GENCAPD PROJECT

MINERS' ENVIRONMENTAL OFFICER'S REPORT
On
FIELD TRIP TO KURUPUNG-EPING MINING AREAS
08 October to 22 October 2003

By
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Georgetown

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1.0 INTRODUCTION

The field trip to the Kurupung-Eping Mining areas (Mining District No. 3) was completed during the period 08 October to 22 October 2003, as scheduled.

The general areas visited were Kurupung, Eping and Mazaruni rivers along with Olive and Takuba creeks, within the Administrative Region No. 7 of the Regional Democratic Council.

Of the thirty (30) operations visited, twenty-eight (28) were diamond-seeking land-dredging operations, one (1) gold mining operation utilizing "missile" (suction) dredges, and one (1) river dredge on the Kurupung.

For the areas visited, mining activities were not centralized but rather occurred in small pockets or as individual operations distributed along the banks of the Mazaruni River and its tributaries.

Land dredging operations were predominately shallow sand, clayey-sand overburden placer deposits with some having virtually no overburden cover on the slopes of hills and in small ravines, where the thin diamond-bearing material occurs within the topsoil cover to residual clay.

In addition to limiting mining activities at some locations (where enough water was not available for continuous operation), the dry season resulted in low water levels in the rivers and creeks which made navigation and access to some mining locations treacherous and difficult.

2.0 OBJECTIVES

The objectives defined prior to the commencement of this field trip were:

To continue the programme of sensitizing gold and diamond miners of the environmental issues related to the industry, particularly on acceptable uses and handling of mercury and effective tailings management as it relates to land dredging operation.

To have in-mine discussions with miners, claim owners and operators to enable effective problem identification and provision of acceptable solutions that will make a positive impact on the mining environment.

Where appropriate, to supplement miners' technical knowledge on "Tailings Management" and on the "Construction of Small Earth Dams" with evening group discussions sessions.

To investigate the degree to which the "Sluice Box Modifications", as suggested by Mr. Randy Clarkson, were being implemented.

To investigate the utilization of GGMC/GENCAPD Mercury Retort used to capture mercury when burning gold amalgam.

To further investigate the probability of establishing functional "Self-Monitoring Environmental Groups" within the mining district.

3.0 SUPPORT

Both office and field units of GGMC's Mines Division continued to provide critical support, essential to the achievement of the project objectives. In this specific instance, Mr. Bhemraj Ramkelawan (Mines Officer, Kurupung Mines Station), Mr. Mohan Persaud (Senior Mines Officer) and Mr. David Edwards (Kurupung Mines Station).

Thanks to Mr. Kerion Husbands (Technician within the Environmental Division) for his assistance and guidance in preparation of this trip, and to all the receptive miners for making a difference.

4.0 ACTIVITIES

The education of miners in the disposal of tailings, in such a manner as to protect human safety and the environment, was the main thrust of the field trip. This was achieved through discussions with mine operators, in-order to identify problems and suggestions, for implementation, of applicable methodology and technology to remedy or improve the situation. Analyses were made of techniques successfully applied to local situations.

A critical analysis of the mode of operation of river dredges was done, with specific interest into the sequencing of operations, positioning of dredges, and the method and placement of tailings discharges.

Notes were made on the level of turbidity of waterways in the vicinity of river and land-dredging (jetting) operations, with water samples were taken at appropriate locations.

AREAS VISITED:

Thursday, October 09, 2003	-	Middle Takuba Creek
Friday, October 10, 2003	-	Upper Takuba Creek and Chance Creek
Saturday, Oct. 11 to Sunday, Oct. 12, 2003	-	Barlow
Monday, October 13, 2003	-	Eping River (above Barlow)
Tuesday, October 14, 2003	-	Kurupung
Wed., Oct. 15 to Thursday, Oct.16, 2003	-	Olive Creek and Kurupung River
Fri., Oct. 17 to Sunday, Oct.19, 2003	-	Barlow
Monday, October 20, 2003	-	Enachu and Mazaruni River
Tuesday, October 21, 2003	-	Upper Kurupung River

5.0 OBSERVATIONS

A synopsis of the relevant observations documented during the filed trip follows:

5.1 TAILINGS MANAGEMENT (Photographs 1 to 10)

Various type of tailings impoundment systems were employed within this mining district, with the selection determined by the availability or lack of, of water for operational purposes.

Generally, there was an awareness of the environmental need (a reduction in the probability of suspended solids in tailings effluent being deposited in our waterways) and the economic benefit (one less pumping unit required for the operations) of employing a "closed-circuit" recycled water system. But, often these reasons were overridden by the ease of operating an open water system (with the accompanying reduction in effort for establishing proper tailings management systems, as evident by the state of portions of Takuba and Chance creeks), readily available sources of fresh water for feed pumps, and secondary concern for the protection of the environment. The consequence of these actions was tailings being discharged directly or indirectly to rivers and creeks, as evidenced by their high level turbidity.

Except for some areas close to the riverbanks, the shallow work grounds comprising predominantly of sand, clayey-sand and gravel overburden and pay material resulted in a lesser amount of tailings effluent per operation. Slurry discharged from these operations should have been easier to control, and of enhanced settlement characteristics due to the lesser percentage of clay type inclusions.

The dry season with the accompanying reduction in water available for mining (jetting) activities had a positive impact on tailings management, in that, some operators were forced or encouraged to employ a closed-circuit mode of operation. The alternative option would have been to pump feed water from rivers or creeks located some distance away.

Loosely placed columns of fibrous roots were among a series of crude methodologies used for rapid filtration of suspended tailings solids, for constructing tailings confinement structures and for routing of tailings discharges, as required.

Rapid filtration units are essential features for efficient functioning of closed-circuit recycled water systems in small gold and diamond land dredging operations, where the flow paths and/or confinement areas of the tailings effluent are not large enough to allow adequate settlement of recycled water. The usage of loosely placed fibrous roots used for this purpose could be improved by binding or compressing a series of layers together, to effectively reduced the pore spaces within this matting, thereby trapping smaller tailings size fractions while allowing percolation of water through these pore spaces.

5.2 RIVER DREDGING (Photographs 11 to 16)

The shapes, sizes and positions of tailings piles deposited from river dredging activities are a function of the sequencing of dredging operations, positioning of dredges (in

relation to the angle of the discharge end relative to the river channel) and the length of time spent discharging to a fixed position. The definition of the tailings piles along the Eping, Kurupung and

Mazaruni Rivers are a clear indication of the various modes of activities adopted by different operators of river dredges.

Improper placement and sizing of tailings piles could and invariably lead to the encroachment of the river channel, with the resulting negative effect on river navigation. The encroachment of the river channel by tailings from river dredging operations could be prevented by:
Sequencing: Sequentially dredging from the riverbank, with the discharge angled towards the bank, while progressing towards the channel (from one bank then the other), will allow the creation of tailings piles in the same sequence.

Placement: With the current configuration of rivers dredges (that is, short, rear end discharge), placement of tailings close to the riverbanks could only be achieved by proper sequencing of dredging operations, in conjunction with angling of discharge ends towards the riverbanks. ***Alternatively, the utilization of "Extended Floating Discharge Pipes" which will allow flexibility in placement of tailings discharge is recommended.***

Sizing: Operational considerations, such as, indication of thick pay gravel, may require dredging in one location for an extended period of time. During this period, extra effort must be made to constantly maneuver the dredge to prevent a buildup of tailings discharge from blocking the channel.

Apart from the visible scars, tailings piles, which encroached on the river channels posed serious navigational difficulties, with resultant safety and economic consequences on the riverain and mining fraternity.

A large river dredge was observed reworking tailings in the vicinity of Temereng on the Mazaruni River. This activity, if completed with a dredge fitted with extended floating discharge pipe, would make a significant impact on the repositioning of tailings piles while effectively clearing the river channel.

The Upper Kurupung River is not an active mining area but was a location for river dredging activities in the past. Apart from visible tailings piles, which changed the course of or resulted in a shallower river channel, the impact of dredging activities on water quality, fish and animal life was reversible. This was evident from the pristine water, and adequate fish and wildlife available for the community's ability to exist on.

5.3 MEDIUM SCALE OPERATIONS (Photograph 17)

Visits to SANMIK Civil Works Ltd., at Barlow and Correia Mining Corporation (CMC), at Olive Creek, (operations, which could be considered as Medium Scale), demonstrated an improved level of the engineering and technology applied.

While the mechanization and tendency to operate in an environmental friendly manner was noted at both facilities, CMC must be commended for their efforts and the ensuing benefits of having a functional, confirmation drilling programme (for Grade Control and Mine Planning purposes) and for strict adherence to environmental regulations pertaining to tailings management and the processing of gold amalgam.

5.4 IMPACT OF THE ENVIRONMENT AWARENESS PROGRAMME

The greatest benefit to be derived from this environmental awareness programme is the permanent change in mining culture, whereby, the appreciation of the environmental benefits, namely; saving of our rivers and creeks, the land and the mode of life of indigenous people are imbedded into operational plan in the form of quality tailings management procedures, among others.

The implementation of closed-circuit recycled water system has made and will, where applicable, continue to make a significant impact on the prevention of turbid effluents being discharged to our waterways.

The continued willingness of miners to interact with the Environmental Officer and GGMC's Mines Personnel is critical to the identification of tailings impoundment systems best suit for specific mining operations. This being so, the greatest responses are obtained when the operational and economic benefits are clearly evident.

Even though **some negatives**, namely; extreme turbidity of portions of creeks and rivers indicating effluent from tailings discharge entering our waterways; and mine operators not controlling the spread of tailings over the land, **the positives instances** of a mine operator ceasing to discharge tailings directly into river and the dredge operator changing the angle of the tailings discharge towards the riverbank (all within a reasonable time), makes this programme worthy.

5.5 MECHANIZATION

Other than the medium scale operations, the generally shallow overburden cover and pay material that are easily penetrated by the water jets, limits the need for excavators in the small-scale mining operations. The essential elements to operational success are: adequate water supply, an efficient water pump feeding hand-held water monitors (jets), efficient gravel pumps, an efficient Lavador or sluice-box, and proper tailings impoundment systems.

All Terrain Vehicles (ATVs) play a critical role in the industry, in relation to farther transportation of miners and supplies, and the ease of accessing farther mining grounds,

5.6 ITINERANT NATURE OF SMALL OPERATIONS

The advent of ATVs on an increased network of roads and more powerful boat engines lends to the continuing nomadic nature of small-scale gold and diamond mining operations. This situation was compounded by the fact that detailed geological information (defining the deposits) was mainly not available.

Again, this enforces why it is paramount that miners be indoctrinated into the culture of applying sound environmental practices.

5.7 HEALTH AND SAFETY (Photographs 18 and 19)

As was the case with previous mining areas visited, instances of undermined trees in current or mined-out areas are a concern.

Some input is required from the Occupational Health and Safety Unit pertaining to the above and to the inadequate level of sanitation at Barlow Landing.

5.8 WATER SAMPLING AND ANALYSES

TEST RESULTS OF WATER SAMPLES

Sample ID	Date	pH	TSS (mg/L)
Kurupung River, above Takuba Creek	16/10/2003	4.25	1.00
Kurupung River, below Takuba Creek	16/10/2003	5.20	434.00
Takuba Creek mouth	16/10/2003	5.20	1588.00
Black Water Creek, Upper Takuba	09/10/2003	5.70	2.00
Mazaruni River, above Kurupung River	16/10/2003	4.90	6.50
Mazaruni River, below Kurupung River	16/10/2003	4.10	33.50
Eping River, below Landing	13/10/2003	4.80	10.00
Eping River, ~ 400 ft. below Landing	13/10/2003	4.40	3.50
Eping River, below Barlow Landing	13/10/2003	4.70	9.50
Makreba Falls, Upper Kurupung River	21/10/2003	4.05	2.00
Water to Feed Pump, "Closed-Circuit" Operation by Raimundo DaSilva, Upper Takuba	10/10/2003	4.90	322.50

TSS – Total Suspended Solids

The concentration of Total Suspended Solids (1,588 mg/L) obtained from Takuba creek corresponded with the unacceptable quality of water observed. Even with the dilution effect on convergence with the Kurupung River, the TSS level of 434 mg/L in the immediate vicinity of the Kurupung was still unacceptable.

The TSS level of 33.5 mg/L proved that the turbidity of the Kurupung River had no significant effect on the Mazaruni River.

As expected from observations, the TSS of the upper Eping and Kurupung Rivers were justified by the fact that these were not active mining areas.

Raimundo DaSilva operated a closed-circuit recycled water mining operation, where the tailings discharge was routed through a filtration dam made of loosely placed fibrous tree roots. The TSS level of 322.5 mg/L at the feed pump was good, given the fact that, the recycle circuit was short (not allowing enough time for solids to settle out), and that

optimum placement of this filter medium would have required some amount of compression of the fibrous matting to increase its ability to trap the suspended solids.

6.0 CONCLUSION

Direct communication with Brazilian miners was often very difficult due to the lack of bilingual skill of the Environmental Officer and most Brazilian miners. There is a sense that some effectiveness is lost when communication is dependent on the translation by other workers on site.

It was difficult to ascertain the practicality of establishing a "Self-Monitoring Environmental Groups" within the portion of this mining district visited, primarily due to:

1). The communication problem with most Brazilian Miners, as explained above, and
2). The decentralized nature of the operations, where a large percentage of the operations were scattered along the riverbanks.

Observation of the previously dredged Upper Kurupung River indicated that the negative effects of river dredging on the aquatic life and water quality are short-termed, as evident by the pristine water, the abundance of fish, and the surrounding wildlife. However, in the long-term, improper placement of tailings piles (sand bars) results in severe restrictions and hardship on river transportation to riverain communities and the gold and diamond fields, especially in the dry season.

Extended Floating Pipes fitted to the discharge end of river dredges would allow more flexible placement of tailings closer to the banks of rivers being dredged, hence reducing the probability of the creation of tailings barriers and hindrance of the river channels.

Miner, Fitz Duke (Kurupung), made a valid suggestion, in that "operators of river dredges should be held accountable for clearing the channel of their work-grounds (claims), especially for issue of new permits, as the creation of tailings barriers in rivers is strangling the river dependent gold and diamond mining industry during the dry season"), by resulting sharp increases in fuel price and general cost of living due to difficulties experienced in river transportation.

There was the need for a collective effort by miners, operating in the vicinity of Middle Takuba Creek area, to improve on implemented tailings impoundment systems in-order to reduce the level of turbidity that was evident in the creek.

Most of the mining operations, located away from readily accessible sources of water for jetting, had implemented some form of closed-circuit recycled water system. While, some operations closer to the banks were pumping continuously from the rivers. These operators were encouraged to convert a closed-circuit system, in-order to eliminate the discharge of tailings effluent to the environment.

In-mine (in-pit) drainage should be compulsory for all land dredging operations. This could drastically reduce the number of stagnant water bodies remaining, on the completion of mining activities. This interconnecting internal drainage system could be cut into the underlying residual clays by the water jets during normal operations.

The efficiency of the locally adopted usage of loosely placed "Fibrous Tree Roots" for rapid filtration of tailings effluent, as a part of the closed-circuit recycle water system, could be improved by binding roots in layers (to effectively reduce seepage path, hence trap finer suspended particles).

This system, as described above, could be modified for utilization as the filtration medium for excess water released to the environment. Here, the efficiency of this system could be further improved, in-order to trap still finer clay particles, by overlaying roots with available synthetic filter-fence material.

7.0 RECOMMENDATIONS

Due to the influx of Brazilian Miners into the small-scale gold and diamond mining industry, serious consideration must be given to the thought of having Field Officers articulate in Portuguese. This will ensure that all regulations are clearly communicated and appreciated by everyone.

Regulations, which hold operators of river dredges responsible for clearing the channel of the river worked within their claim, should be enacted or enforced.

The implications of fitting "Extended Floating Tailings Discharge Pipes" to ordinary river dredges should be investigated with the intention of implementing this change. If feasible, this modification could prevent further encroachment of river channels by tailings piles by providing flexibility in placement of tailings discharges.

Issuance of permits to rework tailings piles in portions of rivers, where these pose severe hardship or safety concerns, (and especially, if the dredges would displace the tailings an acceptable distance away) should be encouraged. If economically viable, a programme could be designed to systematically clear critical river channels.

The practicality of establishing a scheme where mine environmental audits/inspections are done, on proper notification, before commencement and/or after completion of mining activities to increase the accountability of serious environmental damages, should be investigated. This scheme will also serve the purpose of keeping track of itinerant miners.

The use of fibrous tree roots as a filtration medium should be investigated to develop its capabilities.

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APPENDIX A

EXPENDITURE

This expenditure does not include the cost of administrative overheads or the cost of plane flight to and from the mining location.

Budgeted cost for trip	- G$236,720.00
Amount received for trip	- G$237,000.00
Actual cost	- G$202,120.00
Cash returned	- G$ 34,880.00

APPENDIX_B

Photo 1 – Relatively Clean, Orderly and Shallow Mine Pit of Antonio DaSilva's Operations at Barlow.

Photo 2 – Mine Pit at Middle Takuba, Kurupung worked by Bruce Hodge and Neil Fraser. Predominantly Sandy Overburden and Pay Material.

Photo 3 - Unique Land Dredging Operation (by Carlos DeAguiar at Barlow) where a Cluster of Tree stumps Left in Place After Jetting Operations.

Photo 4 – Mine Pit of Roger Baxter's Operations on the Kurupung River Bank. Water Percolating From The River Aid in The Collapsing of Walls of The Thick Overburden Cover.

Photo 5 – Tailings Confinement Dam as Part of The Closed-Circuit Recycled Water System of SANMIK Civil Works Ltd. Operations at Barlow.

Photo 6 – Muddy Feed Water of Roy Morrison's Small, Closed-Circuit Operations at Eping. Minimal Water Supply was Noted.

Photo 7 – Construction of Tailings Confinement Dam From Indigenous Material (as Part of a Closed-Circuit System) at Raimundo DaSilva's Operations at Upper Takuba Creek.

Photo 8 – A Rapid Filtration Dam, Constructed From Fibrous Roots and supported by Tree Trunks, as Part of a Closed-Circuit Recycled Water System. Raimundo DaSilva's Operations at Upper Takuba Creek.

Photo 9 – Tailings to be Routed Through a Patch of Grass to Aid in Filtration and Settlement of Tailings Solids. DeAssis Lopes' Operations at Barlow.

Photo 10 – Tailings Discharged Directly into the Kurupung River by Roger Baxter's Operations.

Photo 11 – Improper Positioning of River Dredge (Tailings Discharge Angled Towards River Channel) Renude Deluz's Operations, Kurupung River.

Photo 12 – Narrowing of River Channel by Tailings Solids from Previous River Dredging Operations. (Kurupung River).

Photo 13 – Ordinary River Dredge, with Extended Floating Discharge Line, Converted to a "Bailer" for Repositioning Tailings, From Missile Dredges, Away From the Mine Pit. CMC's Operations at Olive Creek.

Photo 14 – Major Series of Tailings Sand/Gravel Barrier Close to Eping River Mouth (Temereng) on the Mazaruni River.

Photo 15 – Reworking of Tailings Deposit by Large River Dredge on the Mazaruni River.

Photo 16 – Pristine Water of Previously Dredged Area, in the Vicinity of "Crapo Rock", Upper Kurupung River.

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Photo 18 – Undermined Trees Left Standing in a Mined-Out Pit, at Chance Creek.

Photo 19 – Retorting Shed Consisting of Mercury Retort, Jig Box and Shaking Table for Proper Processing of Gold Amalgam and Black Sands. (CMC's Operations at Olive Creek).