

IANNA GOLD LEACH PROJECT



Prepared
for Nahas
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JINHAN MANAGEMENT PLAN

Contents

1.0 SUMMARY	6
1.1 Introduction.....	6
1.2 Property Description	7
1.3 Geology and Mineralization.....	9
1.4 Mineral Resource Estimate	11
2.0: OPEN PIT MINING	12
2.1 Geo-Mechanical.....	12
2.1: Pit Optimization.....	12
2.3: Open Pit Mineral Reserve Estimate.....	12
2.4: Grade Control and de-watering.....	12
2.5: Manpower.....	13
2.6: List of Equipment.....	14
2.7: Production Schedule	15
2.8: Capital Cost Estimate.....	16
2.9: Operating Cost Estimate.....	17
2.10: Cash Flow Estimates.....	18
3.1: Mercury Pre-treatment Strategy of the Ore materials (if present)	20
4.0 INTERFERENCE MINERALS POTENTIAL.....	22
5.2: Mineral Processing	25
5.3: Project Infrastructure	27
6.0: SOCIAL AND ENVIRONMENTAL ASPECTS.....	28
7.0: CONCLUSIONS	33
8.0: REGULATORY REQUIREMENTS.....	36
8.1: Design Criteria.....	37
8.2: Process Facility Design Basis.....	37
8.2: Head Grade	38
8.4: Flowsheet Development.....	38
9.0 ORE PROCESS DESCRIPTION	38
9.0 Process Strategy	38
9.2 Process Description.....	41
10.0: PROCESS INFRASTRUTURE.....	46

10.1: Leach Pad.....	46
10.6: Drainage Control.....	53
10.7: Process Facility Buildings	54
11.0: REAGENTS.....	55
12.0: Site Characteristic and Layout.....	57
12.1: Site Description.....	57
12.2: On-site Infrastructure.....	57
12.4: Groundwater Hydrology	58
13.0: TAILINGS DISPOSAL.....	59
13.1: Environmental Protection Measures	60
14.0: JINCHAN/CYANIDE MANAGEMENT PLAN	61
14.1: Acquisition.....	63
14.2: Transport.....	64
14.3: Handling and Storage.....	65
14.4: Operations	67
14.5: Personnel Safety	70
14.6: Emergency Response.....	71
14.7: Worker Training	71
14.8: Decommissioning	71
15.0: Potential Environmental and Social Impacts and Associated Management/Mitigation Strategies	72
16.0: JINCHAN/CYANIDE EXPOSURE AND EMERGENCY RESPONSE	78
16.1 Contingency and Emergency Response Plan.....	81
16.2: Jinchan/Cyanide-Related Elements in Emergency Preparedness and Spill Contingency Plan	81
16.3: Potential Release/Exposure Scenarios	82
Table 13: Scenario 3. Potential Release of Cyanide Gas/Fumes from the Processing Heap Leah Facility.	85
Table 17: Scenario 7. Breach in TMA (Main Embankment) and/or Secondary Containment Dam .	91
Table 18: Scenario 8. Overtopping of Tailings Management Facility and/or Secondary Containment System (No Dam Breach)	93
16.4: Emergency Response Team/Off Site Responders	95
16.5: Response Equipment and Maintenance/Inspection Requirements	96
16.6: Response Actions.....	96
16.7: Internal and External Notification Requirements	97
17.0: SOCIAL OR COMMUNITY RELATIONS REQUIREMENTS.....	97

18.0: OCCUPATIONAL HEALTH AND SAFETY	98
18.1: Industrial Accident Prevention and Management	99
18.2: Hazard Identification	100
18.3: Hazard Monitoring and Reporting	101
18.4: Training and Education of Employees.....	104
18.5: Industrial Accident Protocol	104
18.6: Occupational Hazards	105
18.6.1: Dust Exposure.....	105
18.6.2: Noise	106
18.6.3: Heat.....	107
18.7 Food and Water Safety.....	107
18.8: Vector Control	108
19.0: DECOMMISSIONING AND CLOSURE OF HLF FACILITIES	108
Appendices.....	110

List of Figures

Figure 1. Showing IGLP in North West Gyana	10
Figure 2: Geological Map of Ianna area.	12
Figure 3: Pictures of hammer mill tailings IGLP	14
Figure 4: Test results for gold colour indication tests	16
Figure 5: Leach pad Construction in Suriname by NAHAS	26
Figure 6: Physiographic map of Ianna area.	36
Figure 7: Simplified process flow diagram.	41
Figure 8: Heap Leach Facility developed by NAHAS in Suriname	44
Figure 9: Heap Leah Facility Layout.	47
Figure 10: Heap Leach Process Facility Infrastructure Layout	48
Figure 11: Loading of leach pad showing impervious layer in Suriname	Error! Bookmark not defined.
Figure 12; Collection Pond and Carbon Columns in Suriname	Error! Bookmark not defined.
Figure 13: Image of fresh water pond.	Error! Bookmark not defined.
Figure 14: Mined out area identified for the TMA	Error! Bookmark not defined.
Figure 15: Physiographic map of project area.	60
Figure 16: OHS incident/accident reporting format	105

List of Tables

Table 1: Properties acquired for IGLP	11
Table 2: Consolidated Mineral Resource Statement Ianna Gold project	13
Table 3: Manpower required for IGLP	17
Table 4: List of equipment for IGLP	18
Table 5: Open Pit production schedule	19
Table 6: Project Capital Cost estimate	20
Table 7: Cash Flow Estimation for Life of Mine	21
Table 8: Project Design Criteria	39
Table 9: Chemical composition of Jinchan	58
Table 10: Potential Environmental and Social Impacts and Associated Management/Mitigation Strategies	79
Table 11: Potential Release of Cyanide Gas/Fumes During Jinchan Off-loading, Storage, and Initial Mixing of Process Solution (package or tank rupture scenario)	85
Table 12: Scenario 2. Potential Release of Cyanide Gas/Fumes During Initial Mixing of Process Solution (Operator error scenario)	86
Table 13: Scenario 3. Potential Release of Cyanide Gas/Fumes from the Processing Heap Leach Facility.	87
Table 14: Scenario 4. Potential Generation of Cyanide Gas/Fumes from Accidental Release of Jinchan Powder During Transport to the Project Site	88
Table 15: Scenario 5. Potential Jinchan Solution Releases Within the Process Facility from Faulty Tanks, Pipelines, Fittings, or Valves	90
Table 16: Release of detoxified tailings to the environment.	92
Table 17: Scenario 7. Breach in TMA (Main Embankment) and/or Secondary Containment Dam	93
Table 18: Scenario 8. Overtopping of Tailings Management Facility and/or Secondary Containment System (No Dam Breach)	95
Table 19: Potential OHS hazards and mitigation strategies.	102

1.0 SUMMARY

1.1 Introduction

The Ianna Gold Leaching Project (IGLP) is a development stage gold leaching project located within North West Region of Guyana. The project area is situated within Ianna area, a forested region of Guyana, within Mining District number Five (5). The area, approximately 184 Km north west of the capital Georgetown and lies within an area inhabited primarily by small scale miners. The area has been mined extensively by medium and small-scale miners from as early as the 1960 s and is still currently one of the more popular mining areas within the district.

Due to extensive mining within the Ianna area, a major issue is the disposal of mine tailings and the reclamation of mined out areas. Tailings in the area include an abundance of hammer mill (crusher) tailings that has not been disposed of in an environmentally friendly manner. This hammer mill tailings due to its very low clay content and the fact that it is already in waste piles allows itself to be readily processed by alternative gold recovery methods. To capitalize on this opportunity NAHAS Mining Service Incorporated (NAHAS) proposes to conduct environmentally friendly chemical leaching of these tailings to recover gold that would have otherwise been lost. Simultaneously the IGLP will provide jobs, income, investment and enable the proper disposal of the hammer mill tailings within the area providing all permitting requirements has been satisfied.

NMSI proposes to conduct heap leaching of the hammer mill tailings using Jinchuan Mineral Ore Dressing an alternative leaching reagent to sodium cyanide as the lixiviant. The tailings or ore as it may now be referred to, has shown gold content ranging between 0.4 to 0.7 g/t, will be processed in a heap leach circuit. The pregnant solution will then be processed in a carbon in column (CIC) circuit to recover adsorbed gold. The gold barren solution with residual lixiviant will then be recycled after adjusting the Jinchuan concentration and pH balance for optimum recovery parameters. This process will be repeated with the pregnant solution being continuously tested using the gold colour indication test to determine when the pregnant solution has no dissolved gold. The activated carbon with adsorbed gold will then be smelted with borax to recover the gold.

The barren tailings will then de-toxified by treatment with alkaline chlorination to neutralize the tailings to 100% free cyanide if any is detected after processing. The residual chlorine water will then treated with incremental doses of sodium metabisulphite to neutralize any chlorine present

before any tailings is released for reclamation. Overall, this approach will contribute to sustainable mining while also aiding in the reclamation of mined out areas and simultaneously providing valuable investment and income.

1.2 Property Description

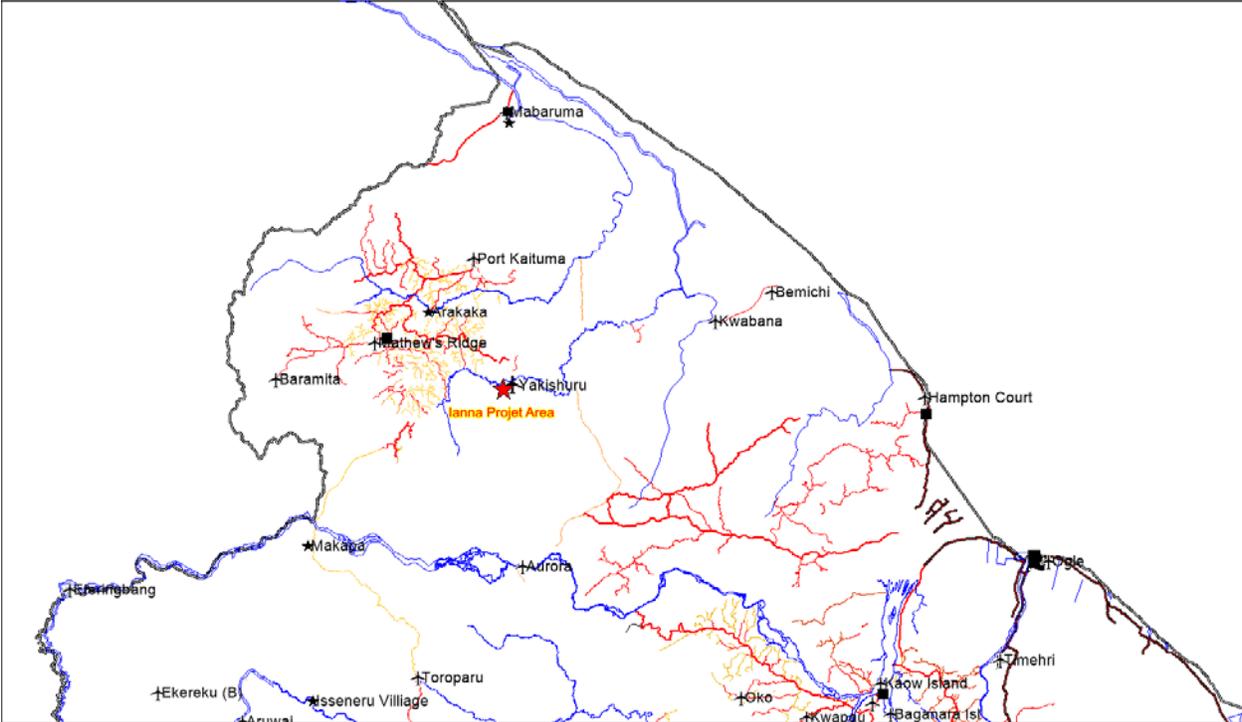


Figure 1. Showing IGLP in North West Gyana

The Ianna Gold Leaching Project is located in the Ianna River area a tributary to the Barama River in the North West District, Mining District Number Five (5). IGLP is owned by NAHAS Mining Service Incorporated (NAHAS), a company duly registered on 2024/02/09 in Guyana. NAHAS proposes to recover gold from the hammer mill tailings found on the Claims of Gerard Naraine and Mihael Harka who have both entered into two-year contracts with NAHAS. Overall, a total of five claims have been contracted for the IGLP. These claims are all found on Stocksheet 10NW, approximately 2 km south of the Ianna River.

Name of Claimholder	Name of Claim	Claim HO #
Gerard Naraine	Pet	51/1990/001
Michael Harka	Pash	51/1990/079
Michael Harka	Job	51/1990/076
Michael Harka	Dimitry	51/2008/033
Michael Harka	Enrique	51/2008/040

Table 1: Properties acquired for IGLP

1.3 Geology and Mineralization

Most of the gold deposit exists within the greenstone belts of the Guiana Shield. The nature of gold deposits is often seen as non-uniform, indiscriminate, patchy and vein type of deposits, spatially varying in resource quantity and grade. A compilation of 135 type of deposits worked and observed in Guyana by Barnard (1990), showed that within the major gold occurrences parts of Guyana. (Barama-Mazaruni Terrain):

- 40% of the mineralized / lodes portion within greenstones and meta-sediments
- 30% of the in-situ placer deposits near granite-greenstone contact zone.
- 20% of the placer deposits over greenstone region.
- The remaining 10% were in other deposits including alluvial deposits and lodes in granitic and gneiss rock.

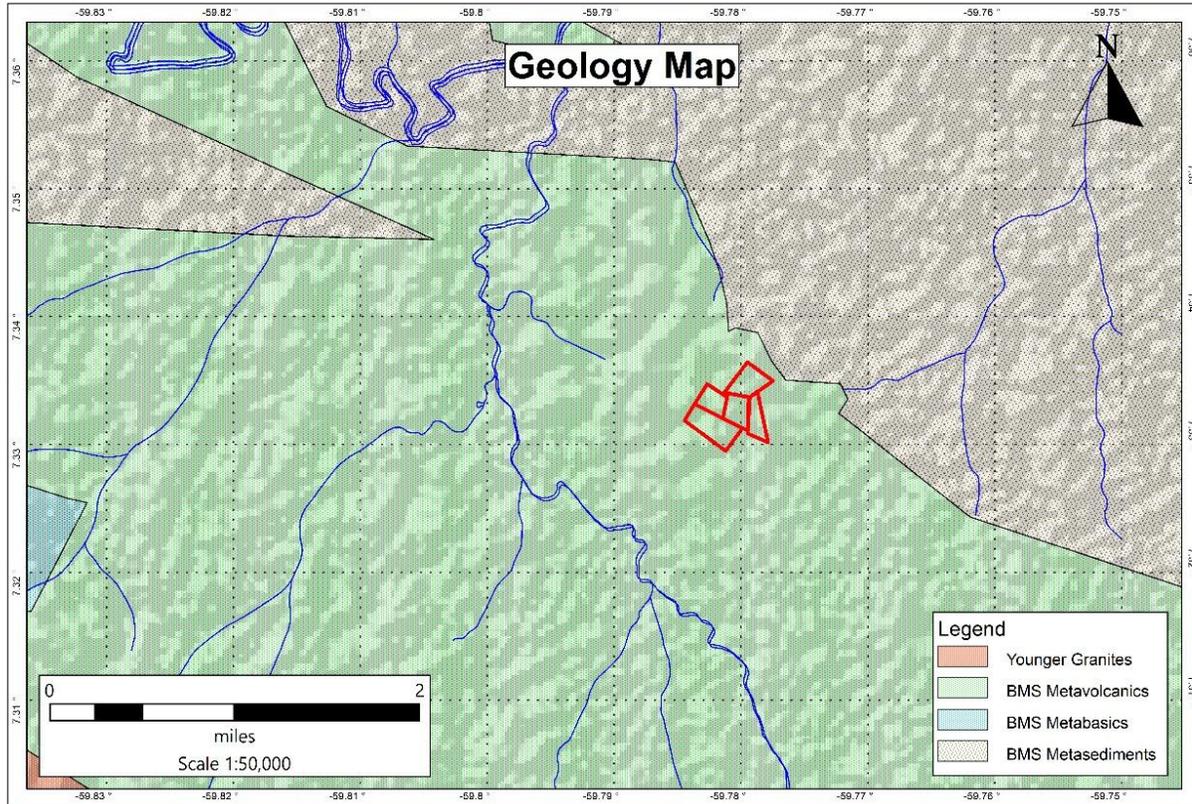


Figure 2: Geological Map of Ianna area.

All zones of gold anomalism are focused on shear zones located in and around diorite and porphyry intrusions of various compositions. Mineralization ranges from bonanza style gold intercepts of visible gold in quartz veins to broad zones of disseminated mineralization associated with arsenian pyrite and pyrrhotite. Recent drilling has also identified a previously unrecognized high-grade shoot component to mineralization associated with flexures in the trace of the principal structures in the area. Since the primary focus of NAHAS is the processing of hammer mill tailings further geological investigations regarding mineralization was not considered at this time.

1.4 Mineral Resource Estimate

This report summarizes the data and parameters utilized by NAHAS to produce the tailing resource model for the Ianna Gold Leach Project. The current mineral resource model and volume of hammer mill tailings reported herein is based on physical measurements and volumetric calculation. Visual estimation was also done for some tailings, this has therefore been referred to as inferred reserves. Currently mining is still being conducted on G Naraine's claim Pet, as such the mineral resource estimation will have to be revised periodically to include the increase in tailings that are now being produced. There are also hammer mill tailings on adjoining properties that are being considered, however negotiations to acquire these rights has not been finalized at this time

The Tailing/Ore Resource statement is presented in Table 2.

Reserve Estimate	Volume of Tailings m³	Mass Of Tailings Tons	Ore Grade (g/t)	Recovery Efficiency (%)	Total (Au Ounces)
Indicated	122,400	208,080	0.6	90	3,612
Inferred	64,000	108,800	0.6	90	1,888
Total	186,400	316,880	0.6	.90	5,500

Table 2: Consolidated Mineral Resource Statement Ianna Gold project



Figure 3: Pictures of hammer mill tailings IGLP

2.0: OPEN PIT MINING

2.1: Geo-mechanical

The primary focus of the IGLP is the processing of hammer mill tailings, the majority of these tailings currently exist as waste piles. As such geological interpretation for open pit analysis was not required.

The basis is that all mine benches/berms will be horizontal, the level of individual benches were determined with regards to the bottom, to mine face heights and to the geomorphology. The criteria for bench design were based on NAHAS mining experience in Suriname, where mining conditions are similar to those at the Ianna mine site.

The design criteria for berms are based on working berm heights of 4 m being the final berm height. Berm widths have been recommended at 6 m with berm face angles (BFA) of 45°. Berm widths design criteria is based on the operating track width of Caterpillar excavators. This allows for the excavators to simultaneously operate and compact bench/berms. Tailings density of 1.7 ton/m³ determined at the site and this density is used in all subsequent estimations and calculations.

2.2: Pit Optimization

Pit optimization is based on current market price of USD 2,000/Oz for analysis. Mine design is based on a conventional surface mine using Caterpillar 323D3 excavators with optimum bucket capacity 1.53m³ for ore and waste loading. Haulage by a 40-ton capacity Howo dump truck while handling within the heap leach pad will be supplemented by 5 m³ bucket capacity front end loader.

2.3: Open Pit Mineral Reserve Estimate and Production Schedule

The IGLP has estimated feed cut-off grades at 0.40 g/t for tailings based on the current gold prices at over US \$2,000. Justification is also based on the fact that the tailings are already stockpiled thus reducing operating costs. Total estimated mineral reserve at the start of operations is 316,888 tons at an average gold content grade of 0.6 g/t.

Based on current models each batch of heap leach will process approximately 9,600 m³ or 16,320 tons of tailings in a 30 days cycle. As such at nominal rates of 80% productivity approximately 156,672 tons of tailings will be processed annually.

2.4: Grade Control and Dewatering

The technical service team will be responsible for continuously sampling of tailings and interpreting the results to define zones above the cut-off grade. Sampling will be done by utilizing the gold colour indication method and will be done on site. Based on results they will indicate those zones in the field and provide direction to the mine operations crew during tailings excavation.



Figure 4: Test results for gold colour indication tests

The dewatering infrastructure and equipment will be sized to handle groundwater inflows and precipitation. The heap leach facility dewatering plan will be developed with emphasis on diverting surface run off water away from the facility. This will be achieved by utilizing ditches and berms to divert surface runoff to settling ponds before discharge to the environment. It is envisaged that ground water inflow should not be significant since most of the tailings/ore being mined is above ground level.

2.5: Manpower

NAHAS will directly employ a total of seventeen (17) persons as shown in table below. However, transportation/delivery services for fuel, rations and supplies will be outsourced local contractors.

NO	STAFF	NO OF EMPLOYEES
1	Site Manager	1
2	Mechanic/technician	1
	Supervisors and others	
3	Loader Operator	1
4	Excavator Operator	3
5	Heavy duty drivers	1
6	Chemical Engineer	1
7	Laborers	6
	Auxiliary Staff	
8	Cooks	1
9	Security	1
10	Medic	1
Total		17

Table 3: Manpower required for IGLP

2.6: List of Equipment

NAHAS will commence the IGLP with the list of equipment outlined in table below. As the mine reaches full capacity there may be the need to adjust this list as the need may arise.

EQUIPMENT LIST (Price Used)	QUANTI TY	Unit Cost (GYD)	TOTAL COST
Haulage Trucks-Howo DumpTruck	1	27,000,000	27,000,000
CAT323 D3 Excavators	2	35,000,000	70,000,000
CAT 950 Wheel Loader	1	37,000,000	37,000,000
Generator (450KVA.) Caterpillar	1	3,500,000	3,500,000
ATV	2	3,000,000	6,000,000
Fuel Pump	1	50,000	50,000
Hilux 4x4 Pik-up	1	8,000,000	8,000,000
Tower Light	1	500,000	500,000
Welding Plant	1	2,500,000	2,500,000
Rectifier	1	12,000,000	12,000,000
Water pumps with metering valves	6	1,800,000	10,800,000
		Total	177,350,000

Table 4: List of equipment for IGLP

2.7: Production Schedule

The overall mine production schedule was developed to feed the leach pad approximately 156,672 tons of tailings per year.

Heap Leaching	Year1	Year 2
Tailings (tons)	156,672	156,672
Overburden (tons)	0	0
Feed Grade (g/t)	0.6	0.6
Recovery Rate (%)	90	90
Gold recovered (g)	84,602	84,602
Gold recovered (Oz)	2,720	2,720
Cashflow(US2,000/Oz)	US\$ 5,440,000	US\$ 5,440,000
Cashflow (Ex Rate \$205/US\$1	\$ 1,115,200,000	\$1,115,200,000

Table 5:Open Pit production schedule

The IGLP is scheduled to operate 365 days per year on a 24 hours per day basis. The work schedule will utilize crews working in 8-hour shifts. An allowance of 80% workforce availability and mine productivity has been factored into the production schedule to compensate for weather/climatic conditions delay.

2.8: Capital Cost Estimates

Project Capital is summarized in Table below. Initial Capital Costs are estimated to be \$375,350,000.

ITEM	COST (GUY\$)
Plant, Machinery and Equipment	177,350,000
Machinery Re-capitalization	48,000,000
Mine development mobilization expenses	22,000,000
Building and civil works	4,000,000
Furniture and Fixtures	2,000,000
Reclamation & Closure	8,000,000
TOTAL	261,350,000
NET INITIAL WORKING CAPITAL	114,000,000
PROJECT COST	375,350,000

Table 6: Project Capital Cost estimate

2.9: Operating Cost Estimates

The life of mine (LOM) operating costs based on annual processing rate of 156,672 tons for two years. is summarized in Table below. Operating costs are estimated at \$1,330,144,784

Ore and tailings handling is estimated to average \$1,220 per ton ore and waste moved.

Processing is estimated at \$2,636 ore processed.

General and administrative (GA) costs are estimated at \$389 per ton of ore and tailing handled within the facility.

Cost Item	Unit Cost Handling	Unit Cost Processing	LOM Cost
Processing (GC)		2,636	825,974,784
G & A	389	1,220	504,170,000
Totals	389	2,636	1,330,144,784

2.10: Cash Flow Estimation

The cash flow analysis for the LOM is shown in Table 7 below;

	Year 1	Year 2
SALES	1,115,520,000	1,115,520,000
Ounces Recovered	2,720	2,720
Operating cost	664,072,392	664,072,392
GROSS PROFIT	451,447,608	451,447,608
Admin, Rehab expenses	124,670,000	124,670,000
Royalty 8 %	89,241,600	89,241,600
NIS 8.4%	399,840	399,840
NET PROFIT BEFORE TAX	237,136,168	237,136,168
Company Tax 40%	94,854,467	94,854,467
Profit/Loss	142,281,701	142,281,701

Table 7: Cash Flow Estimation for Life of Mine

3.0 MERCURY MITIGATION

3.1: Mercury Pre-treatment Strategy of the Ore materials (if present)

Nahas will be continuously testing the ore/ tailings to determine if any mercury is present. However, the likelihood of mercury being present is negligible since the recovery methods used by the mining operations did not use amalgam sheets. The use of amalgam sheets would have required the miners to “spike” their ore with mercury in order to facilitate recovery. Instead, gravity separation methods were used thus mercury would not have been required to “spike” the ore. The presence of residual mercury from the previous processing should therefore be negligible. If any mercury is detected it will be pre-treated as proposed below;

3.2: Assessment and Testing:

- Continuously conduct comprehensive testing of the tailings to quantify the mercury content. This includes sampling at various depths and locations within the tailings to assess the distribution and concentration of mercury if present.
- Utilize advanced analytical methods such as Atomic Absorption Spectroscopy (AAS) or Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for accurate mercury detection.

3.3: Mercury Stabilization and Removal:

- If mercury has been added to the tailings as the primary method for gold recovery—a common practice historically that involves forming amalgams with gold—the approach to handling these tailings needs careful planning to both recover gold and safely manage mercury. This approach has however been negated as stated above. The gold will be recovered using gravity separation; Knelson concentrators before the mercury pre-treatment in keeping in accordance with the Mining act Cap 65:01.
- Implement a pre-treatment process to stabilize and remove mercury from the tailings before leaching. Two effective methods are:

3.3.1: Chemical Stabilization: Use chemical agents such as sulfur-containing reagents (e.g., sodium sulfide) to convert mercury to its non-soluble forms, preventing it from forming complexes with the lixiviant.

3.3.2: Thermal Retorting: Apply thermal treatment to volatilize mercury from the tailings, followed by condensation to recover mercury. This method is effective but requires careful handling due to the toxic nature of mercury vapors. As such this approach will be a last resort due to the aforesaid reason and the required processing cost attached.

3.3.3: Tailings Washing: Wash the pre-treated tailings with clean water to remove any residual mercury or reagents used during stabilization. This step helps minimize the risk of mercury entering the cyanidation process

3.4: Mercury Recovery and Safe Disposal:

- Ensure that any mercury recovered during the pre-treatment process is safely stored and disposed of according to international environmental standards and regulations.
- Consider recycling or selling the recovered mercury to certified handlers for use in other industrial applications, reducing the environmental footprint.

3.5: Monitoring and Reporting:

- Implement a rigorous monitoring program to continuously assess the effectiveness of the mercury removal process (only if it present). This should include periodic testing of the ore materials before and after pre-treatment.
- Maintain detailed records of mercury levels, treatment methods used, and mercury disposal practices. Regularly report these findings to relevant environmental and mining authorities to demonstrate compliance with environmental regulations.

3.6: Worker Safety and Training:

- Provide comprehensive training for workers handling mercury or involved in the pre-treatment process. Emphasize the importance of personal protective equipment (PPE) and safe handling procedures.
- Develop emergency response plans to address potential mercury exposure or spills, ensuring worker and environmental safety.

By implementing these measures, the project can significantly reduce the environmental and health risks associated with mercury in the leaching process, ensuring a safer and more sustainable gold recovery operation. The mercury pre-treatment strategy is based on guidelines from International Cyanide Management Code (ICMC), United Nations Environment Program: Global Mercury Partnership, Minamata Convention Mercury and World Health Organization.

4.0 INTERFERENCE MINERALS POTENTIAL

4.1: Interference Assessment:

- Based on the geochemical and mineralogical data, assess the potential for identified elements and minerals to interfere with cyanidation. For example:
 - Sulfides, such as pyrite (FeS_2) and arsenopyrite (FeAsS), can consume oxygen and cyanide, reducing process efficiency.
 - Copper can complex with cyanide, increasing cyanide consumption.
 - Carbonaceous material can adsorb gold-cyanide complexes, reducing gold recovery.

4.2: Mitigation Strategies:

- Develop strategies to mitigate the impact of interfering elements and minerals. Possible approaches include:
 - **Pre-Oxidation:** Treat tailings with oxygen or oxidizing agents to oxidize sulfides and other reactive minerals before cyanidation.
 - **Gravity Separation:** Use gravity separation techniques to remove coarse-grained, free gold and sulfides before cyanidation.

- **Flotation:** Employ flotation to concentrate gold and remove sulfides and other minerals that might interfere with cyanidation.
- **Blinding Agents:** Add blinding agents to the cyanide solution to complex with interfering metals like copper, reducing their impact on cyanide availability.
- **pH and Cyanide Control:** Carefully control the pH and cyanide concentration during leaching to optimize conditions for gold dissolution while minimizing the effects of interfering elements.

4.3: Pilot-Scale Testing:

- Conduct pilot-scale leaching tests using the tailings material to empirically assess the impact of identified elements and minerals on cyanidation efficiency and validate the effectiveness of proposed mitigation strategies.

4.4: Continuous Monitoring:

- Implement a continuous monitoring program to assess the concentration of potentially interfering elements and minerals in the tailings over time, adjusting mitigation strategies as necessary based on ongoing analysis results.

By systematically establishing the presence of other elements or minerals in the tailings/ore materials and implementing targeted mitigation strategies, the project can enhance the efficiency of the gold cyanidation process, ensuring optimal gold recovery while minimizing environmental and operational risks.

5.0: HEAP LEACHING SPECIFICATION

5.1: Site Preparation & Set up

A leach pad with a high berm will be constructed to ensure no spillage into the environment and also to prevent loss of valuable lixiviant and gold ore. The Area covers 2400 m², its dimensions are 60 m by 40 m with a height of 4 m with the slope of the walls at an angle of 45 degrees. Berm widths of 6 m will be utilized based operating track width of Caterpillar excavators. This allows for the excavators to simultaneously operate and compact berms. Each leach pad will be construct with 3 m berm above ground level with a nominal capacity of 9,600 m³. The concept of

construction above ground level is to allow for gravity flow of lixiviant to the pregnant solution pond.

The construction of leach pads will be based upon guidelines on environmental management systems (ISO 14001), quality management (ISO 9001), and health and safety (ISO 45001) which can influence the operation of heap leach facilities. Its integrity will follow these international standards:

ASTM D5744-18: Standard Test Method for Laboratory Weathering of Solid Materials Using a Humidity Cell. This is relevant for assessing the long-term stability and environmental impact of heap leach pads.

ASTM D6392-12(2019): Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods. This is crucial for ensuring the integrity of the liners used in heap leach pads.



Figure 5:Leach pad Construction in Suriname by NAHAS

The Leach Pad will then be covered with impermeable geomembrane to prevent leaching into the environment.

A composite liner system comprising a linear low-density polyethylene (LLDPE) geomembrane and a compacted low-permeability soil liner with a minimum thickness of 0.3 meters will be used for the leach pad. The geomembrane will have a thickness of 1.5 millimeters (60 microns). The geomembrane will have bottom texturing and single-side texturing.

Above the pad liner, a drainpipe network will be built and embedded in a minimum 0.6 m liner cover drain fill layer made of strong, long-lasting, free-draining granular material. The process pond will receive gravity-drained solution, storm runoff, and infiltration flows gathered by the drain pipe network.

To keep wildlife from getting to the pad, a stock-proof mesh fence with locking gates will be built around the HLF. The fence also serves to keep people safe and prevent unlawful access to the pad area.

5.2: Mineral Processing

The IGLP processing facility is designed to treat 156,672 tons of ore/tailings per annum. Preliminary tests have shown that the mine tailings in the Ianna area is readily amenable to conventional Jinchuan leaching. Jinchuan or Metallic Ore Dressing Agent/SHJCA02 is a brand of leaching reagents specifically designed by Guangxi Senhe High Tehnology Co LTD of Guangxi, China for the extraction of gold from ores. Since the tailings/ore consists primarily of hammer mill tailings that has already been stockpiled there is no requirement for a milling circuit. There is also no requirement for pre-treatment or washing to remove clays since the tailings have not been contaminated by siltation due to surface run off. Leaching will be done in batches of 9,600 m³ or 16,320 tons. Pregnant leach solution will be treated in carbon- in columns (CIC) circuit to recover gold from the lixiviant. The barren lixiviant will then be recycled in the leaching process after the pH and leaching agent concentrations have been adjusted. Gold will be recovered by direct smelting of the loaded carbon. All of the processes outlined will follow industry proven standards.

All of the heap leach tailings will be treated using the alkaline chlorination cyanide neutralization method prior to tailings disposal. Tailings from the leach pad will then be excavated, loaded and

hauled to an engineered tailings management area (TMA) for safe disposal. Further neutralization of the cyanide if present will be achieved here with aging and natural degradation. The chlorine solution will be diverted to the chlorine pond where it will be recycled through neutralization systems.

Before neutralization, a minimal analysis will be conducted using silver nitrate and potassium iodide. This analysis helps determine if any residual cyanide is still present in the solution. The goal is to ensure that the cyanide concentration is reduced to 100% absence in the solution. It should be noted that the barren solution will be reintroduced into circuit and discharge will only occur in extreme circumstances. Once the absence of cyanide is confirmed, the solution can be safely discarded. This process is crucial to prevent any potential environmental impact and ensure the responsible management of cyanide solutions in the mining industry.

It is important to note that the use of cyanide in gold cyanidation requires careful handling and adherence to strict safety protocols, only trained and certified handlers of Cyanide will be doing the supervision. Cyanide is a highly toxic substance, and proper measures must be in place to prevent its release into the environment. Mining operations employ various safety measures, such as containment systems and appropriate waste management, to ensure the responsible use and disposal of cyanide solutions.

The overall strategy for the gold process facility design is to engineer and construct an efficient, safe, robust process facility to recover the maximum amount of gold using industry proven equipment and processes. Process control will employ standard industry techniques including onsite laboratory and instrumentation. Protection of the public, employees, and the environment will be implemented into each step of the mining and recovery processes.

The IGLP process facilities will incorporate the following unit operations:

- Heap Leach Facility,
- Storm water ponds 1-2
- Chlorine water pond
- Carbon Adsorption (Carbon-in-Column)

- Pumps
- Gold room/Smelting Facilities

5.3: Project Infrastructure

Due to the remote location of the project site and the absence of any local infrastructure, it is pertinent that the project design incorporates all the infrastructure components that a medium scale mining project requires.

Access to the project area is by the 70 KM Port Kaituma to Barama River to Ianna. The Port Kaituma wharf will be utilized for barges, cargo vessels and fuel tankers during project construction and operations. An alternative route will be transportation by cargo boats from Charity directly to Ianna via the Barama River. This route can only be utilized when the Barama River water is at a high level. For emergencies and fast access, the Yakishuru Airstrip will be utilized from either Eugene Correia Airport, Ogle or the Cheddi Jagan International Airport, Timehri. The Yakishuru Airstrip is only approximately 3 km from the Ianna Project area via all-weather road.

At the project site the following operations support infrastructure facilities will be or are constructed, since this is an ongoing project:

- On-site service roads and heavy equipment haulage roads;
- Camp accommodation with associated facilities to provide potable water and sewerage disposal;
- A fuel farm, power will be generated by overhead power lines where possible;
- A Tailings Management Area (TMA) for storage of barren tailings; and
- A heavy equipment maintenance workshop, warehouse, Heap Leach Facility, mine buildings, administration buildings, communication systems, waste disposal area and mine waste stockpile areas.

6.0: SOCIAL AND ENVIRONMENTAL ASPECTS

6.1: Environmental Studies

NAHAS is committed to the establishment of environmental and social practices for the AJLP that comply with the legal requirements of Guyana, as well as current World Bank/International Finance Corporation (IFC) performance standards 1 (IFC, 2019) and the IFC 'Environmental, Health and Safety Guidance for Mining (IFC 2007).'

6.1.1: Climate; the climate is tropical with two wet seasons (April to August, and December-February), and two dry seasons (February to April, and August to December). The average temperature is 26°C (79°F), with an average mean rainfall of 2,124 mm, with major inter-annual variations in rainfall attributable to the 'El Niño/ La Niña' cycle.

6.1.2: Air Quality; there are no developed areas with significant fixed or mobile sources of atmospheric emissions in the area surrounding the Project concession. Gaseous emissions in the project area are mostly attributable to rotting vegetation. Some aerial emissions are also related to the operation of Artisanal Small-Scale Mining (ASM) dredges, chainsaws, generators and other motorized equipment. Due to the high humidity and significant level of rainfall, fires are rare in the region, and dust levels on the AJLP roadways, trails, or clearance areas are typically low except on locally heavily trafficked sections of roadway in unusually dry conditions.

6.1.3: Surface Water Flow and Quality; the main drainage feature of the Project area is the Barama River and its tributaries, namely Ianna Creek. The quality of surface water in the Ianna Creek will be monitored during the Environmental Management of the project life.

6.1.4: Ground Water Flow and Quality; ground water flow and quality for each of the tailing processing area needs to be investigated on a weekly basis and will be monitored throughout the life of the mine.

6.1.5: Soils; the native soil of the project area is classified as Red-Yellow Podzolic soil, which refers to a group of acidic, zonal soils having a leached, light-colored surface layer and a subsoil containing clay and oxides of aluminum and iron, varying in color from red to yellowish red to a bright yellowish brown. It is designated as poor agricultural land (NAREI).

6.2: Geochemistry; the geochemistry of the project area has not been investigated by NAHAS. Results from previous geological surveys have shown that the majority of samples tested have very low acid rock drainage (ARD)/metals leaching potential. Geochemical data collected during mining will be used to adjust estimates of leachate loads to support water quality modelling and the ongoing management of the Mine Water Pond (MWP), Fresh Water Pond (FWP), Tailings Management Area, with respect to maintaining effluent/seepage water quality within IFC and International Cyanide Management Code (ICMC) guidelines.

6.3: Flora; the IGLP mining permits and access road corridors were all completely forested prior to initiation of regional ASM and Semi Mechanized Mining (SMM). This part of Guyana does not contain savannah areas or marshes. Canopy trees are the dominant plant strata, followed by lower-story trees, plants and undergrowth. However, the project area has been intensely mined and there is very sparse vegetation mainly of secondary nature. None of the plant species identified in the project area are locally endemic, of significance to local communities, or listed as threatened by the International Union for Conservation of Nature and Natural Resources (IUCN) Red List or equivalent national or regional assessment.

6.4: Terrestrial Fauna; No threatened or endangered species have been observed within the project area of influence (AOI). Evidence suggests that the presence of ASM, SMM, logging, hunting and human activities in the project AOI has significantly reduced the natural abundance of large mammals and has also led to the retreat of more sensitive mammalian species due to noise and other human activity.

6.5: Aquatic Fauna; The types of fish species present in the project area will have to be investigated during the baseline studies of the project area. However, it is not expected that there will be any threatened or endangered species will be encountered during this study.

6.6: Possible Impacts and Mitigation Measures

The most significant associated impacts highlighted from preliminary environmental studies and investigations include:

- Runoff from roadway rights of way (ROWs), tailings stockpiles, mine pit, and other disturbed areas, leading to increased sediment loads to surface water, and associated loss of habitat;
- Potential seepage or spills of fuels and reagents to the land surface, surface water, and groundwater;
- Potential failures of tailings or water management dams, in operation or in closure/post closure.

The proposed Environmental Management Plan (EMP) will be designed to meet Guyana EPA standards and Best Management Practices (BMPs), GGMC Mining Act and Regulations, IFC environmental and performance standards, and the international cyanide management code. The EMP and its supporting management plans will establish requirements and procedures for a comprehensive monitoring program that will include but not limited to:

- Stability and pH of tailings stockpile runoff;
- Integrity and geotechnical stability of the TMA;
- Detection and mitigation of erosion issues that may occur in disturbed areas and constructed earthworks;
- Maintenance of a water balance for the fresh water pond (FWP) and mine water pond (MWP), as well as WMP seepage and discharge water quality;
- All aspects of the procurement, transportation, and operational/closure phase management of Jinchuan reagent and resulting free cyanide;
- Delivery, storage, and management of fuel and other hazardous materials;

- Spill prevention, control, and contingency planning;
- Ambient air quality, noise, and vibration;
- Periodic evaluations of biodiversity in the area immediately affected by the project;
- Management of hazardous and nonhazardous wastes;
- Environmental aspects of occupational health and safety and accident prevention planning;
- The effectiveness of decommissioning and closure actions.

6.7: Permitting Considerations

NAHAS has entered into two years contracts with Gerard Naraine and Michael Harka to operate on one and four Claims respectively. The license and environmental bonds for each of these claims are in good standing with GGMC. The annual renewal of these claim license is subject to renewal following conditions stipulated by the regulatory agency, GGMC. An Environmental permit will be obtained from the Guyana EPA before commencement of mining and processing operations at the Ianna site.

Several other permits will be obtained from the regulatory government agencies prior to commencement of full-scale mining operations:

- Permit to use cyanide (GGMC/EPA);
- Claim Licenses (GGMC);
- Environmental Bond (GGMC);
- Permit to Operate Solid Waste Landfills (Guyana EPA, Ministry of Health, Central Housing and Planning Authority);

6.8: Social or Community Impacts

Small, temporary or transient ASM and SMM encampments may be encountered in the vicinity of the Ianna Gold Project. There are no formal or established communities and settlements in the immediate vicinity of the project site. The IGLP characterizes itself as a medium scale mining operation and as such is not expected to generate any direct socio-economic effects that often characterizes other mining projects. It should be noted that the mining permits will require consistent surveillance to identify potential illegal ASM and SMM incursions. There are currently no permanent communities or residences within the Ianna Project Area that will require physical displacement or resettlement actions.

There are no known archeological sites or areas of significant cultural interest within the project concession. However, any artifacts or items of potential historical, archeological, or anthropological interest, that may be found during the life of the project will be handed over to the Guyana National Trust and Ministry of Culture. There are no communities to be considered to be in the Project AOI.

The Ianna Project Area is not located on lands traditionally owned or customarily used by indigenous Amerindian Peoples. Amerindian Groups may traverse the project area during the LOM and provisions will be made for this in the Communities Relations Management Plan.

6.9: Reclamation and closure

NAHAS has developed a conceptual Mine Reclamation and Closure Plan for the Project which will be issued and implemented within the context of the IGLP EMP and periodically updated over the life of the mine. The Mine Reclamation and Closure Plan addresses progressive, interim, and final closure actions; specific actions to minimize the attractiveness of the closed site for any future ASM incursions; workforce retrenchment considerations; and post-closure inspection and monitoring. The Mine Reclamation and Closure Plan is therefore concentrated on the decommissioning and closure of primary elements of infrastructure at the IGLP mineral processing operations site and main camp; these include:

- All open pit mining areas;
- Run of mine stockpiles;

- The diesel power plant, power distribution substation, and transmission lines;
- The fuel storage tank farm, secondary containments, and fueling station;
- The mineral processing facility (HLF and cyanide detoxification circuits)
- The fresh and mine water ponds;
- Laydown areas and warehouses;
- Mechanical and maintenance shops;
- Permitted solid waste landfill;
- Hazardous waste storage facility area;
- Haul and access roads;
- Main camp and administrative buildings; and,
- Potable water and septic systems.

7.0: CONCLUSIONS

7.1: Geology and Resources

- The Ianna area has been mined extensively with gold being recovered from quartz veins of the Sweet Heart, Money Pond, Fernleaf and King's Ransom Deposits.
- NAHAS has identified and tested tailings from the Fernleaf, Sweetheart and Money Pond mineralization and determined that it is feasible to proceed with the IGLP.
- NAHAS has measured and indicated reserves is estimated to be five thousand five (5,500) ounces of gold.
- Tailings/ore at the Ianna Mine Site has been estimated to be 316,880 tons in the measured and inferred categories.
- The potential for reserves to be revised upward is likely since there is mining being conducted that is producing hammer mill tailings.

7.2: Mineral Processing

- Test work conducted by NAHAS indicated that the Ianna site tailings/ore can be processed in a conventional Heap Leach Facility.
- Tests determined that Jinchan metallic ore dressing is a viable leaching agent for the project, with recovery rates of 90% being achieved.
- Jinchan consumption has been determined from tests conducted to averaged 1.1 kg/ton of ore.
- Jinchan consumption from the laboratory tests averaged 1.27 kg/t for tailings with few deleterious cyanide consumers;
- The tailings produced from the leaching process are amenable to detoxification by alkaline chlorination and further detoxification by aging or natural degradation in an approved TMA.

7.4: Infrastructure

- Proper logistics planning will play a key role in supporting construction and operation of the project;
- Hydrological evaluation of the proposed TMA area are essential before construction starts;
- The hydrological assessment shows that an average annual precipitation of over 2,100 mm is expected at the project site. Diversion channels and collection/ settling ponds are essential for controlling and handling of surface runoff.

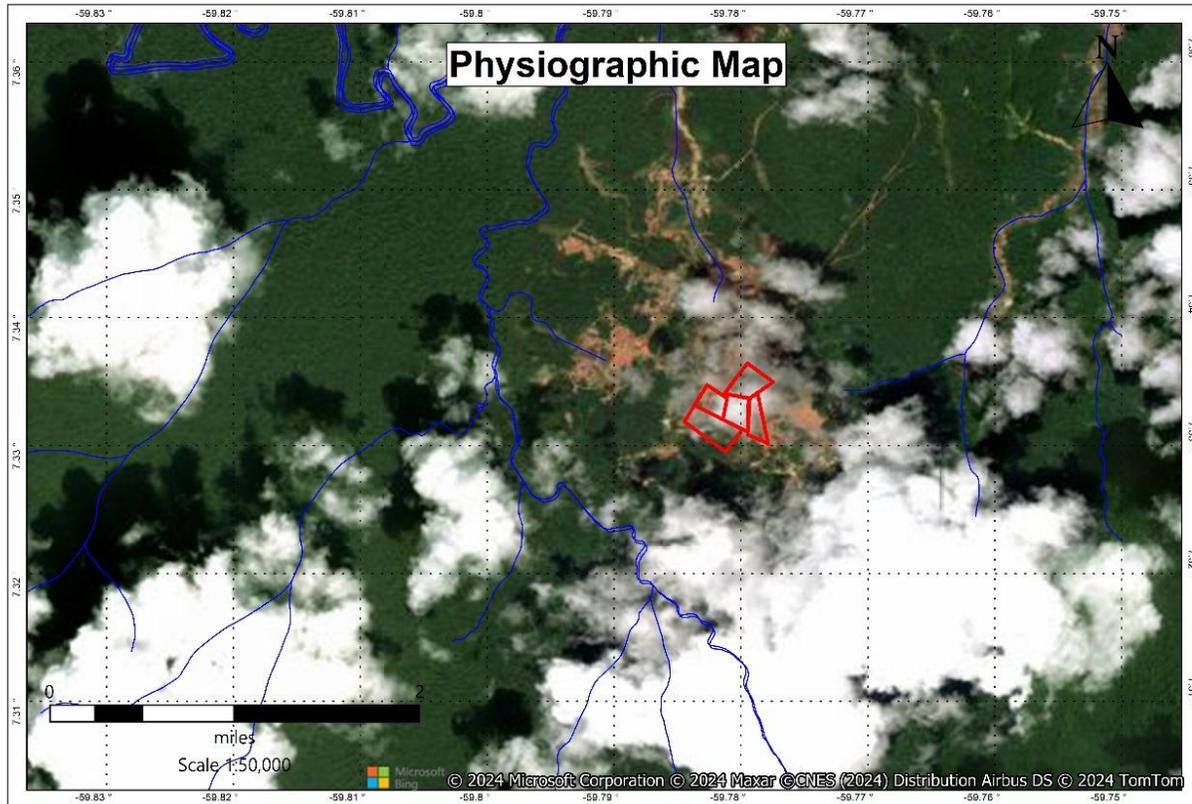


Figure 6: Physiographic map of Ianna area.

7.5: Environmental and Social Conclusions

- The project's area of influence (AOI) has been significantly impacted by historical artisanal and small-scale mining (ASM), SMM, logging, and hunting, for well over a eighty years;
- Large fauna that are otherwise common in pristine habitats along similar types of rivers in this area of South America are absent or rare in the project AOI, and may be viewed as a key indicator of significant historical human impact;
- No rare, threatened, or endangered species have not been observed in the area of the project;
- There are no formal or established communities or settlements in the immediate vicinity of the Ianna site, and the project is not expected to generate direct socio-economic effects;

- Access by traditional unregulated or illegal ASM or SMM to the project vicinity by transient miners is of concern;
- There is no evidence of indigenous hunting activity within the proposed mining area;
- Results of geochemical testing to date indicate that project overburden and waste rock has very low acid rock drainage (ARD)/metals leaching potential;
- The management of tailings and mining-impacted water will be designed for high-precipitation climatic conditions; and
- The project will develop and implement a comprehensive Environmental Assessment and Management Plan (EAMP).

8.0: REGULATORY REQUIREMENTS

Jinchan metallic ore dressing is comprised of two main components, namely carbonized sodium cyanurate ($C_6H_3N_6Na_3O_3$) and thiourea ($SC(NH_2)_2$). Composition of these compounds 70 percent carbonized sodium cyanurate and 30 percent thiourea, respectively. Generally, the carbonized sodium cyanurate is considered to be more reactive than the thiourea. Based on the use of Jinchan as the leaching agent for the IGLP a Cyanide Management Plan will be developed.

This cyanide Management Plan will be developed to satisfy the requirements of Mining Regulation 216 (1) Obtaining a Cyanide Permit, the requirements of the Environmental Protection Act 1996 and the International Cyanide Management Code.

The principles and standards of practice related to the following components, activities and management measures are relevant to cyanide management at the IGLP:

- Transportation;
- Handling and storage;
- Process solutions and waste streams;
- Decommissioning;
- Worker safety;
- Emergency response and training; and
- Public consultation.

The Cyanide Management Plan will be integrated with other relevant Environmental Management Plans (e.g., Emergency Response Plan, Spill Contingency Plan) to ensure that worker and public health and safety and the environment are protected.

8.1: Design Criteria

The overall engineering approach is to design a process facility that can process hammer mill tailings within simple operating parameters that confirm to industry standards and regulatory requirements. Table below shows the key project and ore-specific criteria for the process facility design.

Criteria	Units	Design
Mine Life	Years	2
Heap Availability	%	80
Heap Days per year	days	365
Heap Hours Per day	Hr.	24
Ore Characteristics		
Hammer Mill Tailings	NA	NA
Ore Specific Gravity	g/ ton	1.7
Production Rates		
Annual	t/annum	156,672
Heap Monthly	t/mth	16,320
Heap Daily	t/d	544
Gold		
Grade (LOM Average)	g/t	0.6
Recovery (LOM Average)	%	90
Leach Circuit Type		Heap Leach
Leach Circuit Residence Time	Days	30
Leach Stages		2
Carbon Adsorption Stages		10
Detoxification Process	NaOCl	Na ₂ O ₂ O ₅
Detoxification Target	CN(WAD) ppm	0.5
Lime Consumption (CaO)	kg/t	2
Chlorine Consumption	kg/t	0.1
Sodium Metabisulphite Consumption (SMBS)	kg/t	0.4
Jinchan	Kg/t	1

Table 8:Project Design Criteria

8.2: Process Facility Design Basis

The process facility design is based on the following parameters:

- A nominal ore throughput rate of 156,672 ton per year;

- Plant design availability of 80% (after ramp-up),
- Sufficient process facility design flexibility for treatment of all ore types at design throughput.
- Safety protocol built into the design
- Environmental controls built into the design
- Ease of operation and maintenance

8.2: Head Grade

The process facility is designed to treat various grades of ore, based on results a minimum of 0.4 g/t has been determined to be the cutoff grade.

8.4: Flowsheet Development

The process facility flowsheet design was based on test work conducted by NAHAS, previous study designs and industry standard practices for gold recovery from tailings. This was also supplemented with the experience NAHAS developed while conducting similar mining projects in Suriname.

9.0 ORE PROCESS DESCRIPTION

9.0 Process Strategy

The IGLP processing facility is designed to treat 156,672 tons of ore/tailings per annum. Preliminary tests have shown that the mine tailings in the Ianna area is readily amenable to conventional Jinchuan leaching. Jinchuan or Metallic Ore Dressing Agent/SHJCA02 is a brand of leaching reagents specifically designed by Guangxi Senhe High Tehnology Co LTD of Guangxi, China for the extraction of gold from ores.

The proposed process encompasses one phase to accommodate the processing of tailings. This will be a single-phase process that will consist of constructing the Heap Leach Facility. The facility will process batches of approximately 16,320 tons of tailings per month.

Since the tailings/ore consists primarily of hammer mill tailings that has already been stockpiled there is no requirement for a milling circuit. There is also no requirement for pre-treatment or washing to remove clays since the tailings have not been contaminated by siltation due to surface run off. Leaching will be done in batches of 9,600 m³ or 16,320 tons. Pregnant leach solution will be treated in carbon- in columns (CIC) circuit to recover gold from the lixiviant. The barren lixiviant will then be recycled in the leaching process after the pH and leaching agent concentrations have been adjusted. Gold will be recovered by direct smelting of the loaded carbon. All of the processes outlined will follow industry proven standards.

All of the heap leach tailings will be treated using the alkaline chlorination cyanide neutralization and sodium metabisulphite method prior to tailings disposal. Tailings from the leach pad will then be excavated, loaded and hauled to an engineered tailings management area (TMA) for safe disposal. Further neutralization of the cyanide if present will be achieved here with aging and natural degradation. The chlorine solution will be diverted to the chlorine pond where it will be recycled through neutralization systems.

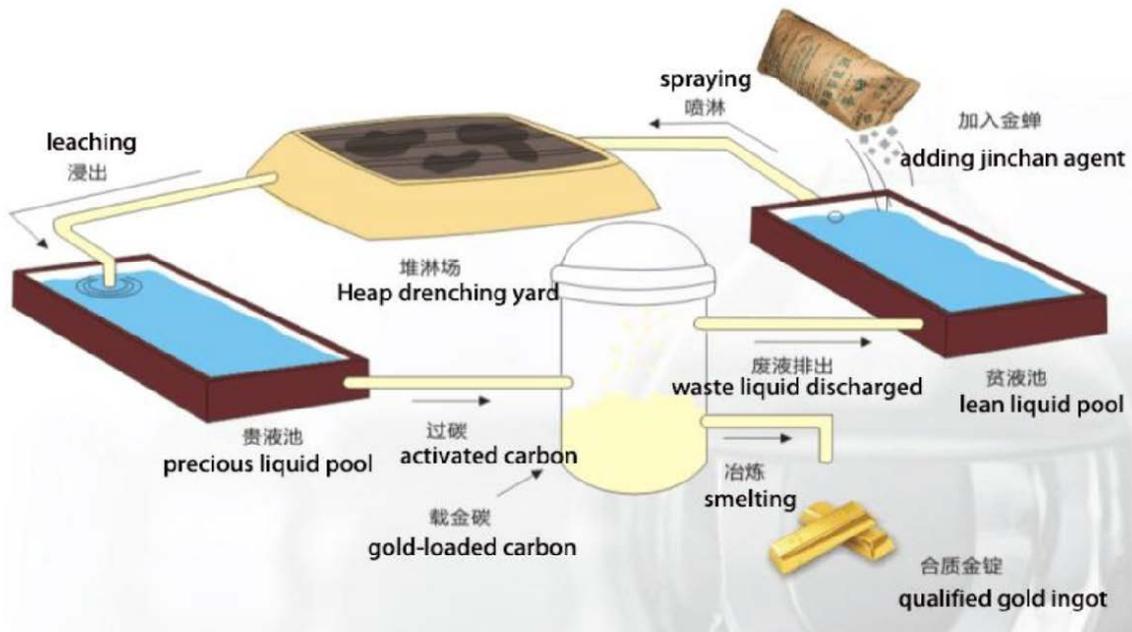


Figure 7: Simplified process flow diagram.

Before neutralization, a minimal analysis will be conducted using silver nitrate and potassium iodide. This analysis helps determine if any residual cyanide is still present in the solution. The goal is to ensure that the cyanide concentration is reduced to 100% absence in the solution. It should be noted that the barren solution will be reintroduced into circuit and discharge will only occur in extreme circumstances. Once the absence of cyanide is confirmed, the solution can be safely discarded. This process is crucial to prevent any potential environmental impact and ensure the responsible management of cyanide solutions in the mining industry.

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has been developed as an alternative leaching agent to Sodium Cyanide. Jinchuan utilizes a leaching mechanism similar to cyanide, however the cyanide within the carbonized sodium cyanurate is not easily dissociated thus making Jinchuan much less toxic.

The overall strategy for the gold process facility design is to engineer and construct an efficient, safe, robust process facility to recover the maximum amount of gold using industry proven equipment and processes. Process control will employ standard industry techniques including onsite laboratory and instrumentation. Protection protocols for the public, employees, and the environment will be implemented into each step of the mining and recovery processes.

The IGLP process facilities will incorporate the following unit operations:

- Heap Leach Facility,
- Storm water ponds 1-2
- Chlorine water pond
- Carbon Adsorption (Carbon-in-Column)
- Pumps
- Gold room/Smelting Facilities

9.2 Process Description

The process facility design is based on a flowsheet with unit process operations that are proven in the minerals processing industries. The IGLP gold circuit includes the following unit processes:

9.2.1: Tailing/ore Preparation: The tailing is mixed with water and any necessary additives, such as lime, to adjust the pH, once it has been stacked on the peach pad. Lime is often added to maintain alkalinity. This promotes the stability of the leaching agent solution and increases the efficiency of the leaching process.

NAHAS will be continuously testing the ore/ tailings to determine if any mercury is present. However, the likelihood of mercury being present is negligible since the recovery methods used by the mining operations did not use amalgam sheets. The use of amalgam sheets would have required the miners to “spike” their ore with mercury in order to facilitate recovery. Instead, gravity separation methods were used thus mercury would not have been required to “spike” the ore. The presence of residual mercury from the previous

processing should therefore be negligible. If at any point mercury is detected then mercury mitigations measures will be followed.

The tailings will be loaded or staked onto the leach pad using CAT 950 Wheel Loader from the Run of Mine (ROM) stockpile. This stockpile will be positioned at the edge of the leach pad in order to reduce travel time for the loader. The ROM stockpile will be supplied by the Howo dump truck which in turn will haul tailings from the various tailings spoil piles.

9.2.2: Leaching: The leaching process consists of stacking the tailings on the leach pad in lifts and leaching each individual lift to extract the gold. Barren Leach Solution (BLS) referred to as the lixiviant containing diluted Jinchuan and pH balancing agent(lime) will be applied to the ore heap surface using a combination of drip emitters and sprinklers at an application rate of 6 L/hr/m². The leach cycle for each batch of ore being processed should be approximately 30 days.

The leaching solution or lixiviant will percolate through the tailings to the drainage system above the pad liner, where it will be collected in a network of perforated drain pipes. These drain pipes will be covered with pervious geotextile and embedded within a 0.6 m minimum thick granular cover drain fill layer above the liner. The solution now termed the Pregnant Leach Solution (PLS) will gravity flow to the pregnant solution pond. PLS collected in the pregnant solution pond will then be pumped to the carbon columns for gold adsorption the gold. After gold absorption the lixiviant now termed the Barren Leach Solution (BLS) is collected within the barren leach solution pond where the concentration of the leaching agent and pH balancing is adjusted before recycling the lixiviant/BLS to the leach pad.



Figure 8: Heap Leach Facility developed by NAHAS in Suriname

9.2.3: The solution /lixiviant; Consideration must be given to the concept that Jinchan has been developed as an alternative leaching agent to Sodium Cyanide. Jinchan utilizes a leaching mechanism similar to cyanide, however the cyanide within the carbonized sodium cyanurate is not easily dissociated thus making Jinchan much less toxic. Jinchan is considered a more environmentally friendly lixiviant and has a simpler operating procedure than sodium cyanide.

Jinchan will be administered at a concentration of 1.0 g/l of lixiviant with consumption being estimated to be approximately 1kg/ton of ore processed. To obtain maximum recovery parameters the pH of the lixiviant within the HLF will be maintained at a pH of 11. Lime (CaO) will be administered to the lixiviant, lime consumption is estimated to be approximately 2kg/ton of ore processed. The administration rate of lime will be between 1.5 to 2 g/L of lixiviant. The dosage rate will be adjusted as the leaching process continues in order to maintain the pH balance.

9.2.4: Pregnant leach solution; as the lixiviant percolates through the ore it dissolves gold particles, this pregnant leach solution (PLS) flows to the PLS pond under gravitational forces. The PLS is then pumped from the process pond to the adsorption feed head tank. From there, the PLS discharges to a single train of 10 carbon adsorption columns. These columns stacked with activated carbon are used to adsorb the metals from the solution.

9.2.5: Adsorption: After the leaching stage, the PLS is pumped through the adsorption circuit, where it passes through a series of activated carbon columns or tanks. The PLS enters carbon column 1, flows through the Carbon-in-column (CIC) circuit, finally discharging from carbon column 10 over a carbon safety screen to the barren solution pond. The dosage rate of activated carbon is estimated at approximately 45 g/L. The carbon adsorbs the gold from the solution, forming a loaded carbon.

9.2.6: Smelting and Refining: The final step in the process is to recover the gold from the loaded carbon and to remove impurities and obtain a high-purity gold. This is typically done through smelting. This process is where the gold is melted along with the addition of borax and silica in order to remove the impurities. Silica, borax, nitrate and soda ash will be combined to form a flux, which will be used to remove impurities during smelting. The fluxes will be weighed out according to the desired mix and combined using a flux mixer. The flux will be combined with the loaded carbon and smelted in the gas-fired furnace.

9.2.7: Tailings detoxification process using alkaline chlorination and sodium metabisulphite to reduce the weak acid dissociable cyanide (CNWAD) levels in the leach tailings prior to discharge to the TMA. The free cyanide or residual; cyanide in the leach heap will be oxidized by the use of chlorine or hypochlorite under alkaline conditions. This will reduce the free cyanide in the processed ore to an environmentally safe level of 0.2 mg/l prior to disposal. The Cyanide detoxification process will be accomplished in a -day cycle after leaching. The process is proposed to require 2 days for draining, 2 days for alkaline chlorination treatment, one day for SMBS treatment to neutralize chlorination and two days for final draining. The operating parameters of this process will however be adjusted to meet the tailings detoxification requirements.

The chlorine detoxification solution is sprayed on the heaps, using the same sprinkler system used in the leaching cycle. After the solution percolates through the heap, it is collected in the chlorine pond and recycled after adjusting the chlorine content. This process is repeated with SMBS to neutralize the chlorine.

Sections of the leach pad will be sampled separately using 1.5-inch (37 mm) diameter pipes driven vertically through the heap to the pad, before the spent ore is emptied from the leach pad. The core samples will be analyzed for free cyanide and total cyanide.

9.2.8: Tailings Management Area; TMA, for leach residue after washing and detoxification is discharged to the engineered TMA for further detoxification through natural aging process and thence mine reclamation.

9.2.9: Storm water ponds; Built into the leaching facility will be two storm water ponds. These ponds will be contingency for the storage, treatment and discharge of excess pregnant and barren leach solutions due to excess water within the facility due to excessive rainfall. Each storm water pond will be equipped with a detoxifying agent point and a monitored regulated discharge point as shown Figure below.

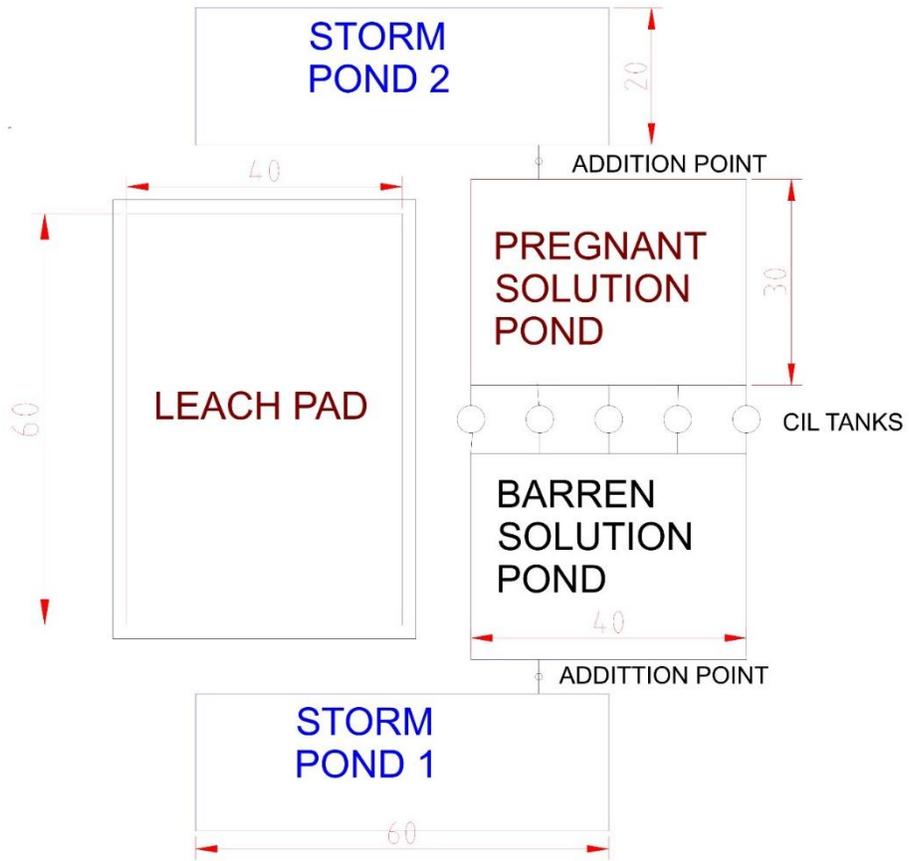


Figure 9:Heap Leach Facility Layout.

10.0: PROCESS INFRASTRUCTURE

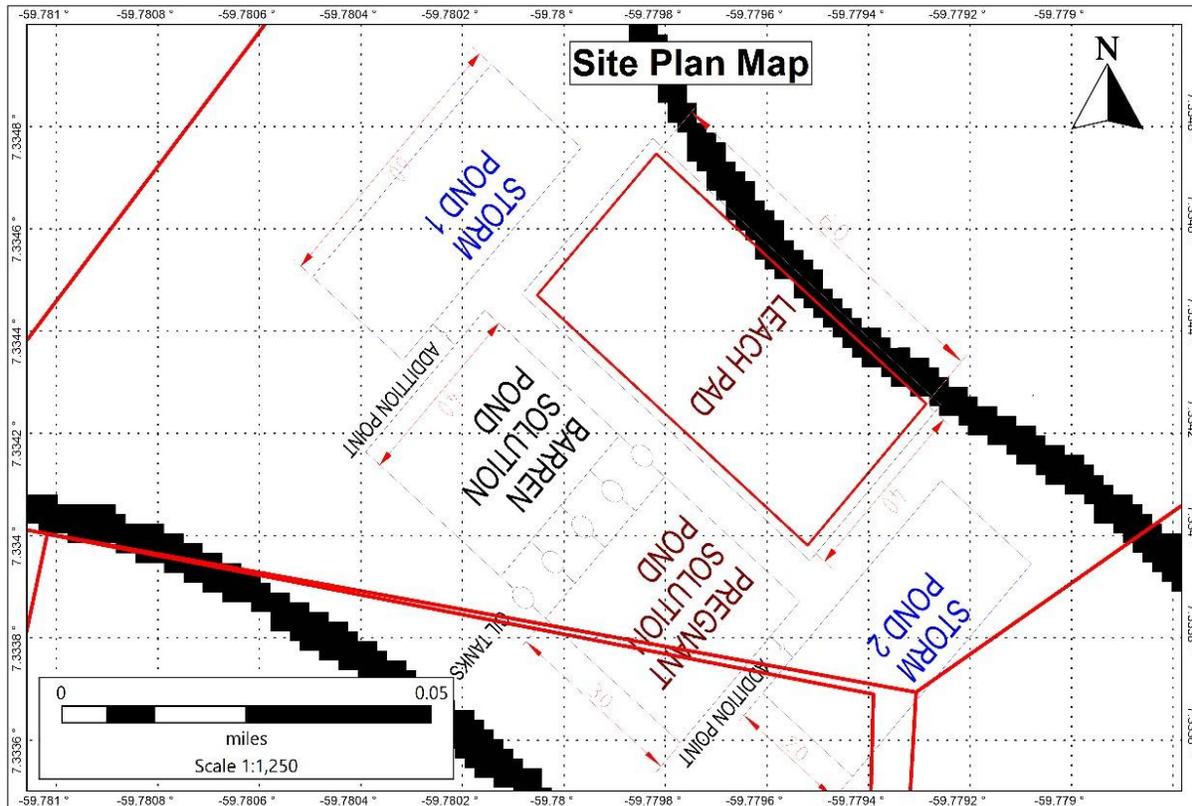


Figure 10:Heap Leach Process Facility Infrastructure Layout

10.1: Leach Pad

A leach pad with a high berm will be constructed to ensure no spillage into the environment and also to prevent loss of valuable lixiviant and gold ore. The Area covers 2400 m², its dimensions are 60 m by 40 m with a height of 4 m with the slope of the walls at an angle of 45 degrees. Berm widths of 6 m will be utilized based operating track width of Caterpillar excavators. This allows for the excavators to simultaneously operate and compact berms. Each leach pad will be constructed with 3 m berm above ground level with a nominal capacity of 9,600 m³. The concept of construction above ground level is to allow for gravity flow of lixiviant to the pregnant solution pond.

The construction of leach pads will be based upon guidelines on environmental management systems (ISO 14001), quality management (ISO 9001), and health and safety (ISO 45001) which

can influence the operation of heap leach facilities. Its integrity will follow these international standards:

ASTM D5744-18: Standard Test Method for Laboratory Weathering of Solid Materials Using a Humidity Cell. This is relevant for assessing the long-term stability and environmental impact of heap leach pads.

ASTM D6392-12(2019): Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods. This is crucial for ensuring the integrity of the liners used in heap leach pads.

The Leach Pad will then be covered with impermeable geomembrane to prevent leaching into the environment.

A composite liner system comprising a linear low-density polyethylene (LLDPE) geomembrane and a compacted low-permeability soil liner with a minimum thickness of 0.3 meters will be used for the leach pad. the geomembrane will have a thickness of 1.5 millimeters (60 microns). The geomembrane will have bottom texturing and single-side texturing.

Above the pad liner, a drainpipe network will be built and embedded in a minimum 0.6 m liner cover drain fill layer made of strong, long-lasting, free-draining granular material. The process pond will receive gravity-drained solution, storm runoff, and infiltration flows gathered by the drain pipe network.

To keep wildlife from getting to the pad, a stock-proof mesh fence with locking gates will be built around the HLF. The fence also serves to keep people safe and prevent unlawful access to the pad area.



10.2: Collection Ponds

The IGLP Heap Leach Facility collection ponds will include the lixiviant solution/BLS pond, pregnant solution pond, and the two storm water ponds. The collection ponds sizes were developed in accordance with the Project design criteria using the results of the HLF water balance requirements. All ponds will be constructed during the infrastructure development phase. As such the storm ponds will be fully functional before the first leach cycle begins.

Process solutions and storm water flows within the leach pad will gravity-drain to the pad's lowest point and through a spillway to the process ponds. A cascading spillway system will be constructed between the process ponds and the storm ponds for each process Pond for potential solution and storm runoff during pad operations. The inflow to the storm water ponds will be equipped with detoxification dosage points in order to treat storm runoff before discharge if necessary. These dosage points will be positioned above the cascading spillways to facilitate mixing of the detoxification agents. The discharge point of each storm pond will be equipped with a monitoring and regulated discharge point.

The process ponds will be designed to contain under normal operating conditions:

- Capacity to contain volume of lixiviant equivalent to 8 hours of solution operational flow.
- Capacity to contain accumulated volume equivalent to 24 hours of solution flow or emergency drain-down flow from the ore heap in case of operational shutdown due to pump failure or power loss;
- The maximum cumulative excess water volume predicted for the Phase 1 pad under typical wet year climatic conditions; and
- The maximum cumulative excess water volume predicted for Phases 1-2 pad under average year climatic conditions.

Storm Pond 1 is designed to contain:

- The maximum cumulative excess water volume predicted for Phases 1-2 pad under typical wet year climatic conditions, less the excess water volume that can be stored in the process pond; and
- The maximum cumulative excess water volume predicted for Phases 1-4 pad under average year climatic conditions, less the excess water volume that can be stored in the process pond.

Storm Pond 2 is designed to contain

- the maximum cumulative excess water volume predicted for Phases 1-11 pad under typical wet year climatic conditions, less the sum of the excess water volume that can be stored in the process ponds and Storm Pond 1, plus an additional 20% capacity as required by the IGLP Environmental Design Criteria.

Standby pumps and an independent backup power supply system will be provided at the storm ponds to evacuate the ponds during large storms and power outages, if needed to prevent pond overflow into the natural drainage.



10.3: Process Ponds

The process ponds will be constructed with a composite double-geomembrane liner system comprised of top (primary) and bottom (secondary) geomembranes. An intermediate leachate collection and removal system (LCRS) layer located between the primary and secondary geomembranes. The LCRS will be underlain by a 0.3 m minimum thick compacted low-permeability soil liner layer

The secondary geomembrane will be 1.5-mm (60-mil) smooth LLDPE, while the primary geomembrane will be 2-mm (80-mil) single-side textured high-density polyethylene (HDPE) with texturing at top for traction. The LCRS between the two geomembranes will be a transmissive geo-composite (drainage net) that is connected to the pond's LCRS sump. The geo-composite, will be 5-mm (200-mil) geonet heat-laminated on both sides with 270-g/m² (8-oz/yd²) nonwoven geotextiles. Should a leak ever occur through the top geomembrane, it would flow through the geo-composite to the LCRS sump, where it would be removed via a pump. The design intent of

the LCRS is to ensure that no hydraulic head occurs on the bottom geomembrane, thereby removing any driving force required for seepage to occur through that geomembrane.

Storm Pond 1 will initially have a single-geomembrane composite liner system consisting of 2-mm (80-mil) single-side textured HDPE geomembrane with texturing at top for traction, underlain by a 0.3-m minimum thickness compacted low-permeability soil liner layer. The pond will be double-geomembrane-lined and a LCRS geo-composite added between the geomembranes during Phase 2 pad construction. The added top geomembrane will be 2-mm (80-mil) single-side textured HDPE with texturing at top for traction, and the geo-composite will be 5-mm (200-mil) geonet heat-laminated on both sides with 270 g/m² (8-oz/yd²) nonwoven geotextiles.

Storm Pond 2 will have a single-geomembrane composite liner system consisting of 2-mm (80-mil) single-side textured HDPE geomembrane with texturing at top for traction, underlain by a 0.3-m minimum thickness compacted low-permeability soil liner layer.

A stock-proof mesh fence with locking gates will be constructed around the perimeter of the collection ponds to prevent wildlife from reaching the fluids in the ponds. An additional purpose of the fence is for public safety and to deter unauthorized access into the collection ponds area.

10.4: Fresh Water Pond

Since the area has been mined heavily in the past by SMMS operations natural tributaries or water bodies have been either mined out or diverted. The only natural water body presently flowing in its original channel is the Ianna Creek. This creek is however, approximately 2 Km from the IGLP site. As such NAHAS has identified a mined-out section of the area that has formed a lake that will be used as the freshwater/ process water pond. This lake is estimated to meet all process water requirements since this lake has an abundant supply of water even in the current El Nino weather pattern. At current water levels the lake is estimated to contain approximately 17,000 m³ of water.



.5: Tailings Management Area

The Tailings Management Area for the IGLP will be required to accommodate solid state tailings from the leach pad. Tailings disposed to the TMA will first be processed using the cyanide detoxification process. This utilizes the alkaline chlorination process along sodium metabisulphite to reduce the weak acid dissociable cyanide (CNWAD) to 0.5 ppm or lower prior to disposal of the tailings to the TMA.

The TMA will be developed in a mined out covered with SMMS dredge tailings by constructing tailings dams and a haul road to be used for the disposal of tailings. This area is not within close



proximity to any natural water bodies. Since the tailings will be in a solid state and already detoxified no liners or pumping will be required.

Accumulated rainfall water, runoff and drainage from the TMA will continuously be monitored to ensure that they meet environmental discharge levels. After further detoxification by aging and providing that residual cyanide content is 100% removed, it is proposed that the tailings be used in reclamation. This proposal will however only be implemented after approval has been granted by the necessary Regulatory Bodies.

10.6: Drainage Control

Diversion embankments and channels will be constructed around the perimeter and upgradient of the HLF to divert storm runoff from upstream catchments away from the pad and collection ponds. The leach pad will have perimeter berms to prevent applied solution and rainfall water within the pad from overflowing the pad.

Underdrains will be constructed at the locations of existing drainages and seeps within the leach pad and collection pond footprints to drain groundwater/subsurface seepage to down gradient of

the ponds. The underdrains will discharge into a collection sump, where the discharge water quality will be monitored as required.

10.7: Process Facility Buildings

Ancillary buildings will be required for the operation and maintenance of the process facility. These include the laboratory, chemical and reagent storage, and process facility control room. The warehouse will be housed in the adjacent vehicle maintenance and administration building. There will be mechanical, electrical, instrumentation and general items in designated areas. Internal offices will be supplied for warehouse and maintenance staff.

The process facility control room will be located within the process facility site within the building that houses the laboratory. A sampling laboratory located within the process facility site will provide the requirements of the process operations. Additional equipment will be provided to allow basic metallurgical investigations.

10.8: Water Requirements:

The water requirements for the IGLP are outlined below;

- Raw water; Raw water will be delivered from the Fresh Water Pond via a water pump to service the process facility. The water pumps will deliver raw water 120 m the process facility. Raw water will be used for process make-up requirements, dust suppression, reagent mixing and fire services.
- Process water; Process water is defined as water that is internally recycled within the process facility infrastructure.
- Fire water. Firewater, a subset of raw water, will be connected throughout the process facility, laboratory, workshop and fuel storage areas via dedicated firewater pump system, which includes a back-up diesel pump. The raw water tank will have a dedicated reserve for firewater.

- Potable water; Potable water will be sourced from an independent artesian well and rain water harvesting. The water will be pumped to a water treatment facility located near the process facility site. The water will be treated and stored in the potable water tanks. Potable water will be distributed throughout the process facility. Potable water will be used for all domestic purposes, eye wash stations and safety showers.

11.0: REAGENTS

Logistics, security and supply of reagents will be an important management function throughout the life of the mine. This is based on factors such as, the project location, cost and shipping and requirements of these reagents. Individual commodities are discussed below.

11.1: Jinchuan

Jinchuan or Metallic Ore Dressing Agent/SHJCA02 is a brand of leaching reagents specifically designed by Guangxi Senhe High Tehnology Co LTD of Guangxi, China for the extraction of gold from ores. It has been developed as an alternative leaching agent to Sodium Cyanide. Jinchuan is considered a more environmentally friendly lixiviant and has a less complex operating procedure than sodium cyanide. It is also patented as a product for “environmentally friendly gold extraction”. Jinchuan has advantages such as: low toxicity, environmental protection, high recovery, low cost and safer storage and transportation (See Appendix 1 Material Safety Data Sheet).

The physical and chemical properties of Jinchuan are:

- Appearance: Solid (powder)
- Smell: Odorless
- Boiling Point: 1496 °C
- Potential Hydrogen (pH): Alkaline
- Density: 1.05 g/m³

The chemical composition of Jinchan chemical ore dressing is;

Component/Substance	Percentage by weight %
Carbon (C)	22.0
Sodium (Na)	3.3
Ammonia (NH ₃)	155.42
Oxygen (O)	22.92
Ferrum (Fe)	0.96
Chlorine (Cl)	0.36

Table 9: Chemical composition of Jinchan

Jinchan is comprised of two main components carbonized sodium cyanurate (C₆H₃N₆Na₃O₃) and thiourea (SC(NH₂)₂). While Jinchan is composed of 70 percent carbonized sodium cyanurate and 30 percent thiourea, the carbonized sodium cyanurate is known to be more reactive than thiourea, however, thiourea complements the carbonized sodium cyanurate

Jinchan utilizes a leaching mechanism similar to cyanide, however the cyanide within the carbonized sodium cyanurate is not easily dissociated thus making Jinchan much less toxic. Since there is less dissociated cyanide as is the case with sodium cyanide, the use, handling and mitigation measures are different. However, since the use of Jinchan as a leaching agent is new by industry standards in Guyana, the Cyanide Standard codes of Practice will be adhered to.

11.2: Calcium Oxide (CaO)

Calium oxide (CaO) or lime as is commonly referred to will be delivered to the site in 25 kg bags. Lime will be added to the lixiviant to maintain a pH of 11 within the HLF. Lime has no special handling requirements and will be stored in reagent storage area of the warehouse facility.

11.3: Activated Carbon

Activated carbon will be delivered to the site in 25 kg bulk bags. Activated carbon will be stored in the reagent storage area of the warehouse facility and transported to the CIL circuit when required. Before addition to the CIL columns the fines will be washed from the carbon to minimize potential gold losses.

11.4: Fluxes

Sodium borate, more commonly known as borax, along with silica flour, soda ash and potassium nitrate will be delivered to the site on a pallet containing 25 kg bags. The fluxes will be stored in the warehouse, and transported to the gold room as required.

12.0: Site Characteristic and Layout

12.1: Site Description

The IGLP is located in the Barama River and Ianna Creek area. The properties extend south of the Barama River, which is approximately 100m above sea level. The area is relatively low relief and covered with dense rainforest. The mine site has however been extensively mined and has sparse secondary growth vegetation. The hills are gently sloping and only a few. The low-lying areas result in swamps during the rainy seasons, some of which the access road dissects.

12.2: On-site Infrastructure

The site entails a series of open pits, tailing ponds, waste piles, a process facility with associated laboratory and maintenance facilities; maintenance buildings for open pit equipment. Facilities and structures include a storage area, office, change house facilities, process facility, reagent storage area, power generating station, fuel storage tanks, and laydown area, permanent accommodation complex.

Areas for the tailings management, and mine water management ponds will be provided by constructing several dams at low topographic points. These ponds will be on the east side of the process facility, away from the accommodation complex.

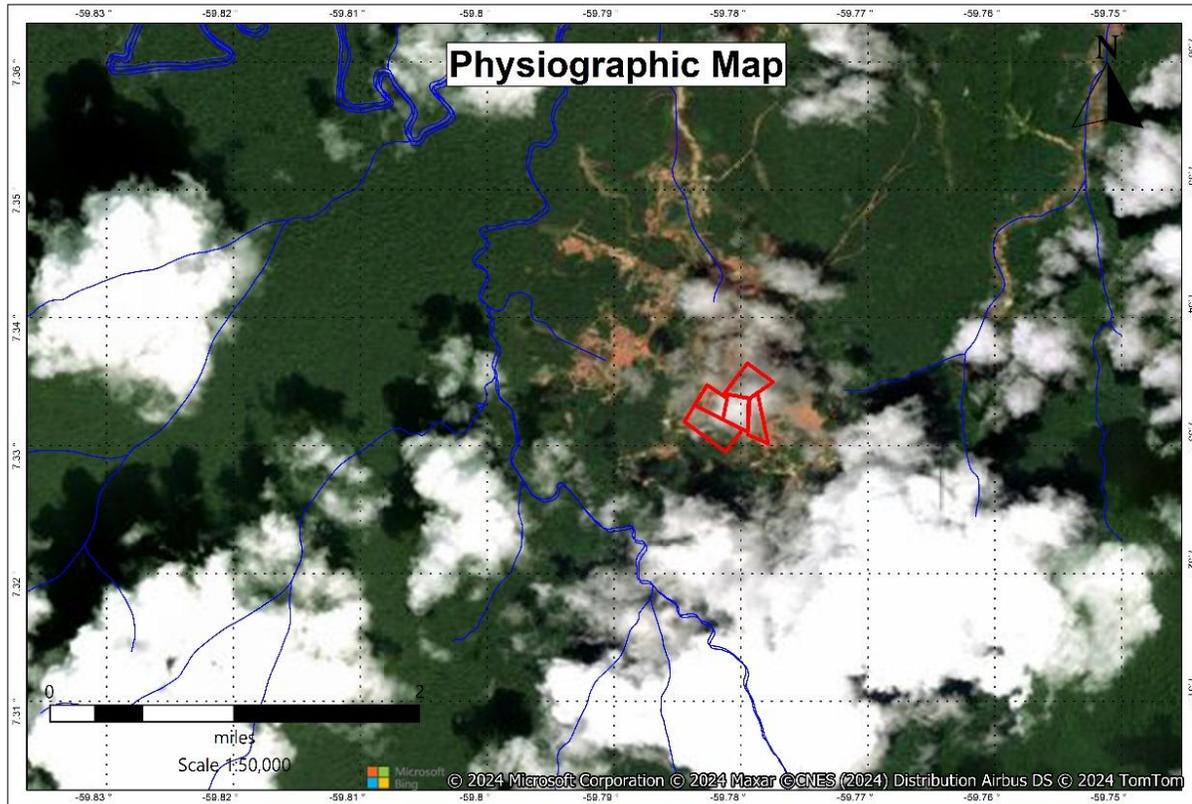


Figure 15: Physiographic map of project area.

12.3: Surface Hydrology

Guyana has an extensive network of rivers and streams that have many rapids and waterfalls, with an absence of naturally occurring lakes. Surface water (which is extracted from shallow reservoirs, streams, or drainage canals) is primarily used for agricultural and industrial purposes. Only about 10 percent of the country’s drinking water comes from surface water. Guyana faces the typical water pollution problems of developing countries in tropical regions. Biological and chemical contamination of surface water varies in magnitude according to location but is increasing with population growth and land use demands.

12.4: Groundwater Hydrology

A concise groundwater hydrological survey will be conducted before construction of the TMA.

13.0: TAILINGS DISPOSAL

NAHAS will adopt a conventional tailings disposal method; detoxified tailings will be deposited in the TMA. The Tailings Management Area for the IGLP will be required to accommodate solid state tailings from the leach pad. Tailings disposed to the TMA will first be processed using the cyanide detoxification process. This utilizes the alkaline chlorination process along sodium metabisulphite to reduce the weak acid dissociable cyanide (CNWAD) to 0.5 ppm or lower prior to disposal of the tailings to the TMA.

Runoff water will have an average retention time of 30 days prior to being discharged under the mean annual precipitation conditions. The TMA will be equipped with a two-level spillway, which will be raised along with each dam raise. The low flow spillway is designed to provide the required retention time. The high flow spillway is set to provide 0.5 m of freeboard above the Probable Maximum Flood (PMF) level. The final TMA dam crest will be at 2 m elevation with the low flow spillway at 1 m and the high flow spillway at 1.5 m elevation.

The lining system selected for the TMA consists of a layer of Saproliite with naturally low permeability, amended as necessary with the addition of a compacted clay liner in basin areas with exposed bedrock.

Water quality in the TMA, MWP, and FWP will be monitored via a surface and groundwater monitoring well-based sampling program to ensure that any seepage and controlled discharges will be within the effluent discharge guidelines and water quality standards defined by the Guyana EPA and (IFC 2007). Indications of any negative water quality trends may prompt the installation or activation of additional clarification ponds, treatment and/or polishing systems, or biotoxicity testing studies to demonstrate that aquatic species are adequately protected.

Monitoring of groundwater and surface water leaving the project site will also be conducted using a network of monitoring wells and surface water monitoring stations. Upgradient monitoring wells and at least one upgradient surface water monitoring station will be established to collect background water quality data.

13.1: Environmental Protection Measures

Environmental monitoring and protection features will be incorporated in the HLF construction to minimize potential impacts on the surrounding environment, wildlife, surface water and groundwater. These features, as discussed above, will include the following:

- Diversion systems to divert storm runoff from upstream catchments away from the leach pad and collection ponds;
- Underdrains beneath the leach pad and collection pond footprints to drain groundwater/subsurface seepage to a collection sump located down gradient of the ponds, where the underdrain discharge water quality will be monitored as required;
- A composite liner system for the pad consisting of a geomembrane underlain by a compacted low- permeability soil liner layer or GCL;
- Process solution and storm water collection and drainage system above the pad composite liner consisting of a network of drain pipes within a free-draining granular fill layer designed to enhance fluids collection and maintain a low hydraulic head on the liner;
- Placement of wear sheets beneath the large-diameter drain pipes within the pad to reduce the potential for wear and damage to the pad geomembrane liner from pipe movement;
- A toe berm with a minimum height of 1.5 m, and perimeter berms with a minimum height of 1 m around the pad phases, for solution and storm water containment;
- A 4 m minimum setback between the crests of the pad toe berm, perimeter berms and phase berms and the ore heap toes to reduce the risk of solution release due to upset conditions during operations;
- Stock-proof fencing around the pad to prevent access;
- A process pond with sufficient capacity to contain the required solution normal operational flow and emergency drain-down flow from the ore heap;
- Storm ponds with sufficient capacity to contain the storm flows from the HLF areas;

- A composite double-geomembrane liner system for the process pond comprised of a top (primary) geomembrane and a bottom (secondary) geomembrane, with an intermediate LCRS layer. The bottom geomembrane will be underlain by a compacted low-permeability soil liner;
- An initial composite single-geomembrane liner system for Storm Pond 1 consisting of a geomembrane underlain by a compacted low-permeability soil liner. This storm pond will be double- geomembrane-lined;
- A composite single-geomembrane liner system for Storm Pond 2 consisting of a geomembrane underlain by a compacted low-permeability soil liner;
- Placement of wear sheets above the geomembrane liners of the collection ponds, underneath pipes and in the corner sump areas, for geomembrane protection from pipe movement and pumping operations;
- Standby pumps and an independent backup power supply system at the storm ponds to evacuate the ponds during large storms and power outages, if needed to prevent pond overflow into the natural drainage;
- Stock-proof fencing around the collection ponds to prevent access;
- Bird-balls have been specified for pond cover, rather than netting. Sufficient bird-balls to be ordered to cover pond surface at maximum operational capacity.
- Bangers and rotating mirrors (eagle eye bird control) will be installed around the perimeter of the ponds to divert birds; and
- Monitoring wells around the HLF for monitoring groundwater quality.

Monitoring wells will be installed around the HLF to monitor the groundwater quality during operations and after closure. The number of wells and their locations and depths will be determined, and the wells installed prior to HLF construction so that baseline data can be compiled. A groundwater quality and environmental monitoring program has been developed for the facility.

14.0: JINCHAN/CYANIDE MANAGEMENT PLAN

Jinchan is patented as a product for “environmentally friendly gold extraction”, it has advantages such as: low toxicity, environmental protection, high recovery, low cost and safer storage and transportation. However, since it contains cyanurate ($C_6H_3N_6Na_3O_3$) as its main active component, measures implemented during cyanide handling, storage, and use at the IGLP will be in accordance with the principles of the Cyanide Code.

Based on this approach NAHAS will monitor both free and Weak Acid Dissociable (WAD) Cyanide in tailings and any discharges from the HLF. Discharges may be necessary under severe storm conditions; however, contingencies have been factored into the design of the HLF to treat any such discharge. The amount of Jinchan solution entering the leach system will be monitored continuously, both for concentration and flow rate which will be adjusted to maintain the minimum required dosage of Jinchan throughout the HLF to maximize gold recovery.

The residual cyanurate or any WAD cyanide present within the HLF tailings be detoxified at the end of each leach cycle by alkaline chlorination, Sodium metabisulphite would then be administered to neutralize the chlorine before discharge to the TMA for further detoxification by natural degradation. At this point in time chemical process involving the use of Jinchan is not fully understood.

NAHAS will adhere to the International Cyanide Code during all processes of the operation. Regardless a cyanide management plan is presented herein based on research of ‘A case study at Goldfields Ghana Limited, M. Beyuo et al, 2016’. This study assessed the use of Jinchan and revealed that the residual solution from the HLF tailings contained marginal free cyanide in the range of 17.15 mg/l along with cyanurates.

The transportation, storage, use and of Jinchan will be considered as hazardous both to human health and the environment regardless of the material safety data sheet (Appendix 1). This approach is undertaken since the Jinchan process is not yet fully understood and since Jinchan is known to produce cyanurate and small amounts of free cyanide within tailings. As such, NAHAS will adopt a strategy apart from the International Cyanide Code to minimize the risk of environmental impacts due to the use Jinchan and discharge of cyanide related compounds to the environment. This strategy will involve:

- Develop maximum operating parameters in order to minimize the dosage rate of Jinchuan required for gold recovery;
- Monitor all operations, discharges and the environment to detect any escape of Jinchuan/cyanide and subsequent impacts if any of that release;
- Ensure a full understanding of the actual and potential hazards and environmental impacts of Jinchuan use;
- Maximize the recycling of lixiviant thereby reducing the quantity of cyanurate and free cyanide in tailings is kept to a minimum or low concentrations.
- Construct physical containment facilities to control spills or leaks of Jinchuan/cyanide;

Clear responsibility will be established for all phases of Jinchuan use, including transportation, storage, use and disposal based on simultaneous capacity development of staff.

NAHAS will also adhere to The Mining Regulations that specify the following requirements for use of cyanide or reagents that result in release of cyanide:

- All vessels or plants used for the cyanide process should be fitted with mechanical agitators and hoods or other appliances of such a nature that the fumes generated in such vessels should be carried directly to the external air at a distance approved by the GGMC;
- Cyanide facilities should be located downwind or in any other wind of all residences so that such residences are not unduly disturbed;
- An adequate supply of wholesome drinking water is to be provided in each premises or place where cyanide or any preparation containing cyanide is used, and this supply should be distinctly labeled Drinking Water; and
- Cyanide used in any mining or milling process is required to be kept in a separate compartment specially set aside for the storage of cyanide with the compartment being locked and in the care of a person duly authorized by the manager and no person is

authorized to remove from a claim or mine any cyanide without having obtained the written permission of the manager.

- All cyanide facilities need to be fenced.

14:1: Acquisition

Jinchan shall be purchased only from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to Jinchan/cyanide and to prevent releases of cyanide to the environment.

14.2: Transport

The transport of Jinchan will be performed to ensure protection of all communities and the environment during transport. Clear lines of responsibility will be established for all aspects of transport including the safety, security, release prevention, personnel training and emergency response procedures in event of unplanned releases. The mines manager will identify personnel responsible for each aspect of Jinchan transport. The transport aspects will include as follows:

- packaging & labeling
- storage and security at port of entry,
- transport to the operation,
- unloading at the operation,
- safety training
- security during transport, and
- emergency response during transport.

The Emergency Response Plan addresses spill response scenario during transport to the site. All personnel involved in Jinchan transport will be trained prior to the commencement of operations and would also be given periodic refresher training in the use of the equipment and the implementation of the Emergency Response Plan.

Warning signs will be posted on all transport equipment alerting workers of the presence of Jinchan/cyanide and that smoking, open flames, eating and drinking are prohibited in the vicinity of Jinchan handling storage and use. In addition, workers will be required to wear cyanide-specific personal protective equipment (PPE). Security measures, such as lockouts on valves and fenced and locked storage of solids, would be provided at all transshipment points and at interim storage sites.

Storage of Jinchan will be separate from incompatible materials such as acids, strong oxidizers and explosives. All contact with low and neutral pH water would be prevented during shipping. Storage facilities will have spill containment capacity at least equal to 120% of the capacity of the storage area and personal protective equipment and clean-up materials appropriate for the type and amount of Jinchan stored would be provided at all storage locations.

High-risk sections of the route to the site, such as river and stream crossing and areas of highly pervious soil, would be identified and evaluated to determine the need for special precautions in these areas. Communities in the area will be consulted and all applicable governmental/EPA transportation related and emergency response procedures would be considered to prevent and respond to any releases during Jinchan transport.

The company road safety program for all Jinchan transport vehicles will include, but not be limited to, vehicle and tire inspections, preventive maintenance, limitations on driver's hours, tie-down procedures for solids, and procedures by which transportation can be suspended if severe weather conditions are encountered. Vehicle operators will retain records to document that these activities have been conducted. The company will also implement inventory and/or chain of custody documentation procedures to identify the loss of any cyanide material during transport.

All transport vehicles will be provided with emergency communications capability to ensure timely communication. Any spills/releases will be immediately reported to the Mines Manager who will immediately inform all potentially impacted communities, relevant government agencies and the company's designated emergency response team.

14.3: Handling and Storage

NAHAS will design and construct unloading, storage and mixing facilities consistent with sound and accepted engineering practice and will employ quality control/quality assurance procedures and spill prevention and containment measures to protect workers and the environment during Jinchan handling and storage.

To the extent practicable, all unloading and storage areas for liquid and solid Jinchan would be located away from civilians and personnel and surface waters. Where this is not practicable, the potential for release to surface water and/or human exposure associated with the storage location will be evaluated and measures will be implemented to prevent or minimize these potentials. The protective measures shall include automatic sensors and alarms for hydrogen cyanide gas, additional containment structures, and specific emergency procedures for evacuation and response.

Unloading of all Jinchan would be done on impervious or lined surface that can prevent leaks from coming into contact with the environment. Direct observation of pond levels or use of a manual gauging will be done to prevent overfilling of Jinchan mixing/storage tanks.

Storage areas for Jinchan shall be well ventilated to prevent the build-up of hydrogen cyanide gas. Measures will be put in place to minimize the potential for contact of Jinchan with water. These measures will include storage in covered enclosures and off the ground or in secure containers.

The public and workers not directly involved in Jinchan operations will be prohibited from accessing Jinchan storage areas by a fenced and locked boundary. Jinchan will be stored separately from incompatible materials such as acids and strong oxidizers with berms, bunds, walls or other barriers that will prevent mixing.

Jinchan storage and mixing tanks would be located on a concrete surface to prevent seepage to the subsurface. Secondary containment would be employed to contain releases from these tanks as well as any precipitation that may come in contact with Jinchan. The secondary containment will allow for recovery and return to the leaching process or proper disposal. Secondary containments

used for this purpose would be constructed of concrete, plastic/HDPE or other materials demonstrated to provide a competent barrier to leakage. All containments will be sized to hold 120 % of the volume of the largest tank within the containment and any piping that drains back into the containment.

Jinchan storage and mixing tanks and related pipeline will be constructed or coated with materials that are compatible with Jinchan/cyanide and high pH conditions. Tanks and pipelines would be clearly identified as containing Jinchan/cyanide. The direction of flow would also be indicated on pipelines. Cyanide specific first aid and emergency response equipment will be readily available for use at unloading, storage and mixing locations, including high-pH water for decontamination of exposed workers, oxygen and a resuscitator and appropriate personal protective equipment. An antidote for cyanide poisoning will also be available. Workers involved with unloading, storage and mixing of Jinchan would be trained in the use of emergency rescue equipment and in the first aid procedures for responding to cyanide exposures.

Spill neutralization and clean-up equipment would be available for use at unloading, storage and mixing locations. This will include water for cleaning spills of liquid Jinchan, shovels for cleaning up spills of solid Jinchan, and chemicals to treat or neutralize Jinchan and Jinchan-contaminated soils, as well as cyanide-specific personal protective equipment. Personnel engaged in unloading, storage and mixing activities would be trained in the operation's procedures to respond to cyanide spills, including notifications, clean up and detoxification.

Storage areas, pipelines, pumps, valves and tanks would be inspected at least once monthly for evidence of leakage, presence of solution in secondary containments and integrity of the containment. Deficiencies would be noted and records would be retained documenting the inspection and the implementation of necessary corrective measures.

Empty Jinchan containers would not be reused on or off the mine site for any purpose other than holding Jinchan. Jinchan bags and liners will be washed and triple-rinsed prior to disposal. The resulting solution from washing and rinsing will be added to the lixiviant. Wooden containers would be burned or disposed of in the spoil pile area.

14.4: Operations

All Jinchuan related facilities would be inspected on an established frequency sufficient to assure and document that they are functioning within design parameters. Tanks holding process solutions would be inspected for structural integrity and signs of corrosion and leakage. Secondary containments would be inspected for their integrity, the presence of fluids and their available capacity, and to assure that drains are closed and, if necessary, locked, to prevent accidental releases to the environment. Leak detection and collection systems at ponds would be inspected as required. Pipelines, pumps and valves would be inspected for deterioration and leakage. Ponds would be periodically inspected to ensure available freeboard and the integrity of embankment.

Facility inspections would be documented on inspection forms and in log books and would include the date of the inspection, the name of the inspector, and any observed deficiencies. The nature and date of corrective actions also would be documented.

Preventive maintenance programs would be implemented to assure the continuous functioning of equipment and devices that are necessary for cyanide management. Pumps, pipelines, and cyanide treatment, destruction and regeneration equipment would be regularly maintained so that failures do not result in worker exposure or releases to the environment. Preventative maintenance activities would be documented.

The operations would have a source of emergency power for pumps and other equipment when their primary power supply is interrupted to prevent unintentional cyanide releases and worker exposures. Back-up power generating equipment would be maintained and tested to ensure its availability if needed. The operations will use bottle roll or another test procedure to determine the optimal rate of Jinchuan addition for the process. The rate of addition would be reevaluated and adjusted as necessary when changes in ore type or processing plant practices occur that effect Jinchuan requirements.

Unintentional releases will be prevented by maintaining adequate drainage in tailings storage facilities. All facilities will be inspected and monitored to determine the accuracy of the water balance and to assure the facilities operates as designed. This will prevent an over-accumulation of water that can result in overtopping, unplanned discharge into the environment, and potential structural failure of the facility.

Spill prevention or containment measures would be provided for pipelines transporting process solution. These measures will include secondary containment ditches, differential pressure sensing with alarms and/or automatic shutoff systems, or preventive maintenance programs with pipe thickness measurements. Jinchan process tanks and pipelines would be constructed or coated with materials that are compatible with Jinchan and high pH conditions. Tanks and pipelines would be clearly identified as containing Jinchan/cyanide. The direction of flow would be indicated on pipelines.

Facilities for the management of Jinchan/cyanide would be constructed according to accepted engineering standards and specifications. Quality control and quality assurance programs would be implemented during construction of new facilities and modifications to existing facilities to assure their structural integrity and their ability to safely contain process solutions and solids.

The quality control and quality assurance program would address the suitability of the materials of construction and the adequacy of soil compaction for earthworks such as tank foundations and earthen liners. Quality control and quality assurance procedures would also be implemented for installation of synthetic membrane liners used in ponds, for pipes, pipe fittings, for welds and bolts on Jinchan storage and process tanks, and for any other equipment containing Jinchan. Records would be retained to document that the specified quality control and quality assurance procedures have been followed.

Holding facilities and compounds will be designed and maintained to ensure the storage areas are adequately ventilated to disperse any buildup of hydrogen cyanide gas to minimize the possibility of contact with water. In addition, all storage areas will be banded and will be located well away from natural drainage channels. Jinchan will be stored separately from corrosive, acidic and

explosive materials. The storage area will be fenced and locked to prevent accidental entry or access by unauthorized individuals. The storage area will also be designed to be fire resistant and will be provided with adequate firefighting capability. In addition, all vegetation will be cleared from the storage area to decrease the likelihood of fires.

An inventory will be maintained of all quantities stored and any loss will be immediately reported to the mines manager and to GGMC.

The company will deploy a system to enable rapid determination of cyanide concentration in any waste water discharged from the site. One of the following systems will be deployed.

- Cyanide Ion Specific Electrode
- Canfield Cyanide Testing System
- Basic Color-Disc Field-Test Kits

14.5: Personnel Safety

Operators undertaking duties involving Jinchan use will wear appropriate protective clothing. For respirable forms of Jinchan/cyanide, a full-face respirator would be worn. Since Jinchan/cyanide can be absorbed through skin, for liquid Jinchan/cyanides, worker would wear disposable coveralls, PVC gloves and waterproof boots. Workers will wash their hands before eating, drinking or smoking. Contaminated protective gear and clothing would be securely discarded, or washed before being stored and re-used. Operators will be protected through a monitoring and sampling program for airborne contaminants in confined spaces. Sampling for hydrogen cyanide gas will either be undertaken continuously, using electronic detection equipment, or batch sampling will be done using air pumps and sampling tubes.

Operators will work in pairs with one acting as a 'sentry' during all operations. The role of a sentry will be clearly defined and will be primarily to act as a passive observer of any Jinchan handling process. The sentry will participate in the handling process only in the event of an emergency. Jinchan handling operations will include the following:

- opening storage containers;
- dissolving Jinchan powder; and
- cleaning-up Jinchan spillages.

Should an operator be exposed to Jinchan/cyanide, effective and timely medical care will be provided. All personnel would be required to be familiar with the treatment procedures for personnel affected by Jinchan/cyanide exposure presented in the box below. The treatment of Jinchan/cyanide poisoning will fall into two categories:

- Patients who are conscious
- Patients who are unconscious

Treatment for both categories will be undertaken swiftly and efficiently by well trained and properly equipped personnel.

14.6: Emergency Response

Detailed emergency response plans for potential cyanide releases will be submitted. The plans will detail the involvement of site personnel and stakeholders in the planning process. It identifies and designates the appropriate personnel, equipment and resources to be mobilized in the event of a Jinchan spill and details the procedures for internal and external emergency notification and reporting.

The emergency response plans also incorporate monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals and entails periodic evaluation and revision of response procedures and capabilities, if required.

14.7: Worker Training

All workers involved in Jinchan handling would be trained to understand the hazards associated with Jinchan use. Workers will also be trained to operate the facility according to systems and procedures that protect human health, the community and the environment. Training will also be provided to workers to respond to both worker exposures and environmental releases of cyanide.

14.8: Decommissioning

All Jinchuan handling facilities will be decommissioned in accordance with the Closure Plan. All Jinchuan handling facilities will be effectively decommissioned to ensure protection of human health and the environment and wildlife. NAHAS will also establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

15.0: Potential Environmental and Social Impacts and Associated Management/Mitigation Strategies

Due to the Project's environmental setting, the most significant potential environmental and social impacts are predicted and summarized in Table 6 below along with a description of the general strategies that will be employed to manage and mitigate such impacts during the life of the Ianna Gold Leach Project.

Project Component	Potential Impact	Management/Mitigation Strategies
Mine & leach pad/ process facility area	Impacts to Soils	<p>Implementation of the Project <i>Erosion Prevention and Control Plan</i>; management of drainage and stormwater runoff on haul roads, maintenance of topsoil/organic matter stockpiles, and grading, scarifying, and re-vegetation of road rights-of-way (ROWs), exploratory roads, and other temporarily cleared areas</p> <ul style="list-style-type: none"> ● Implementation of appropriate progressive restoration and erosional stabilization procedures for disturbed areas per the Project <i>Erosion Prevention and Control Plan</i> and <i>Mine Reclamation and Closure Plan</i> ● Implementation of the <i>Spill Prevention, Control, and Contingency Plan</i>
	Sediment loading of surface water	<p>Installation of diversion structures to route un-impacted surface water around mining operations, and to route impacted surface water to the MWP, FWP, and TMA</p> <ul style="list-style-type: none"> ● Construction of sedimentation ponds and implementation of other best management practices (BMPs) in the <i>Erosion Protection and Control Plan</i> and <i>Water Management Plan</i> to manage stockpile sediment runoff and to detect and mitigate erosion in other disturbed areas

		<ul style="list-style-type: none"> ● Implementation of progressive restoration and erosional stabilization procedures for areas historically disturbed by ASM, per the <i>Erosion Prevention and Control Plan</i> and <i>Mine Reclamation and Closure Plan</i>
	Loss of aquatic habitats	<ul style="list-style-type: none"> ● Installation of diversion structures to route un-impacted surface water around mining operations, and to route all impacted water to the Mine Water Pond (MWP), Fresh Water Pond (FWP), and Tailings Management Area (TMA) ● Implementation of BMPs in the <i>Erosion Protection and Control Plan</i> and <i>Water Management Plan</i> to manage topsoil/overburden stockpiles; and to detect and mitigate erosion in other disturbed areas ● Implementation of appropriate progressive restoration and erosional stabilization procedures for mined-out areas of the open pits, as well as areas disturbed by ASM, per the <i>Erosion Prevention and Control Plan</i> and <i>Mine Reclamation and Closure Plan</i> ● Implementation of a routine water quality monitoring program in the Barima River and its tributaries as described in the <i>Water Management Plan</i> and <i>ESHS Monitoring Plan</i>
	Loss of terrestrial habitat and flora	<ul style="list-style-type: none"> ● Minimization of clearance actions/project footprint per the <i>Erosion Protection and Control Plan</i>, <i>Exploration Management Plan</i>, <i>Early Works Construction Management Plan</i>, and <i>Construction Management Plan</i> ● Implementation of a routine biodiversity monitoring program per the <i>Biodiversity Management Plan</i> and <i>ESHS Monitoring Plan</i> ● Implementation of specific mitigation measures for the protection of any identified sensitive species and habitats, per the <i>Biodiversity Management Plan</i> ● Implementation of BMPs in the <i>Erosion Protection and Control Plan</i> and <i>Water Management Plan</i> to manage sediment generation from waste rock/topsoil stockpiles; and to detect and mitigate erosional conditions in other disturbed areas. ● Implementation of appropriate progressive restoration and erosional stabilization procedures for mined-out areas of the open pits, as well as ASM-disturbed areas, per the <i>Erosion Prevention and Control Plan</i> and <i>Mine Reclamation and Closure Plan</i>
Mine and leach pad/process facility area	Discharges of Jinchan/cyanide and other hazardous chemicals to surface water	<ul style="list-style-type: none"> ● Purchase of Jinchan reagent exclusively in solid powder form, transported to the Project site in dedicated sealed containers ● Jinchan reagent will be transported by truck; delivered in dry powder form in dedicated sealed containers. No alternate delivery forms or methods will be permitted. ● Implementation of the secondary containment, engineered spill prevention and control measures, and other BMPs defined by the Project <i>Jinchan/Cyanide Management Plan</i>, the <i>Ianna Site Spill Prevention, Control and Contingency Plan</i>, and the <i>Emergency Preparedness and Response Plan</i>

		<ul style="list-style-type: none"> ● For non-cyanide reagents and fuel, implementation of the secondary containment and engineered spill prevention and control measures, remote fueling control procedures, and other BMPs defined by the <i>Hazardous Material Management Plan</i>, <i>Ianna Spill Contingency Plan</i>, the <i>Ianna Site Spill Prevention, Control and Contingency Plan</i>, and the <i>Emergency Preparedness and Response Plan</i> ● <i>Adherence to the Cyanide Code</i>
	Slope failures of barren waste tailings and saprolite stockpiles, disrupting surface flows	<ul style="list-style-type: none"> ● Operator training programs/ compliance with <i>Overburden Management Plan</i> ● Periodic monitoring of the physical integrity of the barren waste tailings and Saprolite stockpiles, in accordance with the <i>Overburden Management Plan</i> and the <i>ESHS Monitoring Plan</i>, and re-grading and/or strengthening of earthworks or other action as indicated by observed conditions
	Modification of hydraulic flow patterns within streams/creeks due to FWP, MWP, TMA and surface mining operations	<ul style="list-style-type: none"> ● Installation of diversionary structures/diversion of un-impacted surface water around mining and processing operations in order to maintain biological base flows in local tributaries of the Barima River ● Control of discharges from the FWP, MWP, and TMA into local tributaries of the Barama River in accordance with the <i>Water Management Plan</i> and <i>Tailings Area Management Plan</i>, in compliance with effluent discharge guidelines and/water quality standards defined by Guyana EPA, (IFC, 2007), and the ICMC
Mine and leach pad/process facility area	Breaches and overtopping of the FWP, MWP and/or TMA	<ul style="list-style-type: none"> ● Provision of sufficient freeboard in the design of the MWP, FWP, and TMA based on the Probable Maximum Precipitation (PMP) event ● Inclusion of sufficient contingency in the design of the MWP, FWP, and TMA embankments to withstand PMP events plus an appropriate safety factor ● Inclusion of a series of redundant water management features (e.g., spillways, diversion ponds) in the TMA design ● Rigorous independent Construction Quality Assurance (CQA) oversight of MWP, FWP, and TMA embankment construction ● Development and implementation of probabilistic water balance/monitoring program and other BMPs for the MWP, FWP, and TMA, in accordance with the <i>Tailings Management Plan</i>, <i>Water Management Plan</i>, and <i>Jinchan/Cyanide Management Plan</i> ● <i>Adherence to the Cyanide Code</i>
	Potential runoff of impacted stormwater into surface water	<ul style="list-style-type: none"> ● Diversion of un-impacted surface water around mining and processing operations ● Installation of skimmers/oily water separators on mine stormwater discharges, with discharge reporting to MWP for settling/dilution and testing prior to any discharge

		<ul style="list-style-type: none"> ● Collection (and as necessary treatment) of leachate from onsite solid waste disposal facility prior to any potential controlled discharge ● Collection of runoff from mining and process facility processing areas, stockpiles, and roadways, and retention in settling ponds and the MWP (or dedicated settling ponds at individual waste rock stockpiles) for settling and dilution prior to any potential controlled discharge ● Regular monitoring of MWP water quality in accordance with the <i>Water Management Plan</i> and <i>ESMS Monitoring Plan</i> to ensure that controlled discharges meet quality standards defined by the Guyana EPA and (IFC, 2007) ● Implementation of the <i>Project Erosion Prevention and Control Plan</i>; management of drainage and stormwater runoff on haul roads to minimize sedimentation; maintenance of topsoil/organic matter stockpiles; and grading, scarifying, and re-vegetation of road ROWs, exploratory roads, and other temporarily cleared areas
<p>Mine and leach pad/process facility area</p>	<p>Potential runoff or seepage of contaminated water from TMA into surface water</p>	<ul style="list-style-type: none"> ● Installation of barge and pump back systems to return TMA reclaim water back to the process facility for industrial use ● Installation of embankment seepage interception, collection, and return systems on TMA ● Construction of TMA in a low-permeability saprolite soil basin, supported by geological evaluation of the basin and local compaction, grouting, or other basin preparation actions during construction as necessary to ensure consistent low-permeability conditions ● Inclusion of a series of redundant water management features (e.g., spillways, diversion ponds) in the TMA design. ● Implementation of probabilistic water balance/water monitoring program for the TMA in the operational phase, in accordance with the <i>Tailings Management Plan</i>, <i>Water Management Plan</i>, and <i>Jinchan/Cyanide Management Plan</i> ● Regular monitoring of TMA water quality in accordance with the <i>Tailings Facility Management Plan</i>, <i>Jinchan/Cyanide Management Plan</i>, and <i>ESMS Monitoring Plan</i> to ensure that controlled discharges will be within Guyana EPA and (IFC, 2007) limits, as well as the free cyanide limits recommended by the ICMC for protection of aquatic life
	<p>Diesel oil spill into the Barama River and its tributaries</p>	<ul style="list-style-type: none"> ● Implementation of the secondary containment and engineered spill prevention and control measures, remote fueling control procedures, oily water separators/treatment systems, and other BMPs per the <i>Hazardous Material Management Plan</i> and <i>Spill Prevention, Control and Contingency Plan</i> ● Implementation of the Project's preventive maintenance (PM) and field inspection programs for the operation of the fuel farm, emergency generator area, and fueling station ● Installation of skimmers/ oily water separators on mine wastewater discharges, reporting to the MWP for settling and dilution prior to any controlled discharge

		<ul style="list-style-type: none"> ● Regular monitoring of MWP water quality in accordance with the <i>Water Management Plan</i> and <i>ESMS Monitoring Plan</i> to ensure that controlled discharges will be within the effluent discharge guidelines and/water quality standards defined by the Guyana EPA and (IFC, 2007)
Mine and leach pad/process facility area	Jinchan/Cyanide spill into the Barama River and its tributaries	<ul style="list-style-type: none"> ● Purchase of Jinchan reagent exclusively in solid powder form, transported to the Project site in dedicated sealed containers ● Restrict direct delivery of Jinchan to the Ianna site using boats or barges on the Barama Rivers ● Implementation of the secondary containment, engineered spill prevention and control measures, and other BMPs defined by the Project <i>Jinchan/Cyanide Management Plan</i>, and <i>Emergency Preparedness and Response Plan</i> ● Implementation of operational practices in the process facility that minimize the potential for process upsets, as noted in the Project <i>Jinchan/Cyanide Management Plan</i> ● Implementation of the Project's PM and field inspection program for the operation of the process facility ● Adherence to the Cyanide Code
	Potential runoff or seepage of leachate from the solid waste landfill	<ul style="list-style-type: none"> ● Collection and periodic testing of leachate from landfill; if testing results indicate effluent quality issues with respect to Guyana EPA or (ICMC, 2007) guidelines, route to MWP for dilution and storage or install local water treatment system
	Infiltration of potential spills or discharges of Jinchan/cyanide and other chemicals into groundwater	<ul style="list-style-type: none"> ● Purchase of Jinchan exclusively in solid powder form, transported in dedicated sealed containers. ● Implementation of the secondary containment, engineered spill prevention and control measures, and other BMPs defined by the Project <i>Jinchan/Cyanide Management Plan</i> and <i>Emergency Preparedness and Response Plan</i> ● Implementation of operational practices in the process facility that minimize the potential for process upsets, as noted in the Project <i>Jinchan/Cyanide Management Plan</i> ● For other (non-cyanide) reagents and fuel, implementation of the secondary containment and engineered spill prevention and control measures, remote fueling control procedures, oily water separators/treatment systems, and other BMPs defined by the <i>Hazardous Material Management Plan</i>, <i>Ianna Spill Contingency Plan</i>, the <i>Ianna Site Spill Prevention, Control and Contingency Plan</i>, and the <i>Emergency Preparedness and Response Plan</i>
Mine and leach pad/process facility area	Potential failure of the TMA and MWP dams after completion of mining activities	<ul style="list-style-type: none"> ● Stabilization, breaching/removal of embankments, closure, and selective re-vegetation of tailings surfaces and embankments per the final <i>Detailed Mine Reclamation and Closure Plan</i>

		<ul style="list-style-type: none"> ● Post-closure monitoring of the stability of the reclaimed MWP, FWP, and TMA areas and periodic monitoring of down gradient surface and groundwater conditions per the final <i>Mine Reclamation and Closure Plan</i> and <i>ESHS Monitoring Plan</i>
Ianna Landing to Ianna Mine Site	Impacts to soils	<ul style="list-style-type: none"> ● Implementation of the <i>Spill Prevention, Control and Contingency Plan</i> and <i>Ianna Spill Contingency Plan</i>, placement of spill kits in heavy equipment /passenger vehicles
Ianna Landing to Ianna Mine Site	Impacts from improper culvert installation at stream crossings	<ul style="list-style-type: none"> ● Design culverts to properly handle natural surface water flows, per the Project <i>Erosion Prevention and Control Plan</i>; correct grading, lined with grass and/or riprap, where necessary, to control flow rates/velocities and minimize erosion
	Loss/degradation of aquatic habitats	<ul style="list-style-type: none"> ● Implementation of BMPs in the <i>Erosion Protection and Control Plan</i> and <i>Water Management Plan</i> to detect and mitigate areas of soil erosion, manage stormwater runoff, and control sedimentation on access road ROWs and other adjacent disturbed areas ● Implementation of progressive restoration and erosional stabilization procedures for any excessively wide ROW areas, as well as any ASM disturbed areas, per the <i>Mine Reclamation and Closure Plan</i> ● Implementation of routine water quality monitoring program at stream crossings per the <i>ESHS Monitoring Plan</i>
	Loss/alteration of terrestrial habitats	<ul style="list-style-type: none"> ● Minimization of clearance actions/project footprint per BMPs in the <i>Exploration Management Plan</i>, <i>Early Works Construction Management Plan</i>, and <i>Construction Management Plan</i> ● Implementation of a routine biodiversity monitoring program within the Ianna mining permits per the <i>Biodiversity Management Plan</i> and <i>ESHS Monitoring Plan</i> ● Implementation of progressive restoration and stabilization procedures for ROWs and ASM-disturbed areas, per the <i>Exploration Management Plan</i>, <i>Early Works Construction Management Plan</i>, <i>Construction Management Plan</i>, and <i>Mine Reclamation and Closure Plan</i> ● Implementation of specific mitigation measures for the protection of sensitive species and habitats, as directed by the <i>Biodiversity Management Plan</i> ● Implementation of BMPs in the <i>Erosion Protection and Control Plan</i> and <i>Water Management Plan</i> to manage stockpiles, and to detect and mitigate erosional issues in other disturbed areas
Ianna Landing to Ianna Mine Site	Impacts to soils	<ul style="list-style-type: none"> ● Implementation of the Project <i>Erosion Prevention and Control Plan</i>, including maintenance of stockpiles, and -re-vegetation of ROWs and other cleared areas adjacent to the road ● Implementation of the <i>Spill Prevention, Control and Contingency Plan</i> and <i>Ianna Spill Contingency Plan</i>; placement of spill kits on all heavy equipment

		<p>and passenger vehicles, and installation of emergency response stations at select locations along the access road</p> <ul style="list-style-type: none"> ● Inclusion of appropriate contractual requirements for spill prevention and control and maintenance of spill kits for all delivery contracts
	Spills of fuel and other chemicals during transport between the Ianna Landing and Ianna Mine Site	<ul style="list-style-type: none"> ● Establishment of contractual requirements for the trucking companies transporting other hazardous chemicals to have spill contingency plans and spill kits ● Establish emergency response stations at selected locations on access road
Overall macro-scale impacts of the project	National socio-economic impacts due to closure	<ul style="list-style-type: none"> ● Implement the Project <i>Community Relations Plan, Influx Management Plan, and final Detailed Mine Reclamation and Closure Plan</i>; key actions will include: <ul style="list-style-type: none"> - diversification of skills/training, and building capacities of former workers and service providers to find economic opportunities with other industries in Guyana; and - Amerindian communities for income generation projects ● Implement selected public/community development projects
	Potential influx into the site, leading to health, security and conflict related risks	<ul style="list-style-type: none"> ● Hiring advertised and controlled through Georgetown office ● Control of employee travel to and from site using NAHAS Mining vehicles ● Prohibition of economic or social contacts by workforce or contractors with transients or local communities ● Prohibition of public (transient) access to the mine, process facility, mechanical shops, fuel storage areas, TMA/MWP/FWP areas, main-camp, solid waste landfill, water supply system, airstrip, explosives silos and magazine, and other sensitive locations ● Promote and implement health awareness and disease prevention campaigns among workers and contractors, as well as local communities upstream and downstream of project site
	Potential ASM and SMM issues	<ul style="list-style-type: none"> ● Continued consultation and engagement with illegal and artisanal/local miners' in accordance with the <i>Influx Management Plan</i> and <i>Community Relations Management Plan</i>.
	Potential human influx to the mine site and related risks	<ul style="list-style-type: none"> ● Train the security personnel on site to monitor potential influx, and to handle influx without creating conflict or security issues, in accordance with the <i>Influx Management Plan</i> and applicable sections of the <i>Community Relations Management Plan</i> ● Prohibition of onsite hiring. Work opportunities advertised and controlled through NAHAS Mining Georgetown office ● Control of employee travel to and from site using NAHAS Mining vehicles ● Prohibit public access to the Solid Waste Landfills

		<ul style="list-style-type: none"> ● Promote and implement health awareness and disease prevention campaigns, especially for malaria suppression and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) and sexually transmitted diseases (STDs) among workers and contractors.
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Table 10: Potential Environmental and Social Impacts and Associated Management/Mitigation Strategies

16.0: JINCHAN/CYANIDE EXPOSURE AND EMERGENCY RESPONSE

Job functions and tasks would be evaluated to determine possible exposure scenarios and pathways. Process changes or engineering controls would be developed and implemented to eliminate these exposures where practicable and to reduce or control them when they cannot be eliminated. The operations would develop and document procedures for performing Jinchan related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination prior to maintenance in a manner that minimizes worker exposures.

These procedures would address the use of cyanide-specific personal protective equipment such as respirators, eye protection and protective gloves, coveralls or suits, pre-work inspections, emergency response, cyanide monitoring and communications and documentation. Personnel involved in Jinchan/cyanide management would be trained in handling Jinchan/cyanide in a manner that protects their safety and the safety of their co-workers. Training would also include the proper use of personal protective equipment, emergency rescue equipment, and cyanide first aid equipment.

The plant would implement procedures to review process and operational changes and modifications for their potential impacts on worker health and safety, and to incorporate the necessary worker protection measures. Worker input through safety meetings, suggestion boxes, or other methods would be factored into the development and evaluation of health and safety procedures.

Process changes and engineering or administrative controls would be used to limit worker exposure to hydrogen cyanide gas and sodium and potassium cyanide to the American Conference of Governmental Industrial Hygienists (ACGIH) Ceiling Limit Value of 4.7 parts per million (5 mg/m³) as cyanide. Where the potential exists for significant worker exposure to hydrogen cyanide gas or sodium or potassium cyanide dust, the operation would monitor hydrogen cyanide concentrations with ambient and/or personal monitoring devices and evaluate the results to confirm that controls are adequate.

Cyanide monitoring equipment would be maintained, tested and calibrated as directed by the manufacturer, and records would be retained for at least one year. Warning signs would be placed where cyanide is used and would alert workers that cyanide is present, that smoking, open flames, eating and drinking are not allowed and that the necessary cyanide-specific personal protective equipment must be worn. Showers, low-pressure eye wash stations and dry powder or non-acidic sodium bicarbonate fire extinguishers would be located at strategic locations throughout the operation where cyanide is present. This equipment would be maintained and be inspected or tested on a regular basis, and records would be retained, to assure that it is in good working order if and when needed. Tanks and piping containing cyanide would be identified by color code, signs, labels, tags, decals or other means to alert workers of their contents. The direction of cyanide flow in pipes would also be labeled, marked or otherwise designated.

Cyanide first aid equipment including medical oxygen and a resuscitator will be provided and will be inspected regularly to assure that it is available when needed. Antidotes for cyanide poisoning would be available. Antidotes will be stored and/or tested as directed by their manufacturer and replaced on a schedule that assures their effectiveness. In general, the procedures for responding to inhalation of cyanide gas or skin contact with liquid or gaseous cyanide would include the following elements:

- Activate alarm or call for help to notify the appropriate site personnel (through alarms, radio, telephone) so that medical assistance is available as soon as possible.
- Call for assistance before responding to the emergency (“buddy-system”). Never try to rescue a cyanide victim on your own.

- The responder must put on the personal protective equipment necessary to safely enter the area and come in contact with the exposed individual.
- If possible, the responder must move the exposed individual to a safe area away from continued exposure. If removing the exposed individual from the area is not possible, the responder must attempt to prevent further exposure to the victim or seek assistance in moving the victim from the area of exposure.
- All contaminated clothing must be removed from the exposed individual, and the exposed individual should be decontaminated by washing with water. Safety shower and eye wash station using low pressure water are recommended.
- Oxygen must be administered, and medical help must be sought. If authorized by the applicable jurisdiction, treatment with amyl nitrite is recommended along with oxygen. A resuscitator should be used if the exposed individual is not breathing.

If Inchan/cyanide is ingested the response to such exposure should include the following elements:

- Notify the appropriate site personnel and put on personal protective equipment, as above.
- An exposed individual who is conscious should spit or be made to vomit, and the mouth should be rinsed with water.
- Continue with decontamination and administration of oxygen and amyl nitrite if permitted, or if the exposed individual is not breathing, a resuscitator should be used.
- An exposed individual that is not conscious, or has impaired consciousness should be treated with oxygen and amyl nitrite if permitted.

Workers who may be called upon to respond to cyanide exposures will be trained in the operation's response procedures and will take part in routine drills to test and improve their response skills. The operations will develop its own on-site capability to provide first aid or medical assistance to workers exposed to cyanide.

Formalized arrangements would be made with local hospitals so health workers are aware of the potential need to treat patients for cyanide exposure. In making these arrangements, the operation

will ensure that the medical facility has adequate qualified staff, equipment and expertise to be able to respond effectively. The operation will assist local medical providers with training and equipment to enhance its capabilities.

Mock emergency drills based on likely release/exposure scenarios would be conducted periodically to test response procedures. Lessons learned from the drills would be incorporated into response planning.

16.1 Contingency and Emergency Response Plan

Nahas Mining Services Inc. will incorporate measures into the design, construction, and operation of its facilities to prevent Jinchuan/cyanide releases to the natural environment as well as workplace exposures. The unloading, storage, mixing, and use of Jinchuan in the mineral extraction process will be conducted within fully contained areas of the process plant. The plant design requires individual containment areas to be sized to accept 110% of the volume of potentially reporting material. All spills within the containment area are amenable to being returned directly to the lixiviant or leaching process, and no residual spill material will be generated in normal operations that will require management or disposal as a waste. Spills of dry Jinchuan powder in the unloading or storage area will be captured and deposited in the mixing tanks. Any spills of process solution will be captured with portable suction pumps and returned to appropriate locations in the process (i.e., areas that will not contribute to a process upset). Containment areas associated with cleaned-up spills will be washed into sumps within the containment, and the collected effluent pumped back to the process.

These preventive measures (and the low probability of Jinchuan-related accidents or emergencies) notwithstanding, it is both prudent and necessary to plan for emergency situations and to be prepared to respond rapidly and effectively in the event that emergencies do occur. NAHAS has therefore included Jinchuan/cyanide and or cyanide derived, specific elements in its detailed *Emergency Preparedness and Spill Contingency Plan*.

16.2: Jinchuan/Cyanide-Related Elements in Emergency Preparedness and Spill Contingency Plan

The *Emergency Preparedness and Spill Contingency Plan* addresses Ianna Gold Leach Project procedures for responding to all types of emergency situations that may occur on site, including injuries and spills of chemical, petroleum products, and other potentially dangerous or hazardous substances. However, rather than providing a separate set of procedures for response to Jinchuan/cyanide exposures and releases within this *Cyanide Management Plan*, the details of the NAHAS response procedures for cyanide are included in the overall *Emergency Preparedness and Spill Contingency Plan* so that a single document may serve as the primary reference during emergencies. The minimum considerations presented for information in this Section of the *Cyanide Management Plan* will be reflected in the procedures included in the *Emergency Preparedness and Spill Contingency Plan*.

The *Emergency Preparedness and Spill Contingency Plan* is designed to fulfill the IGLP obligations under applicable GGMC & EPA directives for preparation and submission of emergency prevention, response and notification plans, a Safety Report, and other requested information.

The *Emergency Preparedness and Spill Contingency Plan* also describes IGLP policies and procedures for prevention of major accidents in addition to describing the elements of the facility's design and construction that limit the potential for such events.

The *Emergency Preparedness and Spill Contingency Plan* will also be developed with the involvement of and consultation with the project workforce and external stakeholders, in order to ensure that it addresses site-specific risks. External stakeholders may include local communities, potentially affected individuals or groups, community leaders or representatives, and/or local response agencies and medical facilities. NAHAS will periodically consult with employees and stakeholder to ensure that the *Emergency Preparedness and Spill Contingency Plan* continue to address current conditions and risks.

16.3: Potential Release/Exposure Scenarios

The development of effective emergency response procedures requires a realistic evaluation of potential Jinchan/cyanide releases and/or exposure scenarios that may occur at the IGLP site, regardless of the probability or likelihood of occurrence. A range of potential scenarios is therefore identified below, along with brief summaries of the likely nature of the potential release or exposure and the appropriate response. Specific response actions and mitigation measures designed to minimize the likelihood of such occurrences are further detailed in the *Emergency Preparedness and Spill Contingency Plan*.

Table 11: Potential Release of Cyanide Gas/Fumes During Jinchan Off-loading, Storage, and Initial Mixing of Process Solution (package or tank rupture scenario)

Nature of Incident	High-concentration of cyanide gas/fumes release
Potential Cause	Operator error and/or equipment failure leading to rupture of package or mixing tanks during off-loading and initial process solution mixing, and subsequent contact of Jinchan with precipitation or other low to neutral pH water source.
Preventative Measures	<p>Design of covered offloading area to permit safe maneuvering of trucks and trailers and elimination of precipitation and all potential low to neutral pH water sources.</p> <p>Provision for highly audible and visible (flashing light) alarms, triggered by appropriate airborne cyanide detectors.</p> <p>Compliance with the <i>Jinchan/Cyanide Management Plan</i>.</p> <p>Compliance with applicable SOPs, including:</p> <ul style="list-style-type: none"> “Unloading and Storage of Reagent Jinchan” “Heap Leach Facility Operation” “Inspections of Jinchan Tanks, Pipelines, and other Jinchan Facilities” “Maintenance and Calibration of Cyanide gas Monitoring Equipment” “Decontamination of Jinchan Handling Equipment” “Emergency Power Generation for Jinchan/Cyanide Handling Equipment” “Emergency Response Preparedness” “Alcohol Testing for Drivers/Equipment Operators”

	<p>“Hazardous Material Storage and Transfer Operations”</p> <p>“Environmental and Social Management Training”</p>
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i> depending on the potential for offsite impacts. Immediate coordination with responsible regulatory agencies</p> <p>Notify and evacuate down-wind areas; stop release, contain spill, and neutralize, if possible, followed by immediate first aid for any exposed personnel.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

Table 12 Scenario 2. Potential Release of Cyanide Gas/Fumes During Initial Mixing of Process Solution (Operator error scenario)

Nature of Incident	High-concentration cyanide gas/fumes release
Potential Cause	Operator error during process solution mixing that would introduce low to neutral pH water into the Jinchan mixing containment tank.
Preventative Measures	<p>Piping system interlocks designed to prevent a potential for accidental operator introduction of low to neutral pH water.</p> <p>Provision for highly audible and visible (flashing light) alarms, triggered by appropriate process set points.</p> <p>Compliance with the <i>Jinchan/Cyanide Management Plan</i>.</p> <p>Compliance with applicable SOPs, including:</p> <ul style="list-style-type: none"> ● “Unloading and Storage of Reagent Jinchan” ● “Heap Leach Facility Operation” ● “Inspections of Jinchan Tanks, Pipelines, and other Jinchan Facilities”

	<ul style="list-style-type: none"> ● “Maintenance and Calibration of Cyanide Monitoring Equipment” ● “Decontamination of Jinchan Handling Equipment” ● “Emergency Power Generation for Jinchan Handling Equipment” ● “Emergency Response Preparedness” ● “Hazardous Material Storage and Transfer Operations” ● “Environmental and Social Management Training”
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i> depending on the potential for offsite impacts. Immediate coordination with responsible regulatory agencies</p> <p>Notify and evacuate down-wind areas; stop release, contain spill, and neutralize, if possible, followed by immediate first aid for any exposed personnel.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

Table 13: Scenario 3. Potential Release of Cyanide Gas/Fumes from the Processing Heap Leach Facility.

Nature of Incident	Low -concentration cyanide gas/fumes release
Potential Cause	Temporary loss of process pH control systems
Preventative Measures	<p>Installation of pH monitoring equipment (with backups) and establishment of alarmed set points to prevent pH control excursions.</p> <p>Provision for highly audible and visible (flashing light) alarms, triggered by appropriate process set points, that prompt process operators to close influent valves and adjust the system.</p>

	<p>Compliance with the <i>Jinchan/Cyanide Management Plan</i>.</p> <p>Compliance with applicable SOPs, including:</p> <ul style="list-style-type: none"> ● “Heap Leach Facility Operation” ● “Inspections of Jinchan Tanks, Pipelines, and other Jinchan Facilities” ● “Maintenance and Calibration of Cyanide Monitoring Equipment” ● “Decontamination of Jinchan Handling Equipment” ● “Emergency Power Generation for Jinchan/Cyanide Handling Equipment” ● “Emergency Response Preparedness” ● “Hazardous Material Storage and Transfer Operations” ● “Environmental and Social Management Training”
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i> depending on the potential for offsite impacts. Immediate coordination with responsible regulatory agencies</p> <p>Notify and evacuate down-wind areas; stop release, contain spill, and neutralize, if possible, followed by immediate first aid for any exposed personnel.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

Table 14: Scenario 4. Potential Generation of Cyanide Gas/Fumes from Accidental Release of Jinchan Powder During Transport to the Project Site

Nature of Incident	Potential generation of cyanide gas/fumes from accidental release of Jinchan Powder
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Potential Cause	Transport vehicle accident; breach of ISO container and contact with water
Preventative Measures	<p>Maximization of road transportation in logistics planning for delivery of Jinchan.</p> <p>Avoidance of high-risk road areas as indicated by transportation route surveys and evaluation and selection of routes to minimize risks, including logistics considerations and local community emergency response capabilities.</p> <p>Establishment of co-operative arrangements with emergency response organizations located in towns or villages along the primary transportation corridors.</p> <p>Strict contractual controls over transport operations including:</p> <ul style="list-style-type: none"> ● driver training/competence certifications; alcohol testing for delivery and escort vehicle drivers, before and after delivery; ● specific logistics and routing instructions for transport to the operation; ● convoy and escort vehicles with flashing lights and UN-compliant signals and placarding; ● delivery container design requirements, condition, and certification; ● direct (radio/telephone) communication capabilities along the entire transit route, including Global Positioning System (GPS) tracking; ● safety and maintenance of the means of transportation (e.g. vessels, vehicles, or railway cars) throughout transport; ● compliance with applicable national regulations in each phase of transport; ● safety training for transporters and handlers throughout transport; ● security throughout transport; and ● specific instructions for unloading; and ● planned and coordinated emergency response actions, if necessary, at any point in the transportation process. ● NAHAS and transporter compliance with the <i>International Cyanide Management Code</i>. <p>Compliance with the periodic emergency response drill and all other requirements of the <i>Jinchan/Cyanide Management Plan</i>.</p>

	<p>Compliance with applicable SOPs including:</p> <ul style="list-style-type: none"> ● “Decontamination of Jinchan Handling Equipment” ● “Emergency Response Preparedness” ● “Hazardous Material Storage and Transfer Operations” ● “Environmental and Social Management Training”
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i> depending on the potential for offsite impacts. Immediate coordination with responsible regulatory agencies</p> <p>Contact and co-ordinate other response actions with local, regional, and national officials, as indicated by the community emergency plans from the affected transportation corridor communities.</p> <p>Secure the spill site, immediately initiate air quality monitoring actions, notify and evacuate down-wind residential areas as indicated.</p> <p>Under dry conditions, use shovels and/or front-end loader to pick up material and place in drums for use or return to NAHAS for recycling, and remediate contaminated soil; under wet conditions, cover with plastic to prevent contact with water and recover material when dry.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

Table 15: Scenario 5. Potential Jinchan Solution Releases Within the Process Facility from Faulty Tanks, Pipelines, Fittings, or Valves

Nature of Incident	High concentration Jinchan solution release from reagent mixing, storage facility or low concentration Jinchan solution release from HLF; or very low concentration Jinchan solution release from tailings treatment process.
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<p>Potential Cause</p>	<p>Failure or leaks from ponds, pipelines, couplings, valves, or secondary containment systems; power outages and pump failures occurring simultaneously with malfunctions of pump interlocks and high-level switches</p>
<p>Preventative Measures</p>	<p>Design to prohibit potential mixing of process solution with precipitation or low- or neutral pH water.</p> <p>Installation of bermed concrete secondary containment structures for the mixing and storage tanks and all Jinchan process areas within the process plant, capable of capturing 110% of the volume of process solution that could potentially report to a given containment.</p> <p>Installation of airborne cyanide gas alarms above the Jinchan mixing and storage tanks and at other appropriate locations throughout the plant.</p> <p>Design of interlocks and backup systems to eliminate the potential for simultaneous pump/level switch failures.</p> <p>Installation of backup generators to prevent loss of electrical service to all cyanide process pumps.</p> <p>Use of BAT design standards for piping system/pump/ component selection, including requirements for materials and structural characteristics compatible with cyanide service.</p> <p>Engagement of qualified construction firm with certified tank and piping system welders.</p> <p>Strict construction quality assurance requirements in construction and acceptance testing of process plant, including receiving inspection of all construction materials, welder certification and welding inspections, tank and piping system integrity inspections, and appropriate system pressure and operational tests during plant commissioning.</p> <p>Compliance with the periodic emergency response drill requirements and other provisions of the <i>Jinchan/Cyanide Management Plan</i>.</p> <p>Compliance with applicable SOPs including:</p> <ul style="list-style-type: none"> ● “Unloading and Storage of Reagent Jinchan” ● “Heap Leach Facility Operation” ● “Inspections of Jinchan Tanks, Pipelines, and other Jinchan/Cyanide Facilities” ● “Maintenance and Calibration Cyanide Monitoring Equipment”

	<ul style="list-style-type: none"> ● “Decontamination of Jinchan Handling Equipment” ● “Emergency Power Generation for jinchan/Cyanide Handling Equipment” ● “Emergency Response Preparedness” ● “Hazardous Material Storage and Transfer Operations” ● “Environmental and Social Management Training”
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i> depending on the potential for offsite impacts. Immediate coordination with responsible regulatory agencies.</p> <p>Notify and evacuate downwind areas; stop release, contain spill, and neutralize, if possible, followed by immediate first aid for any exposed personnel.</p> <p>Pump spilled solutions from secondary containments back to the HLF process.</p> <p>Use earth-moving equipment to construct emergency catchment areas, as necessary if containments were breached, and remediate any contaminated soil areas.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

Table 16: Release of detoxified tailings to the environment.

Nature of Incident	Release of detoxified tailings with trace (< 10 mg/L) concentrations of WAD cyanide by spillage.
Potential Cause	Haulage equipment accident or spillage from haul unit.
Preventative Measures	<p>Use of BMP design standards for haul road design and haulage equipment handling.</p> <p>Loading of haulage equipment to struck capacity to minimize spillage.</p>

	<p>Strict compliance with loading and haulage equipment operating parameters.</p> <p>Compliance with <i>Tailings Management Area Plan</i>, including periodic condition/integrity inspections and periodic emergency response drills, as specified.</p> <p>Compliance with applicable SOPs including:</p> <ul style="list-style-type: none"> ● “Emergency Response Preparedness” ● “Operations Start-up” ● “Normal Operating Procedures- Tailings Deposition” ● “Tailings Management Area- Operations Inspection” ● “Tailings Management Area- Operations Reporting” ● “Tailings Management Area- Emergency Maintenance/ Inspection” ● “Tailings Management Area- Emergency Response Action” ● “Tailings Management Area- Emergency Notification Requirement” ● “Tailings Management Area- Health and Safety” ● “Tailings Management Area- Health and Safety Monitoring” ● “Environmental and Social Management Training”
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i>. Immediate coordination with responsible regulatory agencies.</p> <p>Initiate emergency shutdown of tailings disposal and stop detoxified tailings release.</p> <p>Contain spill, reload to haulage equipment and dispose to the TMF.</p> <p>Use earth-moving equipment to construct emergency catchment areas, as necessary if containments were breached.</p> <p>Initiate equipment and haul road repairs, conduct inspections and acceptance testing of repaired equipment or facility prior to authorizing tailings disposal restart.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and</p>

	<p>“Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>
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Table 17: Scenario 7. Breach in TMA (Main Embankment) and/or Secondary Containment Dam

Nature of Incident	Major breach of the TMA tailings dam (main embankment) and/or Secondary Containment Dam [with trace/ultratrace (< 10 mg/L) concentrations of WAD cyanide in tailings]
Potential Cause	Inadequate QA/QC management practices in starter dam construction and/or subsequent raises, as well as earthquake, foundation failure, overtopping, erosion, or bombing or other manmade action intended to cause a dam breach
Preventative Measures	<p>Institution of rigorous site security procedures in accordance with “Site Security” SOP</p> <p>Proactive engagement of external stakeholders and local, regional, and national officials in accordance with the <i>Social Management Plan</i>.</p> <p>Compliance with the emergency response drill requirements and other provisions of the <i>Tailings Management Area Plan</i>.</p> <p>Compliance with all proactive monitoring, inspection, and other requirements from all applicable SOPs including:</p> <ul style="list-style-type: none"> ● “Emergency Response Preparedness” ● “Normal Operating Procedures- Tailings Water Management” ● “Tailings Management Facility- Operations Inspection” ● “Tailings Management Area- Operations Reporting” ● “Tailings Management Area- Emergency Maintenance/ Inspection” ● “Tailings Management Area- Emergency Response Action” ● “Tailings Management Area- Emergency Notification Requirement” ● “Tailings Management Area- Health and Safety” ● “Tailings Management Area- Risk Analysis”

	<ul style="list-style-type: none"> ● “Tailings Management Area- Health and Safety Monitoring” ● “Tailings Management Area- Groundwater Monitoring” ● “Tailings Management Area- Surface Water Monitoring” ● “Tailings Management Area- Air Monitoring/Meteorological Facility” ● “Environmental and Social Management System Training” <p>If daily monitoring reveals worsening or unexpected conditions, shut down disposal of tailings and minimize other inflow into the TMA by placement of diversion berms or dikes; immediately alert public officials and affected communities via community emergency response contacts.</p>
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i>. Immediately alert and coordinate with responsible regulatory agencies and emergency response organizations.</p> <p>Administer first aid/arrange for medical attention, as needed.</p> <p>Immediate notification and evacuation of residents in Lower Barama and other locations down gradient of the secondary containment dam.</p> <p>Immediate notification of mine site management and local, regional, and national authorities; notify local law enforcement.</p> <p>Immediate notification of and co-ordination with the Government of Guyana, relief agencies, and/or other concerned stakeholders as indicated by the <i>Social Management Plan</i> or specific permit conditions.</p> <p>Implement emergency systems, shut down the process plant and tailings disposal, and take site stabilization actions (e.g., breach repair, backfilling, reinforcement, and installation of dikes or diversion structures) to the extent practical given the nature of the incident.</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p>

	Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.
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Table 18: Scenario 8. Overtopping of Tailings Management Facility and/or Secondary Containment System (No Dam Breach)

Nature of Incident	Overtopping of the TMA and/or Secondary Containment System (with trace/ultratrace concentrations of WAD cyanide in tailings)
Potential Cause	Extreme rain and storm runoff event in excess of the design PMF
Preventative Measures	<p>Compliance with the emergency response drill requirements and other provisions of the <i>Tailings Facility Management Plan</i>.</p> <p>Compliance with applicable SOPs including:</p> <ul style="list-style-type: none"> ● “Emergency Response Preparedness” ● “Normal Operating Procedures- Tailings Water Management” ● “Tailings Management Area- Operations Inspection” ● “Tailings Management Area- Operations Reporting” ● “Tailings Management Area- Emergency Maintenance/ Inspection” ● “Tailings Management Area- Emergency Response Action” ● “Tailings Management Area- Emergency Notification Requirement” ● “Tailings Management Area- Health and Safety” ● “Tailings Management Area- Risk Analysis” ● “Tailings Management Area- Health and Safety Monitoring” ● “Tailings Management Area- Groundwater Monitoring” ● “Tailings Management Area- Surface Water Monitoring” ● “Tailings Management Area- Air Monitoring/Meteorological Facility” ● “Environmental and Social Management Training” <p>If daily monitoring reveals worsening conditions, shut down process plant and tailings disposal, pump down the decant pond, and minimize other inflow into the TMA by placement of diversion</p>

	berms or dikes; alert public officials and issue evacuation alert to affected communities via community emergency response contacts
Response	<p>Immediate implementation of the <i>Emergency Preparedness and Spill Contingency Plan</i>. Immediately alert and coordinate with responsible regulatory agencies and emergency response organizations.</p> <p>Administer first aid/arrange for medical attention, as needed.</p> <p>Immediate notification and evacuation of residents in the Barama and other locations down gradient of the secondary containment dam.</p> <p>Immediate notification of mine site management and local, regional, and national authorities; notify local law enforcement.</p> <p>Immediate notification of and co-ordination with the Government of Guyana, relief agencies, and/or other concerned stakeholders as indicated by the <i>Social Management Plan</i> or specific permit conditions.</p> <p>Implement emergency systems, shut down the process plant and tailings pipeline, and take site stabilization actions (e.g., reinforcement of weakened dam areas) to the extent practical given the nature of the incident.</p> <p>Minimize other inflow into the TMF and/or stop overtopping flow by placement of diversion berms or dikes</p> <p>Conduct incident investigation and undertake appropriate corrective and preventive action in accordance with “Emergency Incident Investigation, Reporting, and Record keeping” and “Corrective and Preventive Action for Environmental and Social Management System Nonconformances.”</p> <p>Implement other emergency-specific actions as described in the <i>Emergency Preparedness and Spill Contingency Plan</i> and the Safety Data Sheet (SDS) information.</p>

16.4: Emergency Response Team/Off Site Responders

The *Emergency Preparedness and Spill Contingency Plan* identifies primary and alternate Emergency Response Coordinators, Emergency Response Team members and off-site response

agencies for response to emergency situations. These same personnel are also the appropriate responders for Jinchan/cyanide emergencies, and shall have received the training specified in the *Jinchan/Cyanide Management Plan*. The *Emergency Preparedness and Spill Contingency Plan* includes contact information and call-out procedures for response personnel. The plan also requires that any off-site response personnel that may be called to assist in the event of an emergency be familiarized with the contents of the plan, the nature of the risks present at the Ianna Gold Leah Project including Jinchan/cyanide, and the planned response actions.

In the event of a cyanide-related emergency, the primary or alternate Emergency Response Coordinator will be immediately contacted. The Emergency Response Coordinator will subsequently activate the Emergency Response Team.

The Emergency Coordinators are responsible for coordinating all emergency response measures. They shall be thoroughly familiar with all aspects of the *Emergency Preparedness and Spill Contingency Plan*, all operations and activities at the IGLP involving Jinchan/cyanide, the location and characteristics of Jinchan/cyanide, cyanide solutions and Jinchan/cyanide facilities, the location of response equipment, and the facility layout. The Emergency Coordinators are specifically vested the authority to commit the resources needed to implement *Emergency Preparedness and Spill Contingency Plan* requirements in response to a cyanide emergency.

All members of the Emergency Response Team are responsible for implementing the *Emergency Preparedness and Spill Contingency Plan* under the direction of the Emergency Coordinator. Team members will be trained in the response procedures included in the *Emergency Preparedness and Spill Contingency Plan* and in the use of the response equipment listed therein.

NAHAS also will work with the communities adjacent (and along the transit routes) to the Project site in order to develop the information necessary for preparation of external community emergency plans, and will co-ordinate with potential off-site responders such as local police and fire-fighters to make them aware of the nature of potential cyanide-related risks and the possible need for their assistance in an emergency.

16.5: Response Equipment and Maintenance/Inspection Requirements

Standard operating procedure “Emergency Response Equipment - Maintenance, Inspections, and Testing,” describes how NAHAS will ensure the availability of such equipment in the event it is needed. A list of equipment items required for the management of Jinhan/cyanide exposures and releases are listed in the procedure and address items necessary for containment and cleanup of spillage, traffic control, first aid and personal protective equipment, special equipment for response vehicles, and necessary items for documentation and communication.

16.6: Response Actions

Standard operating procedure “Management of Reactive Chemical Spills” will include additional information on response actions specific to each cyanide release scenario identified in Section 16.3. For example, where a release from a pipeline or tank can be stopped by closing a valve or shutting down a pump, it is intended that the procedure identify the specific valve or pump. Such detail will be incorporated into an update of the *Emergency Preparedness and Spill Contingency Plan* when facility design characteristics are finalized.

Any accidental release of Jinchan/cyanide constitutes a non-conformance with the IGLP Environmental and Social Management System. Standard operating procedure “Corrective and Preventive Action for Environmental and Social Management System Nonconformances” describes the process by which such incidents are document and near-term corrective actions initiated, along with the development of long-term preventive measures that address root causes and that are designed to eliminate or minimize the likelihood that such non-conformances will recur.

16.7: Internal and External Notification Requirements

Reporting of Jinchan/cyanide releases and exposures shall follow the same procedures established in the *Emergency Preparedness and Spill Contingency Plan* for the internal and external reporting

of accidents and incidents. In the event of a major accident, NAHAS will comply fully with the requirements of the Guyana geology and Mines Commission and Guyana EPA and provide the competent authority with the following information:

- The circumstances of the accident;
- Identification of the dangerous substance(s) involved;
- Information to enable an assessment of the effects of the accident on human health and the environment;
- The emergency measures taken; and
- The measures to be taken to alleviate medium- and long-term effects of the accident, as well as to prevent recurrence.

17.0: SOCIAL OR COMMUNITY RELATIONS REQUIREMENTS

Small, temporary or transient ASM and SMM encampments may be encountered in the vicinity of the IGLP. There is no formal established community and settlements in the immediate vicinity of the Ianna project site. The IGLP characterizes itself as a medium scale mining operation and as such is not expected to generate any direct socio-economic effects that often characterizes other mining projects. It should be noted that the mining permits will require consistent surveillance to identify potential illegal ASM and SMM incursions. There are currently no permanent communities or residences within the IGLP that will require physical displacement or resettlement actions.

The area of the project is very remote, but has been impacted by traditional and largely unregulated ASM, SMM and hunting activities.

There are no known archeological sites or areas of significant cultural interest within the project concession. However, any artifacts or items of potential historical, archeological, or anthropological interest, which may be found during the life of the project will be handed over to the Guyana National Trust and Ministry of Culture.

The IGLP is not located on lands traditionally owned or customarily used by Indigenous Amerindian Peoples. The nearest Amerindian community of Kariako, may be impacted by project operations. It is expected that some Amerindian Groups may traverse the project area during the LOM and provisions will be made for this in the Communities Relations Management Plan.

The potential for incursions of traditional unregulated or illegal ASM and SMM access to IGLP areas by small groups or individual transient miners (or the creation of opportunistic encampments or informal communities in the area of the IGLP) is known to be an area of significant concern to NAHAS. Such access will therefore be actively discouraged in collaboration with the GGMC, out of concerns for the health and safety of employees and the contractor workforce, the transient miners themselves, and other individuals opportunistically attracted to the IGLP because of a perceived potential for economic activity or benefit.

18.0: OCCUPATIONAL HEALTH AND SAFETY

During the operation of the IGLP, emphasis will be placed on providing a safe and healthy environment for personnel. A health and safety plan will be implemented to ensure compliance with the regulations of the OHS Act 1997. Occupational Safety & Health plans will be implemented in the following areas:

- Industrial Accident prevention and management
- Occupational Hygiene.
- Illness & Infectious disease prevention and management.
- Sewage and Waste Disposal.

Occupational health and safety will be implemented to protect the physical and mental health of workers and ensuring their continual welfare in their working environment. In addition to preventing ill health, other important aspects of occupational health and safety include:

- Ensuring fitness and physical capability to perform a job safely;

- Health education and promotion;
- Providing medical services including health surveillance;
- Rehabilitation after illness or injury.

The IGLP will implement a mine health and safety management system. There will be an agreed OHS policy that will be integral to the manner in which the management of NAHAS intends to pursue OHS.

The intent of the OHS policy will be to fully meet Guyana EPA, Mining Regulations, the OHS Standards and the Labour Act. Management will educate employees on OHS standards and also promote an effective OHS culture.

All employees will have, as minimum responsibilities, defined to;

- Take care of themselves and others that may be affected by their acts and omissions;
- Wear appropriate personal protective equipment (PPE) at all times whenever necessary
- Follow the training they have been given when using any equipment, substance, safety device or procedure provided by their employer;
- Report to the employer any risks to health or safety they may find; and
- Report any shortcomings in the health and safety arrangements.

18.1: Industrial Accident Prevention and Management

Industrial accident prevention and management will be affected via the company safety program. This will commence during the construction phase of the new facility and continue throughout the life of the mine and closure and monitoring stages. The program will include the following:

- Hazard identification and control;
- Monitoring and reporting of industrial accidents;
- Training or education of employees in industrial first aid;
- Industrial Accident Protocol;

- Fire Safety & Preparation and
- Hazard Identification and Control

18.2: Hazard Identification

For each work activity all the health hazards will be identified. Most hazards will be identified based on knowledge and observation of the work activity, though specialist advice or assistance may be necessary. Useful advice is also available from other sources such as data sheets supplied with equipment or chemicals.

Table 7 lists the potential hazards in different phases of the operations of the facility and the preventative and remedial activities necessary for their elimination and control. In addressing these hazards, the first priority will be their elimination via modification in the design of equipment or process. If this is not possible or feasible and the hazard cannot be eliminated, then the employees will be provided with the necessary safety protective gear to prevent any injuries during the work process.

Phase	Potential Hazard	Protective & preventative safety Measures
1. Clearing of site & construction of living quarters: <ul style="list-style-type: none"> ● Felling trees ● Removal of topsoil & overlying vegetation ● Assembly of building ● Assembly of generating plant 	Insect bites Snake bites Minor trauma to extremities Lacerations from use of sharp tools	Use of insect repellants Provision of snake bite kits Use of safety shoes & gloves
2. Excavation of Ore	Fugitive dust blown into eyes Inhalation of fugitive dust High noise levels from working of heavy duty vehicles- trucks, tractors, etc.	Use of clear goggles Use of dust/mist respirators Use of ear plugs
3. Smelting of ore in furnaces	High temperatures Minor burns to extremities	Use of heat resistant aprons/overalls Use of heat resistant gloves
4. Operation of power generating plant	High noise levels	Use of ear muffs & ear plugs
5. Maintenance shop operations	Contact dermatitis Skin irritation from exposure to grease High noise levels	Use of barrier creams & detergents on hands Use of ear plugs

6. Cyanide exposure	Inhalation of hydrogen cyanide gas Ingestion	Use of respirators, clear goggles, protective gloves, coveralls, cyanide gas monitoring, washing before eating, drinking or smoking
7. Onsite and offsite spill	Discharge to groundwater Discharge to surface water	Containment around storage areas Monitoring discharges Communication with impacted areas

Table 19: Potential OHS hazards and mitigation strategies.

Hazard identification and reporting will constitute an ongoing activity in which the employees' participation will be considered an integral part of his work functions. The OHS Act 1997 clearly stipulates the responsibilities of employees and supervisor/management in this regard. In accordance with those regulations the supervisor/manager will do the following:

- Inspect all machines and equipment for the existence of potential hazards and ensure that they are in working order.
- Inform the worker of any hazards present.
- Instruct the employee in the correct safe work procedure to prevent injuries and ensure that those
- instructions are followed
- Provide the necessary safety protective gear when required.

In accordance with OSH Act 1997 employees will be authorized to do the following:

- Cease work once a hazard is perceived.
- Report the hazard to the supervisor who will in company with the safety representative inspect the condition or circumstance and determine its validity.
- Obey the instruction to perform alternative work or cease work completely as directed by the supervisor.
- Return to the workstation or proceed once the hazard has been adequately dealt with or eliminated.

18.3: Hazard Monitoring and Reporting

The Safety Representative, elected from among the workers, will monitor hazards and work conditions. He will do the following:

- Perform Safety Inspections on and off the operations site on a regular and programmed basis (at least once per month) for the detection of unsafe conditions or any potential hazards and report these hazards to management.
- Record all minor and loss time accidents in a ledger as required by the Ministry of Labor (Fig 14, shows the format to be used for recording industrial accidents).
- Remit reports of industrial accidents or fatalities to the Ministry of Labor when required.

In addition to the abovementioned, all employees will be educated about their responsibility to participate in the creation of a healthy and safe environment by:

- reporting unsafe and hazardous conditions when detected
- performing work in a safe manner by following the correct work procedure.

ACCIDENT/INCIDENT REPORT FORM

Record No: _____

Personal details

Name: _____

Occupation: _____

Section/Dept: _____ Date of report: / /

Accident/incident details

Date: _____ Time: _____ Date reported: / /

Location: _____ Witness: _____

Reported to whom: _____

Full accident/incident details – what happened, or in the case of a near miss, what could have happened**Injury – Nature of Injury**

- | | | | |
|--|---|---------------------------------------|--|
| <input type="checkbox"/> Contusion/crush | <input type="checkbox"/> Burn | <input type="checkbox"/> Dislocation | <input type="checkbox"/> Amputation |
| <input type="checkbox"/> Laceration/open wound | <input type="checkbox"/> Superficial injury | <input type="checkbox"/> Foreign body | <input type="checkbox"/> Internal injury |
| <input type="checkbox"/> Concussion | <input type="checkbox"/> Sprain/strain | <input type="checkbox"/> Fracture | <input type="checkbox"/> Dermatitis |

Location of Injury

- | | | |
|--|--|--|
| <input type="checkbox"/> Head/face | <input type="checkbox"/> Eye | <input type="checkbox"/> Internal organs |
| <input type="checkbox"/> Hand/fingers | <input type="checkbox"/> Shoulder/arms | <input type="checkbox"/> Trunk (other than back) |
| <input type="checkbox"/> Hip/leg | <input type="checkbox"/> Foot/toes | <input type="checkbox"/> Back |
| <input type="checkbox"/> Other (state) | | |

Results of accident

Lost time injury Y / N No. of days: _____ days Workers' compensation Y / N

Treatment received: First aid Doctor Hospital**Damage to equipment/buildings/vehicles etc.**

What was damaged? _____

Extent of damage: _____

Contributing factors

What were the contributing factors (if any)? _____

Corrective actions

Immediate actions

What controls can be put in place to prevent this from happening again?

Recommendations for action _____

Who is to implement these controls/corrective actions? _____

Date by which action is to be taken / /

Signatures

Officer: _____ HS Rep: _____ Manager: _____

Director: _____ Investigating officer: _____

Actions completed: _____ Date: / / Manager: _____

Figure 16: OHS incident/accident reporting format

18.4: Training and Education of Employees

The company will run periodic training program in:

- Basic first aid programs (all employees).
- Advanced first aid programs
- Accident investigation & reporting seminars (supervisory personnel & safety reps.)

The basic first aid program will be extended to all employees and would be geared to ensure that in the event of an accident or injury, someone with first aid knowledge will always be present to render initial assistance until further medical attention can be made available. Qualified personnel will run seminars to impart the necessary theoretical as well as practical skills required. These courses will be scheduled depending on employee strength and attrition.

The advanced first aid program will constitute an upgrading course from the basic first aid program in which selected employees including supervisors and the Safety representative will be exposed to advanced first aid knowledge and techniques which will enable them to participate in the recognition and the initial management of serious injuries and illnesses e.g. Fractures, Spinal Injuries, Malaria, Typhoid fever etc.

18.5: Industrial Accident Protocol

Serious injuries will be referred to a medical practitioner and medical institution. The medical institution and practitioner will preferably be chosen from the nearest Town/Village to the operations and contact will be maintained at all times. In the event of an industrial accident the following protocol will be followed:

- A basic first aider will be summoned if not already present at the scene of accident.
- The basic first aider will render first aid care.
- The basic first aider will summon a certified medex who will administer further care if necessary and evaluate the necessity for removal to the first aid centre.

- The certified medex will summon the vehicle specifically identified for this purpose and supervise the removal of the injured to the first aid station.
- The employee's immediate supervisor will be informed. He will:
 - Make contact with the identified medical Practitioner and Institution and inform them of the time of arrival of the injured employee.
 - Complete the accident form and forward same along with the injured to the medical institution for completion by medical practitioner
 - Inform the Safety representative who will record the accident in the Industrial accident register.

A vehicle will be available at all times to respond to accidents. That vehicle will be equipped with a four-wheel drive and will have the following equipment:

- oxygen cylinder and gas masks resuscitation equipment,
- a bed and accommodation for a first aid attendant to sit alongside the injured,
- a flashing light attached to warn other road users,
- communication equipment.

18.6: Occupational Hazards

The main environmental occupational hazards to which employees will be exposed during the operations phase of the mining entity are:

- Dust.
- Noise.
- Heat
- Fumes

18.6.1: Dust Exposure

The following measures will be implemented in order to decrease or eliminate respirable dust inhalation and prevent any adverse effects on workers:

- Provision of dust respirator with filters to employees exposed during the excavation and transportation of ore
- Siting of living quarters a convenient distance from the operations site and on the leeward side of same.
- Minimal denudation of vegetation around campsite.
- Chest X-Rays of all employees once yearly in order to detect any incipient pulmonary disease such as persistent coughing and/or shortness of breath.

These measures will assist in elimination or reduce further the very low risk of the development of lung impregnated disease by employees exposed to dust.

Workers in the excavation and transportation phases of the operations would be exposed to windblown/fugitive dust being blown into the eyes and causing eye irritation and conjunctivitis. These employees will be provided with clear goggles and eye wash lotion will at all times be available for washing the affected eyes.

18.6.2: Noise

The following measures will be implemented to address worker health and safety related to noise associated with the operation:

1. Control of noise levels at source via installation of silencers on exhaust system of power generating plant.
2. Provision of hearing protection to employees exposed to high noise levels: ear muffs for employees in the maintenance shops and generating plant areas.
3. Earplugs for employees who operate heavy-duty machines.
4. Siting of power generating plant and mining operations in location away from the living quarters of employees.

5. Warning signs in areas of high noise levels instructing employees to wear earmuffs or earplugs as required.
6. Hearing conservation program for employees exposed to noise. This will consist of:
 - Audiological examination before employment to establish baseline hearing capacity on
 - initiation of employment.
 - Yearly audiological testing of employees exposed to high noise levels.
 - Acquisition of a portable sound level meter
 -
 - Measurement of sound levels in instances where it is suspected that deviations from the previous levels are occurring.

18.6.3: Heat

Measures to decrease the effect of increased exposure to heat will include:

- Measurement of ambient temperature levels in vicinity of generating plant
- Provision of heat shields - coating of surface of generating plant by high reflective material such as polished aluminum.

18.6.4: Fumes: The exposure of personnel to fumes has been considered in Tables 7 to 10 above.

18.7 Food and Water Safety

Food and water will be provided by the mine site operator to employees. No sales of food, beverages will be permitted by vendors etc. within the mine site. A condition of employment will forbid purchasing of food, beverages etc. from vendors. All food including both raw and refrigerated foods will be stored in accordance with guidelines provided by the Environmental Health Unit of the Ministry of Health. Redundancy will be provided for storage of refrigerated

goods to ensure capacity exists in the event of damage or loss of any unit. All waste generated by the operation will be disposed in accordance with the Waste Management Plan.

A vector control program will be implemented over the duration of the project. Should an outbreak of flies occur, an insect exterminator would be used to control the flies at the source. Uncovered and available food wastes will not be permitted, to minimize the development of any rodent populations. Should an outbreak of rodents or other vermin occur within the area, the vermin will be exterminated by a licensed exterminator in a manner that is appropriate for the vermin in question.

All water for drinking purposes will be imported to the site from acceptable and certified drinking water sources. If groundwater is utilized for drinking water, it would be treated by chlorination and filtration to acceptable quality for potable water use. Samples of drinking water will be tested at the Government Analyst Department to ensure it conforms to drinking water standards.

18.8: Vector Control

Water in water management ponds may favor the multiplication of waterborne disease vectors such as flies, mosquitoes and other parasites and the introduction of new ones.

Pesticides that are non-toxic to humans, fish and livestock will be used for habitat and vector control. A body will be established to provide health advisory and support health services and to monitor disease vector and disease incidences.

19.0: DECOMMISSIONING AND CLOSURE OF HLF FACILITIES

NAHAS will decommission its Jinchan/cyanide facilities as part of the overall mine closure activities discussed in the Ianna Gold Leach Project *Mine Rehabilitation and Closure Management Plan*. Decommissioning and closure of Jinchan/cyanide facilities will entail the removal or detoxification of unused reagent Jinchan and the cleanup of Jinchan-containing residues in process tanks and equipment. The specific measures to accomplish these tasks are included in the *Mine*

Rehabilitation and Closure Management Plan, as are the cost estimates and information on financial assurance for decommissioning and closure required by the International Cyanide Management Code. As noted in the *Mine Rehabilitation and Closure Management Plan*, all Jinchan process tanks and piping systems will be triple flushed with water to remove residual Jinchan and the effluent routed to the detoxification circuit for reduction of residual Jinchan/cyanide concentrations to below the International Cyanide Management Code standards for cyanide in tailings. Detoxified wash-water will then be released to the collection ponds for deposition in the TMA. The decommissioned process plant tanks and piping systems will then be dismantled and recycled. Any decant water remaining in the TMA supernatant pond after process plant decommissioning will be pumped to the Secondary Cyanide Treatment Plant and, as necessary, treated to below Guyana EPA water quality discharge standards (<0.1 mg/L total cyanide), and then discharged to local tributaries. Any TMA seepage will be captured and routed to a system of passive/semi-passive treatment cells downstream of the Secondary Containment System. Water will not be discharged from the treatment cell system unless residual or trace concentrations of cyanide in seepage water are below Guyana EPA standards. Any treatment cell effluent not meeting Guyana EPA standard requirements will be captured and pumped back to the Secondary Cyanide Treatment Plant for treatment and discharge to local tributaries.

NAHAS proposes to further investigate and explore strategies aimed at minimizing the quantity of Jinchan during the Life of Mine (LOM). Emphasis will also be placed on further investigations to determine whether a larger portion tailing can be processed by other techniques, thereby reducing the quantity of material to be processed in the HLF and lowering the consumption of Jinchan within the facility.

SIGNATORIES:

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Kai Fan

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Date

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Paul Callender

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Date

Appendices

(Chemical analysis on tailings solution after leaching, ‘A comparative study of sodium cyanide and JinchanTM gold leaching reagents: A case study at Goldfields Ghana Limited, M. Beyuo et al, 2016.’)

Gold Extraction from Carlin-type concentrate by a new environmental-friendly lixiviant: Xue-Yi GUO et al, 2021