2.1 Environmental action Plan (EAP)

The design of the proposed Leach Plant is such that its potential to cause adverse impacts will largely be minimized or eliminated by means of in-built features e.g. bunding to contain spills, recycling of process water to increase plant efficiency, high level of automation for process control etc. However, due to the hazardous nature of the operation, an incident free regime is not feasible, hence specific additional environmental management measures to mitigate adverse environmental impacts are discussed in table 8.

General good environmental management practices will be ensured through adherence to the approved environmental management measures.

2.1.1 Construction Phase

The construction of the proposed Plant will be managed in accordance with the approved principles.

2.1.2 Operational Phase

The Leach Plant will be operated in a manner that ensures environmental protection as per modern design concepts.

Other activities that are of direct relevance are the following:

- Environmental Monitoring Plan
- Auditing and Reporting Plan
- Capacity Development and Training Plan
- Emergency Preparedness and Response Plan

Table 12: Environmental Action Plan

What needs to be managed?	Why does it need to be managed?(impact)	Rating	How it will be managed
Land transformation	•To prevent further inundation of new land	L	• The dumping of the tailing will conform to the approved design of the tailings dams and not extend outside the designated area. • The dams will be inspected daily to ensure that construction is to design specifications. • The dams will be surveyed annually to ensure stability of the dams.
Release to air due to fugitive and stack	To prevent: • The deterioration of	L	•Dust extraction equipment will be installed and maintained in such away

What needs to be managed?	Why does it need to be managed?(impact)	Rating	How it will be managed
emissions	health of employees and public due to the emissions from the operations, • The acidification of soils due to acid mist or rain washout of sulphur dioxide / trioxide.		as maintain efficiency and prevent pollution. • Water will be used to suppress dust in areas of reclamation at the dams and ore stockpiles • An emergency response procedure will be developed and implemented to deal with incidents of plant failure. • Air quality monitoring will be undertaken to collect information on ambient air quality levels.
Spills, leaks incidents and emergencies.	• To prevent the contamination of soil and water due to poor storage and disposal practices. • To prevent leakages and spills of hazardous materials from entering plant drains and contaminate the soil and water environment.	L L	• Areas where hazardous materials are stored or handled will be adequately bunded so that the material cannot leave the area. • Emergency procedures will be put in place to clean up spills quickly and efficiently. • The floor of acid handling areas will be lined with an acid resistant material to contain acids and prevent them from seeping into the soils and groundwater environment. • All acid spills will be collected and recycled or neutralized before being released to the natural watercourses. • The floors of the heap leach areas will be lined with anti-acid impervious surfacing to enable the collection of the pregnant solution and prevent contaminated seepage.
Water Consumption	•To encourage the recycling of water and to prevent the inadequate recovery of process water.	L	•A water management strategy will be developed that will reduce the water consumption on site. • The plant piping system will be constructed and maintained in such a way as to reduce leaks and minimize wastage. • Plant staff will be educated in the importance of water conservation • Where possible the drainage system will be upgraded so as to enable collection of spillage and return to the

What needs to be managed?	Why does it need to be managed?(impact)	Rating	How it will be managed
			process circuit instead of discharging it to the receiving environment.
Health risks	• To prevent illegal entry into the dams	L	• Barriers and signs will be erected to prevent access from the public.
Stormwater	• To prevent runoff from potentially contaminating the aquatic environment	L	• Runoff will no be allowed to mix with process water.

2.1.3 Rehabilitation and Decommissioning

The rehabilitation and decommissioning of the processing facilities at Sino-Metals will be incorporated in the decommissioning and closure plan for NFCA PLC which will be covered in detail in the Environmental Assessment (currently under production). The proposed Leach Plant will consist of relatively minor additions to these facilities and will not significantly alter the approach to or the cost of rehabilitating and decommissioning the processing facilities when the processing operations at Sino- Metals Leach Zambia Ltd and NFCA PLC Chambishi Mine eventually cease.

SAFETY AND INDUSTRIAL HYGENE

2.2 Safety

The proposed copper hydrometallurgical plant at Chambishi Mine will strictly conform to the Mine Safety Regulations as required by Zambian government, and the principle of "Safety First" precaution will be followed. In principal personal protection should be the last option / precaution to protect workers from health damage. The plant has been designed to eliminate or minimize all forms of anticipated hazards. Personnel will be provided with protective clothing and equipment. Personnel working in high dust areas should have dust mask, or respirators. Personnel working in places with noise levels over 85dB(A) such as the Crusher Section will be provided with hearing protection devices. In addition, efforts to shorten the working time in the high noise level environments will be pursued.
The following safety and loss control precautions will be carried out:

Safety precautions – Construction and Operation
Personnel will be provided with suitable protective equipment such as overalls, coveralls, and work suits, foot protection, head protection, hand protection, face protection, hearing protection, specialized protection etc. to ensure the safety of the personnel. Operators of the plant and various pieces of mechanical equipment will undergo training in order to operate in accordance with the established operational procedures.

All the operating platforms, tanks, stairs and other places inside the plant that present the risk of falling shall be fixed with the protective barriers and hazard warning signs. All the parts of exposed power driven production facilities will have protection guards fixed on them.

Fire-protection

The fires of non-ferrous mines are primarily caused by open fire activities of welding and electric equipment or lines. With the increase of automation, the risks of fires caused by electricity are also expected to increase. The following protection measures will be put in place:

The selection of electro-mechanical equipment will strictly conform to the electric fire-protection standards. These will have grounding connection fixed on them and other facilities to prevent electric leakage and overload.

All places which may generate fire, such as the fuel or organic tanks, extraction plant and so on, will be equipped with fire fighting facilities, mainly the foam type fire-extinguishers. There will be special CO_2 (black mark) and dry chemical (blue mark) extinguishers near the electro-mechanical devices, and the fire fighting water pump connectors on the fire fighting pipelines.

Welding work will be carried out in non-inflammable areas. These will be screened with steel panels and equipped with suitable fire fighting facilities.

Fire and explosion protection of the oil tanks

There will be permanent fire-protection thunder-proof facilities for oil tanks. The tanks will be made of non-combustible materials and safety and hazard symbolic signs will be placed around them. The tanks will be fixed with fire ladders and foam fire extinguishers will be posted around them.

2.3 Ventilation

Measures to prevent dust and harmful gases

The closed hood systems will be installed at the transfer points of the conveyors and feeders to extract the dust generated in the Crusher Section as well as at the Agitation Leach Plant. Other housekeeping measures to ventilate and refresh air will be employed in order to maintain the quality of the working environment and meet national industrial hygiene standards.

Measures to eliminate noise

Because of the high noise levels generated from the Crusher Section facilities, measures to minimize noise will put in place. Facilities of international advanced levels to reduce vibration and minimize noise will be installed.

All the air-blowers will be fixed with silencers, and high-vibration facilities will be fixed with the damping devices. Places like control rooms will be soundproofed.

Appendix A

Mining Environmental Regulations, First Schedule:

Information to be contained in Environmental Project Brief

1. Name of developer

2. Address of developer
3. Telephone number of developer
4. Fax numbers and Electronic mail address
5. Name of owner of mine
6. Mine manager of the person responsible for mine
7. Prospecting permit or mining right or licence number
8. Regional setting:
   (a) plan or aerial photograph required;
   (b) topography (Plan required);
   (c) surface infrastructure (such as road, railway lines and power lines in the vicinity).
9. A brief description of the regional climate:
   (a) mean monthly and annual rainfall for the site;
   (b) mean monthly maximum and minimum temperatures;
   (c) mean monthly wind direction and speed-where appropriate (such as in urban areas and if such information is freely available);
   (d) mean monthly evaporation; and
   (e) incidence of extreme weather conditions-floods, drought, high winds.
10. Soil:
   (a) plan required;
   (b) a description of the soil types to be disturbed; their fertility, erodibility and depth;
   (c) pre-mining land use (proportions of the land used as: arable land, grazing land, wetland, and wilderness land, and existing structures and any evidence of misuse);
11. Natural vegetation or plant life
12. Animal life:
   Presence of rare or endangered species.
13. Surface Water
   (a) plan required;
   (b) the presence of water course, streams, rivers, dams, and pans should be indicated; and
   (c) surface water quality;
14. Groundwater (information readily available):
   (a) depth of water-table, presence of water boreholes; and springs (plan required); and
   (b) groundwater quality and use;
15. Air quality
16. Noise
17. Sites of archaeological and cultural interest (plan required)
18. Sensitive landscapes
19. Visual aspects
20. Regional socio-economic structure (does not apply for prospecting);

21. Interested and affected parties;
    Identify and list known bodies representing interested and affected parties:
22. Geology:
    (a) representative logs, and where appropriate, a section through the ore body and surface mapping;
    (b) identify and characterize overburden material that will be disturbed, may give rise to a deterioration in water quality; and
    (c) presence of dykes, sills and faults that extend beyond the property boundary (plan required)
23. Mineral Deposit:
    (a) mine product(s); including solid, liquid and gaseous waste generation; and noise, heat and radioactive emissions, from normal and emergency operation: or prospecting target mineral(s);
    (b) estimated reserves or extent of target areas;
    (c) proposed prospecting or mining method(s) (e.g. opencast, underground, long wall, extensions to existing mine, etc.); and
    (d) planned production rate; planned life of mine or duration of prospecting;
24. Environmental Impact:
    (a) the expected environmental impact of the mining operation;
    (b) the expected area of land and water that may be affected;
    (c) a description of measures to be taken on pollution and any monitoring programmes to be implemented;
25. Mining Operation Project Motivation:
    (a) a brief summary of the motivation fro the mining operation; where it is
    (b) intended that the product(s) shall be sold;
    (c) an estimate of the expenditure required to bring the mining operation into
    (d) production;
    (e) an estimate of the total annual expenditure at full production;
    (f) an estimate of the labour force during construction and at full production; and
    (g) an estimate of the multiplier effect on the local regional and national economy;
26. Mining Operation alternatives:
    (d) a brief summary of considered mining operation alternatives;
    (e) mining methods;
    (f) mineral processing method;
    (g) transport
    (h) power and water supply routes;
    (i) sources of water;
    (j) mine infrastructure sites;
    (k) mine disposal sites;
    (l) domestic and industrial waster disposal sites;
    (m) housing sites;
    (n) land use options after rehabilitation;
    (o) alternatives to river diversions; and
    (p) the "No mining operation" option;