration vertical shaft sinking project is planned to start from 2<sup>nd</sup> quarter of 2005 in order to determine stability, ore content and shape or volume of body of rock massif within Hugo Damet section in Oyu Tolgoi deposit in detail.

Vertical shaft sinking project is called “Shaft No1” and its technical development is designed by American McIntosh Engineering company.

Vertical shaft shall be executed by Canadian specialized company called Redpath in accordance with the agreement made between Ivanhoe Mines company and Redpath.

This vertical shaft sinking shall take place on location of diamond drill hole OTD 572 for the purpose of further survey of Oyu Tolgoi deposit exploitation.

The company mainly has been doing surface drilling until now but, since 2004 the company has commenced survey of subterranean exploration excavation.

The project is specially designed and includes potential negative impacts on environment. Contruction works of overground facilities shall be built in first years of shaft sinking.

As excavation goes deeper, environmental protection plan will specially be designed and which should include management of ground water seepage and stockpile. Although EEP will be submitted to relevant orgazinations.

### **1. PROJECT SPECIFICATION**

### **1.1. Project name**

Oyu Tolgoi exploration project, The northern Hugo, Vertical shaft No1

### **1.2. Project objective**

Objective of the project is to determine stability, ore content and shape or volume of body of rock massif within Hugo Damet section in Oyu Tolgoi deposit in detail

### **1.3. Final output of the project**

Report of the detailed determination of stability and ore body formation of rock massif within Hugo Damet section in Oyu Tolgoi deposit

### **1.4. Project owner**

Ivanhoe Mines Mongolia Inc LLC will implement.

### **1.5. Project location**

The project is:

- The northern Hugo ore body. Near location of OTD 572th borehole, coordinate 4766294 X, 651189 Y,
- 

### **1.6. Equipment**

Vertical shaft sinking work will be carried out by Canadian company Redpath Mongol and special machinery and equipments for underground mining shall be used.

### **1.7. Project terms**

As estimated previously, vertical shaft sinking work will be done within 3 years time commencing July 2005.

## **2. SHAFT SINKING PROJECT**

Project facilities can be divided into 3 main parts in accordance with their location and time sequences to build.

1. Facilities above the ground
1. Surficial or rim facilities
2. Vertical shaft

### **2.1. Buildings and constructions on the ground**

Overground facilities consist of administration building, services, repair shop, warehouse and temporary buildings for fuel and electric power supplies. /See attachment figure 3 or 210-A-1005/

Such facilities will be constructed during construction of surface opening facility.

### **2.2. Surface and collar structure**

Surface and opening facilities shall include lifting crane, ventilation building for lifting machine and opening and vertical shaft opening. Opening facility shall include 30 m section which located under vertical shaft opening.

Sequences of vertical shaft excavation, equipping and dimension for vertical shaft opening is shown on attachment figure 4, figure 5 or 01-184-1000, figure 6 or 210-A-6201.

### **2.3. Excavation and sinking**

Total depth of vertical shaft is 1300 m, inside diameter is 6.7 m and excavation will sink with drilling and blasting methods and will be bolte with concrete fixing with anker bolt.

Main concrete fixing shall be not less than 200 mm and distance of the scarp from concrete fixing will be fixed with шүрмэл concrete to guarantee safety of workers.

Excavation will be ventilated by fan which placed on the surface. Air flows into scarp shall be heated with a heater in wintertime.

Water accumulated during the excavation and sinking process shall be pumped out on surface and accumulated in previously excavated section with capacity of 240 000 m3.

**Excavation and sinking is presented in attachment figure 5 or 01-184-1001 in detail.**

## **3. GEOTECHNICAL CONDITIONS**

### **3.1. Main concept**

Vertical shaft and drilling borehole OTD572 will be sunk parallel each other. Fixed layer diameter of vertical shaft is 6.7 m, total depth will approximately be 1300 m. Excavation will be sunk with drilling-blasting method and fixed with concrete.

Surface layer of excavation sinking area covered with approximately 20 m thick cretaceous period red clay and gravel.

Main rocks consist of the following 3 types of rocks:

- Biotitot granodiorit (BiGd),
- Dacitian ashen sinter (IGN),
- Quartz moncodiorit (QMD)

Biotit granodiorit is seam of porfiry dacit which is released during shaft sinking at Hugo deposit. Biotit granodiorit is 2-3 cm in size and has pinkish brown plagioklazian inlay and main brown part with 5% of biotit which changed into chlorite and sericit. Biotit granodiorit with plagioklaz distributed in Hugo Dammit with 600 m in width and suddenly gets narrower.

Dacitian ashen sinter is dark green and often affected by intensive sericitization change and argillitization change.

Quartz moncodioritian intrusives are detected as larger seam and these inlays are porfiry for too mineralized texture.

It contains small inlays of gematit therefore has red color where not changed and also contains gematit and albit in some its parts. Intrusives which are late from quartz montsodiorit (10-300 m wide) or contrary intrusives (500 x 2000 m area) are strongly

affected by cericit changes and copper which is cut with smaller quartz seams are slightly mineralized (<0.3% Cu).

### **3.2. Groundwater**

Static water level at borehole OTD572 exists at 48<sup>th</sup> m below the surface. To judge from a report of Aquiterra company completed in November 2004, water yield varies between 1 l/sec and 5 l/sec.

### **3.3. Seismic conditions**

Seismic survey near Oyu Tolgoi area is being carried out by Mongolian Seismic Study Institute. Report of this survey will be completed in 1<sup>st</sup> quarter of 2005.

Sharma and Judd had revealed the hazard evidence during the seismic survey took place 1991 if the earthquake occurs the 50 m upper section of underground excavation may be greatly influenced.

For vertical shaft No1, upper part of vertical shaft with thickness of 50 m consists of clayey covering material, weathering section, and also weathered biotit granodiorit (BiGd).

### **3.4. Geothermal gradient**

Reasves carotage officers have done carotage on borehole OTD572 and this survey also showed measurement of temperature. Any serious temperature changes haven't been identified during the survey and which means that temperature of water in drilling borehole is equaled to rocks in borehole.

Gradient of geotermal temperature of OTD572 borehole is investigated as 1.73°C at 100 m in depth.

## **4. ENVIRONMENT**

### **4.1. General section**

It is required to remove and transport soil and rocks during the construction of surface and collar of vertical shaft and vertical shaft sinking. Although dewatering of leakage shall be essential.

During the project life, total of 46200 m<sup>3</sup> soil and rocks shall be stockpiled. Rocks will be transported to 1 km away from north-eastern section of vertical shaft.

Water leakage may result from shaft sinking and pumped out with pump and collected in previous excavation.

It is detemined in Australian Aquiterra company report of groundwater exploration for Oyu Tolgoi deposit, that static water level at borehole OTD 572 exists at 48<sup>th</sup> m below the surface. Therefore it is not essential to collect water from main excavation surface till 48<sup>th</sup> m below the surface.

In frame of geological exploration work of Oyu Tolgoi deposit which has been done until now, only surface drilling had been executed but the company commenced exploration

sinking for ore technological sample, ore body capacity and detailed determination work of ore content, since 2004.

Impacts on environment which caused by 1<sup>st</sup> vertical shaft sinking shall be determined and protecting measures are developed in advance.

#### **4.2. Environmental impact**

The following impacts may develop within 1<sup>st</sup> vertical shaft sinking and this consideration is based on scale of the project, proposed works and time frame:

- Construction work will result in buildings and facilities which occupy 185x187 m<sup>2</sup> or 3.4 hectare
- A borehole with size of 6.7 m in diameter and 1300 m deep will be created within the bowels of the earth
- Approximately 60 000 m<sup>3</sup> stockpile of rocks will be created resulted from foundation of building and vertical shaft
- Road network will be created near vertical shaft.
- Household sewage and wastes from workers' consumption
- Used lubricant from diesel power generator and machinery will be collected
- Groundwater will be pumped out on surface.

### **5. ENVIRONMENTAL PROTECTION MEASURES**

#### **5.1. Providing environmental safety**

During construction of buildings and facilities, fence with size of 2 m height and 7.3 km long will be built in order to ensure safety.

Entrances to vertical shaft have doors and security people will work there to ensure workers and vehicles to enter the area.

#### **5.2. Setting up stockpiles**

Removal and stockpiling of mountain rocks which taken from vertical shaft sinking is major process of such sinking works.

Clay and rocks taken from vertical shaft sinking shall be stockpiled for further use for building and road construction activities.

The area is very arid and exists under strong wind events therefore stockpile should be covered with rocks and gravel in order protect from wind blows that may cause dust emission of the surrounding area.

Removing rocks from vertical shaft sinking to undisturbed area is main process of the shaft sinking. To judge from previous experiences, an area used for stockpiling is buried not recovering again. While choosing an area for stockpile the following criteria should be considered:

- To choose the areas which are unsuitable for household use
- To consider geography, hydrogeology and topography of deposit area
- The chosen are should be as close to mining area

Although all practicable measures shall be taken in order to prevent the collapse and slide of dump during rain and flood events.

The area is very arid and exists under strong wind events therefore stockpile should be covered with rocks and gravel in order protect from wind blows that may cause dust emission of the area. Further, rehabilitation works will continually take place and surface of stockpile shall be vegetated.

During that excavation total of 46 200 m<sup>3</sup> muck rock , soil (clay) and low grade ore dump will be released. Therefore:

1. Muck/rock dump
2. Low grade ore dump

To judge from planned chart of excavation, 74000 m<sup>3</sup> rocks will be released in 2005 and of which 58 000m<sup>3</sup> muck rock, low grade ore dump 16 000 m<sup>3</sup>.

Stockpile	2005.07	2005.08	2005.09	2005.10	2005.11	2005.12	Нийт м <sup>3</sup>
Muck rock dump	9 000	13 000	13 000	13 000	10 000	-	58 000
Low grade ore stockpile	-	-	-	-	3 000	13 000	16 000
Total m <sup>3</sup>	9 000	13 000	13 000	13 000	13 000	13 000	<b>74 000</b>

### 5.3. Low grade ore stockpile

During vertical shaft sinking some of low grade ore will be produced and therefore it may require making dump for low grade ore. Pirit which mainly contains sulphid is dominant in low grade ore and it can create acid while reacted with air and oxygen. That may negatively affect on environment. Therefore it is essential the following condition shall be considered while creating low grade ore dump:

- Physic-mechanical characteristics of rocks of the area
- To determine characteristics geology and hydrogeology

The following measures shall be taken:

- If sediments with good water transmitting capacity and rocks with many cracks are distributed or ground water level is close to the surface it is suggested that base of dump should be spread with clayey soil
- To determine geographical location, geometric dimension of dump and slope in order to support stability of dump
- To ensure if there is temperature variation occurring
- Flood dam should be created in surrounding areas of dump and precipitation water collecting sum for dump shall be created which flow from dump
- Do watering on dumps because of Gobian nature and climatic characteristics and if necessary to use indirect watering method

- If dump is no longer contain ore, neutralizing process shall be carried under control of relevant professional such work include rock cover.

#### 5.4. Groundwater conditions

Accordinging the report of Oyu Tolgoi deposit water resource areas survey done by Australian Aquiterra Company that statistic level of water on borehole OTD 572 is located at 48<sup>th</sup> m beneath the surface. Water discharge level is 1-5 l/sec.

There is lack of ground water study, so measures will be taken to mitigate hazards of collapse within high pressure and groundwater flow zone.

As mine goes deeper, the seepage volume will increase therefore it's required that water need to be pumped out permanently and kept specially prepared sump. Water collected in a sump can be used for mitigating dustiness near mine.

#### 5.5. Raw materials and supplements

Household water needs are provided with water supply resource of existing exploration camps.

Sand and gravels are extracted from local area. Temporary gravel borrow pits will be created within northern section of exploration license area. Approximately 30 m<sup>3</sup> gravel will be extracted from this small borrow pit. Sand is taken from dry river bed.

#### 5.6. Waste management

All project activities of IMMI shall have waste disposal management and monitoring and run in accordance with main waste disposal policy of the company.

Sewage holes with size of (3m x 3m x 4m) 36m<sup>3</sup> are built near laundries, showers and bathrooms of exploration camps and collect sewage from them. Sewage vehicle will pump and transport it to the central waste disposal point.

#### 5.7. Waste and intermediate wastes

##### a/ Solid waste

Types	Volume	Source
Plastic and paper packs, bottles, construction material residue	5m <sup>3</sup>	Food and construction material residue, containers, packs

##### b/ Liquid waste

Types	Volume	Source
Productional sewage	4m <sup>3</sup> /day	Drilling
Household sewage	2m <sup>3</sup> /day	Shower, laundry, bathroom
	1098m <sup>3</sup> /year	

##### c/ Wate lubricant

Types	Volume	Source
Waste lubricants (in 2005)	1.5m <sup>3</sup> or 1500 l/year	Heavy duty machinery and drilling machine



**d/ Intermediate wastes**  
No

**5.8. Waste clean-up and disposal methods**

**a/ Solid waste**

Types	Clean-up	Disposal
Plastic and paper packs, bottles	everyday	Work places have been provided with rubbish bag and wastes shall be disposed to central disposal point

**b/ Liquid waste**

Types	Clean-up	Disposal
Productional sewage	To pump out with sewage vehicle	Sewage disposal point within central waste disposal point
Household sewage	To pump out with sewage vehicle	From sewage vehicle to sewage disposal point

**c/ Waste lubricant**

Type	Clean-up	Disposal
Waste lubricant	A barrel with capacity of 200 l shall be positioned in mechanical or repair shop	In a butt with capacity of 25 tonnes which is located in fence of mechanic shop of Major Pontil drilling company

**d/ Radioactive waste**

No radioactive waste

**5.9. Raw materials and supplements**

Household water needs shall be supplied with currently used resources for exploration camps.

Construction materials, fortifying metal parts and cement shall be supplied from Ulaanbaatar. Sand and gravel shall be extracted from local area.

**a/ Utilizing natural resources**

Vertical shaft excavation project involves 50 workers in a shift during 183 days. Household water need for individual person is estimated as 50 l/day and productional water demand is estimated as 14 m<sup>3</sup>.

Water supply for any purposes should not use springs and herder wells. See Table 5.9.1

**Naturel resource utilization during vertical shaft**

Table 5.9.1

Types	Volume	Resource
Household water	9150 person/day x 0.05 m <sup>3</sup> = 457.5 m <sup>3</sup> /year	Borehole, ground water OTRC-218
Productional water	For mitigating dustiness – 10 m <sup>3</sup> /day For preparing concrete and mortar – 14m <sup>3</sup> /day Total 4392 m <sup>3</sup> /year	Borehole, ground water CC-01, CC-02,
Stone river	For preparing concrete and mortar - 9150 m <sup>3</sup> /year shall be used.	Use stone river borrow pit

Vertical shaft requires using quite a hard stone river so the company intended to use borrow pit near mine. During 2005 total of 9150 m<sup>3</sup> stone river is estimated to be used and special project will be developed for this work, which shall include measurements to protect environment in detail.

## 6. EXPENSES, FEES AND CHARGES

### 6.1. Expenses for environmental protection measures

Measurements of environmental protection plan for vertical shaft sinking at the northern Hugo of Oyu Tolgoi deposit will require expenditure of 500 000 tugrug for the first year. In first year, operational area shall be surrounded with fences. Measures of environmental protection plan of vertical shaft and expenditure related to it are summarized in a table. (Page 32)

In accordance with provision 11 of article 30 of Mineral law of Mongolia, 50% of environmental protection expenditure or 250 000 tugrug will be transferred to local revenue account.

### 6.2. Fees and charges for environmental pollution

As previously estimated in that supplementary plan, water use fees and stone river use fees will be transferred to local revenue account in accordance with Mongolian relevant laws and rules.

## ENVIRONMENTAL PROTECTION MEASURES AND ESTIMATED COSTS

No	Environmental protection works	Summarized table	
		Volume	Cost/in tugrug/
<b>1</b>	<b>Rehabilitation work</b>		
	Burying drilling sump	980 m <sup>3</sup> /year	1 470 000
	Burying trenches	10 000 m <sup>3</sup> /year	2 800 000
<b>2</b>	<b>Waste disposal</b>		130 000
<b>3</b>	<b>Mitigating dustiness</b>		
3.1	Near exploration camp, along the road and at the northern Hugo	36 390 m <sup>3</sup> /year	500 000
<b>4</b>	<b>Transporting and storing of gasoline, diesel fuel and lubricants</b>		
<b>5</b>	<b>Inspection</b>		
5.1	Environmental inspection	Weekly and monthly	
5.2	Inspection of state environmental inspector		Quarterly
<b>6</b>	<b>Environmental fees and charges</b>		
6.1	Water use fees:		
	-household (30 tug/m <sup>3</sup> )	40 500 m <sup>3</sup> /year	1 215 000
	-productional (50 tug/m <sup>3</sup> )	119 735 m <sup>3</sup> /year	5 986 750
	<b>Total</b>	<b>160 235m<sup>3</sup></b>	<b>7 201 750</b>
6.2	-gravel use fees(50 tug/m <sup>3</sup> )	6000 m <sup>3</sup>	300 000
	-sand use fees (100 tug/m <sup>3</sup> )	2000 m <sup>3</sup>	200 000
	-stone river use fees (9150 m <sup>3</sup> /year)	To pay after started to use.	
	<b>Total</b>		<b>500 000</b>
<b>6.3</b>	<b>Local road use fees</b>	<b>170 km x 7500 tugrug</b>	<b>1 275 000</b>
<b>6.4</b>	<b>Local revenue</b>		<b>8 976 750</b>
<b>7</b>	<b>Vertical shaft in the northern Hugo</b>		
	- to remove top soil		Not necessary
	- To build a fence to surround shaft and signpost it	7000 m	500 000
<b>8</b>	<b>Estimated costs for environmental protection and rehabilitation for Oyu Tolgoi project in 2005:</b>		
	- for Oyu Tolgoi exploration project		<b>5 000 000</b>
	- in the northern Hugo		<b>500 000</b>
	<b>Total</b>		<b>5 500 000</b>
<b>9</b>	50% of total costs shall be deposited in local authority.		<b>2 750 000</b>



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