

December 4, 2008



TSX: IMG NYSE: IAG

**Tailings Management at Omai  
Gold Mines Ltd., (OGML)  
*Catalyst for Change***

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Member of World Gold Council

[www.gold.org](http://www.gold.org)





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\* Total Resources includes all categories of resources unless indicated otherwise.

**All currency numbers are in US\$ unless otherwise stated**



# Background

## Omai Gold Mine

- Open pit gold producer from 1993 to 2005
- IAMGOLD acquires Cambior/OGML in 2007
- Located in Guyana, at confluence of Omai & Essequibo Rivers; approximately 170 km from Georgetown
- Production: peak 20,000 tpd; 78M tonnes processed
- Essequibo River hosts numerous small scale mining operations
- Tailing facility designed for zero discharge



# Spill Incident

1995

- Occurred August 19<sup>th</sup>-24<sup>th</sup>
- A major seepage through the tailings dam into the Omai River was discovered followed by a second breach observed also directly discharging effluent to the river



AUGUST 21, 1995 - Seepage flow at toe of north end of the main dam.



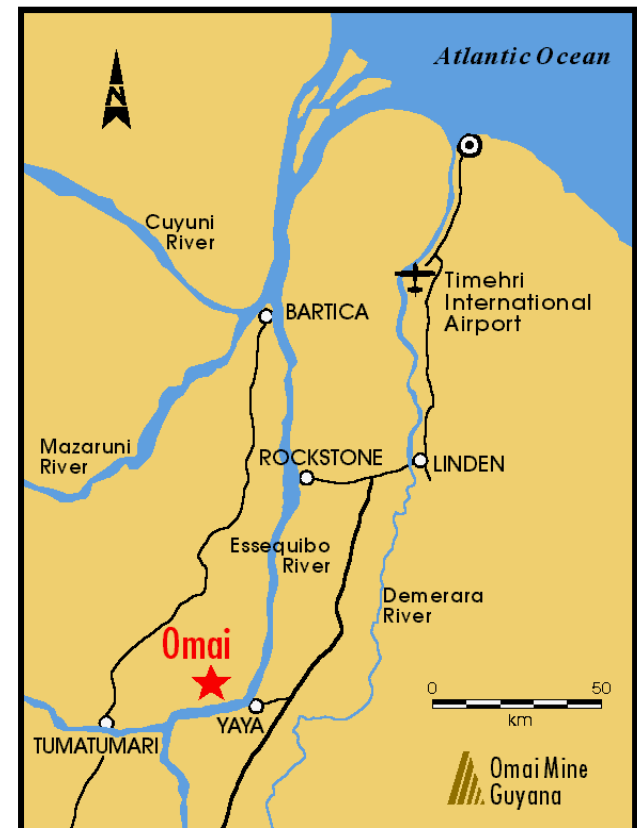
- Emergency response initiated:
  - Installation of pumps to transfer effluent to Fennell Pit
  - Building a coffer dam to stop main dam leakage
  - Building a diversion to route discharge to Fennell Pit
  - Filling sink holes on the upstream face of the affected dam to halt discharge
  - Informing Government and stakeholders
  - Water quality monitoring conducted throughout the incident
- **Emergency response actions were SUCCESSFUL in halting the discharge after 100 HOURS**



# Spill Incident

## Consequences

- Approximately 3.2 M m<sup>3</sup> of tailings water released into Omai River – CN concentration average of 25 – 30 ppm (as CN total) and 5 – 6 ppm (as CN dissolved (free))
- Rapid reduction of total CN contamination in both rivers after spill arrested
- Aquatic effects limited to 1 mile downstream in Omai River; recorded 346 fish deaths and effects to macro-invertebrates
- No traditional water users within the discharge zone in the Omai River
- No aquatic or animal life losses in Essequibo from Omai to Bartica
- No environmental risk to communities > 200m downstream
- International attention especially media

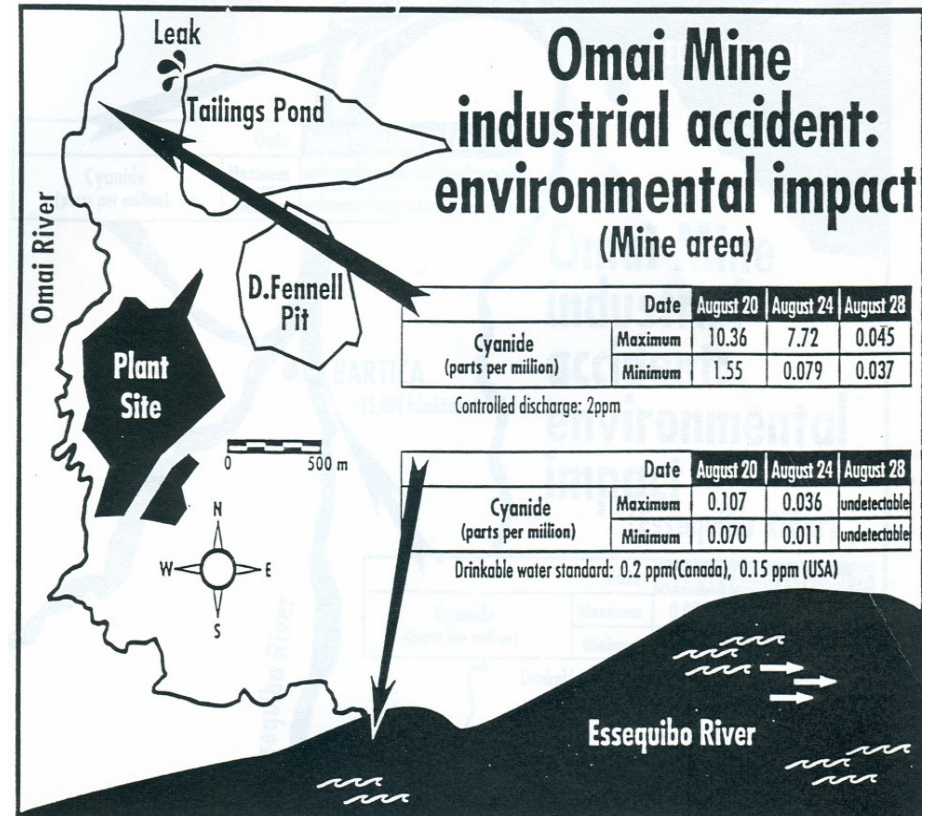




# Spill Incident

## Communication

- Large national and international concern about the incident
- Results communicated to local press

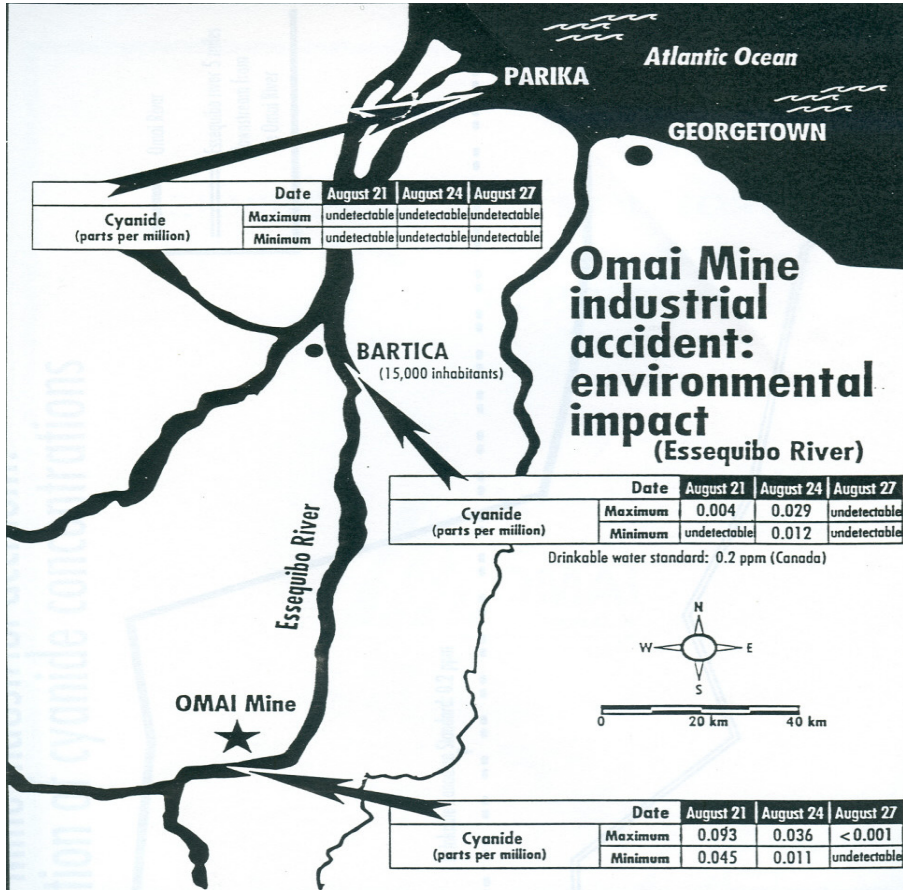


During the week following the Omai Mine accident, cyanide levels above the 0.15 ppm American standard and the 0.20 ppm Canadian standard for drinking water were recorded only in the section of the Omai River crossing a six-kilometre stretch of uninhabited land. The level exceeded the norm from Sunday, August 20, to Thursday, August 24. Since then, the leak of cyanide-lainted water has been stopped and concentrations in the Omai River have quickly dropped, reaching 0.04 ppm on Monday, August 28.

In the Essequibo River, the data from continuous monitoring between August 20 and August 24, 1995 at 10:30 AM, indicated low concentrations of cyanide, well within the drinking water standards of Canada (0.20 ppm) and United States of America (0.15 ppm). Since August 27, concentrations have been undetectable.

Over a distance of approximately 80 miles in the Essequibo River (Omai-Bartica) no dead fish nor animals were found.

(Source: Technitrol Eco Inc. and Medisys)

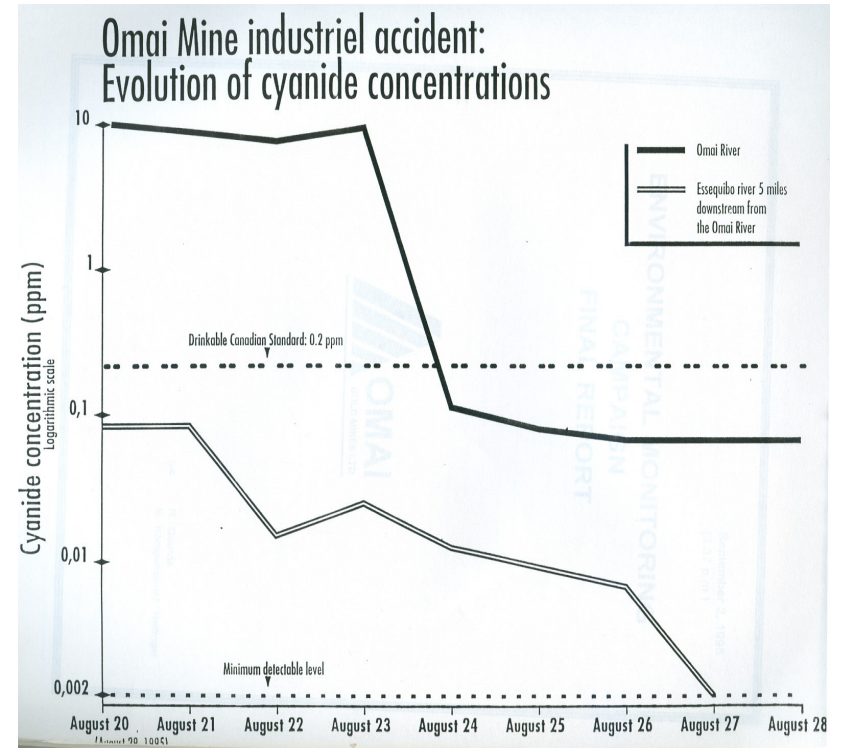


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- Clean up conducted on Omai River (sediment traps established, saprolite removed)
- Water distribution to downstream communities until water quality verified for use
- Sampling conducted during and after spill
- Investigation of spill conducted by Commission of Inquiry

# Post Incident

## Environmental Consequences



- Live fish swimming in spill discharge area to Omai River less than 1 month after incident
- Downstream macro-invertebrate recolonization observed
- Omai River affected by saprolite sediments, but only traces of cyanide residue found in confluence of Omai and Essequibo River after clean up
- No contamination of Essequibo River bed and banks





# Post Incident

## Environmental Conclusions



- Short-term damage to water quality, fish population and sediments
- No long-term environmental damage
- Experts, consultants and relevant professionals consensus:
  - Natural Resource Canada
  - Commission of Inquiry
  - Dr. M. Speyer
- No significant or persistent effects on aquatic organisms and environment after the spill

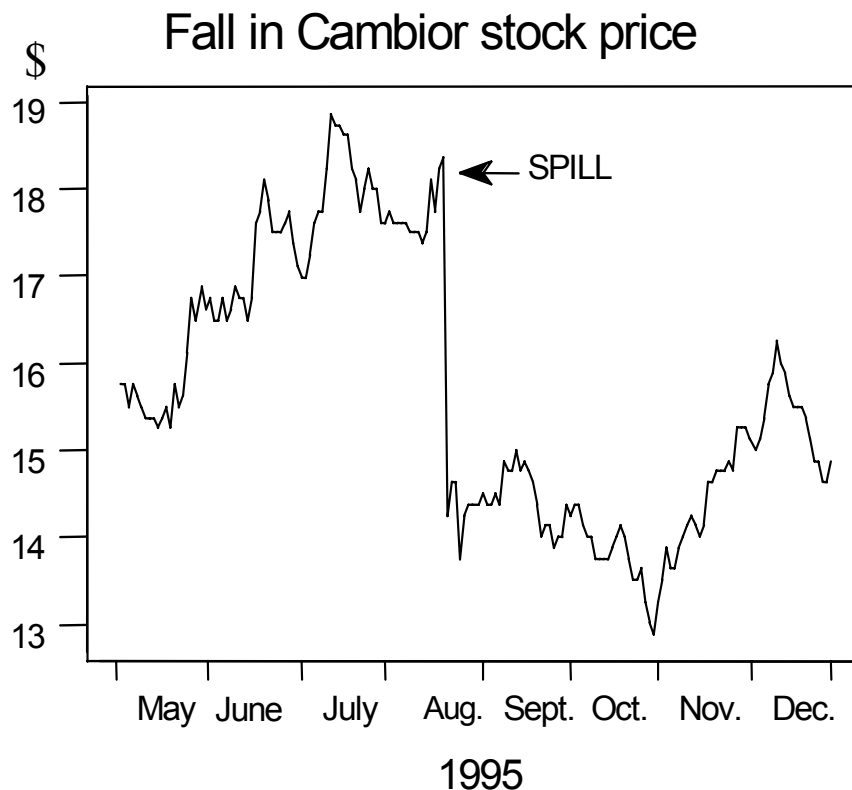


# Post Incident

## Business Consequences

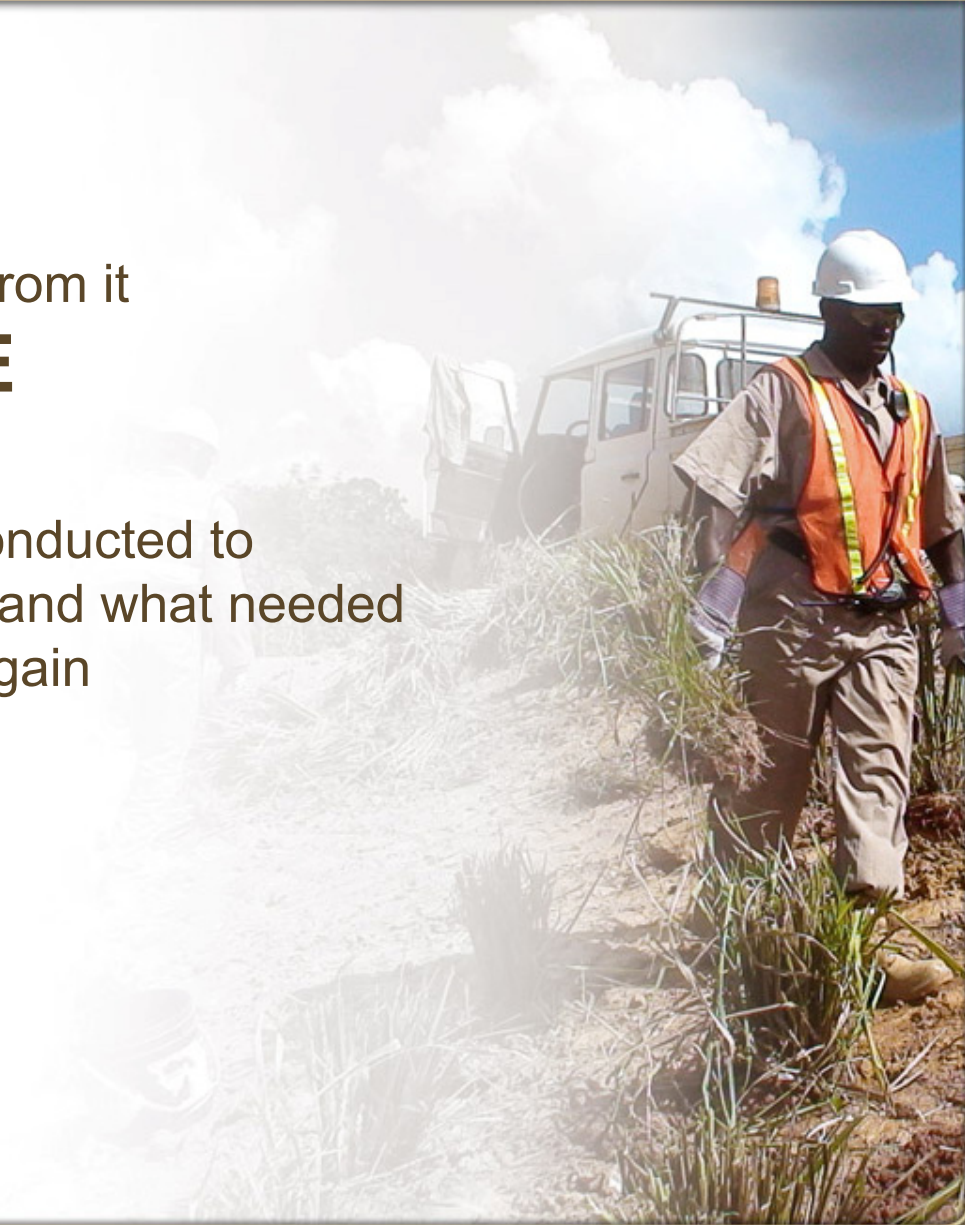


- Company share price dropped, investors concerned with clean-up costs and business interruption – uncertainties reflected in share price
- Reputation and credibility of company questioned
- Loss of trust – both locally and in other locations where operations exist or were planned
- Drop in Guyana economy due to cessation of mining
- Public outrage and international scrutiny
- Government and regulatory agencies increase oversight
- **While the environment recovered and the damage was repaired, the financial impact and legacy continue...**



- To have an incident  
is **UNFORTUNATE**
- To have an incident and not learn from it  
is **UNFORGIVABLE**

A number of investigations were conducted to determine what led to this incident and what needed to happen to avoid this occurring again





# Results from the Final Report

Technical Causation Omai Tailings Dam Failure, Steven Vick, Dam Review Team

- Failure caused by “Massive loss of core integrity resulting from piping”
- Diversion conduit (pipe culvert) and/or surrounding materials contributed to failure
- Gradation did not allow filter compatibility causing internal erosion of filter sand
- Immediate measurable environmental effects relatively modest
- Dam failure and operations stoppage widely viewed as catastrophe for Guyana



AUGUST 23, 1995 - Upstream face of main dam.  
Note: Vertical scarps developed above sinkhole  
thought to be in the original area of failure.



# Results from the Final Report

Technical Causation Omai Tailings Dam Failure, Steven Vic, Dam Review Team



AUGUST 21, 1995 - Close-up of cracking in core.

Notes:

- Little vertical displacement shortly after failure.
- Pronounced lateral displacement (spreading)



AUGUST 23, 1995 - Cracks in core at about dam center.

Notes:

- Horizontal and vertical displacement.
- Layering in compacted saprolite core.



# Results from the Final Report

Technical Causation Omai Tailings Dam Failure, Steven Vic, Dam Review Team



AUGUST 23, 1995 - Upstream face of dam.

Note: Enlarged cracking and vertical displacement has developed over 2 days.



# **Results from the Final Report**

Omai Cyanide Spill Environmental Audit Socio-Economic Committee



- Generally OGML functioned very well
- No indicated intensive or significant environmental damage
- Short exposure period should not have had a significant effect on Essequibo aquatic life (Cyanide & metals toxicity did not have a great impact)
- Omai River's capacities likely not severely affected

**Fish Captured in Omai River  
2003**

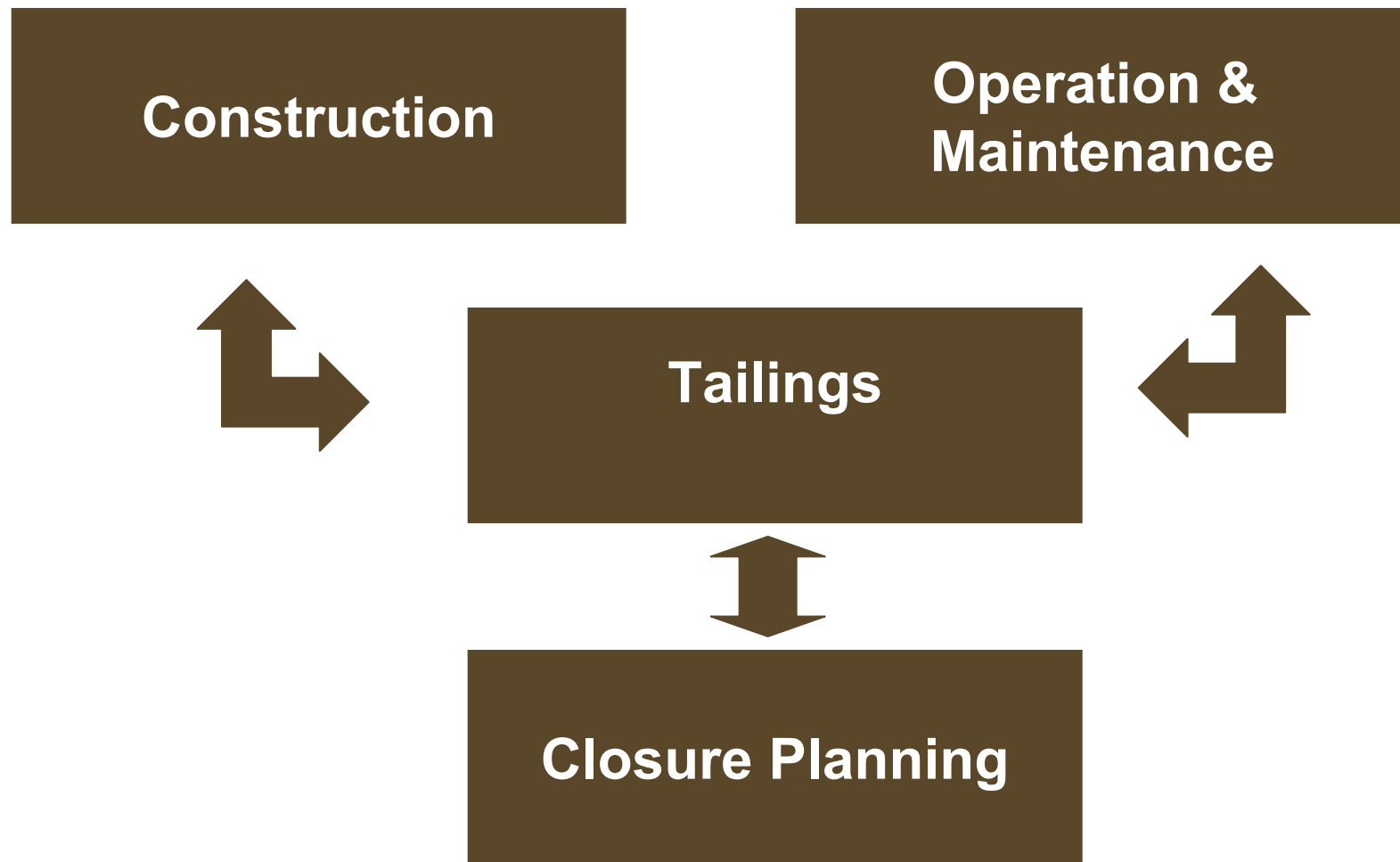


- No proactive community awareness/ preparedness program conducted
- No central coordination on environment



# Key Learnings

Strict Controls Need to be Included in the Full Cycle



# Key Learnings

## Gaps Identified



### Construction Phase

- No access road to dams
- No continuous on-site management & supervision
- No third party geotechnical reviews
- Diversion conduit pipe through the main embankment core
- Issues with run of mine rock & filter compatibility; lack of specification for processing transition zone filter rockfill and placement

### Operations Phase

- Large volume water maintained against the dams
- No organized emergency/ contingency plan in place for a dam failure
- High concentrations of CN in the pond
- Zero discharge; no effluent treatment system in place
- Inadequate continuous monitoring



# **Key Learnings**

## Gaps Identified



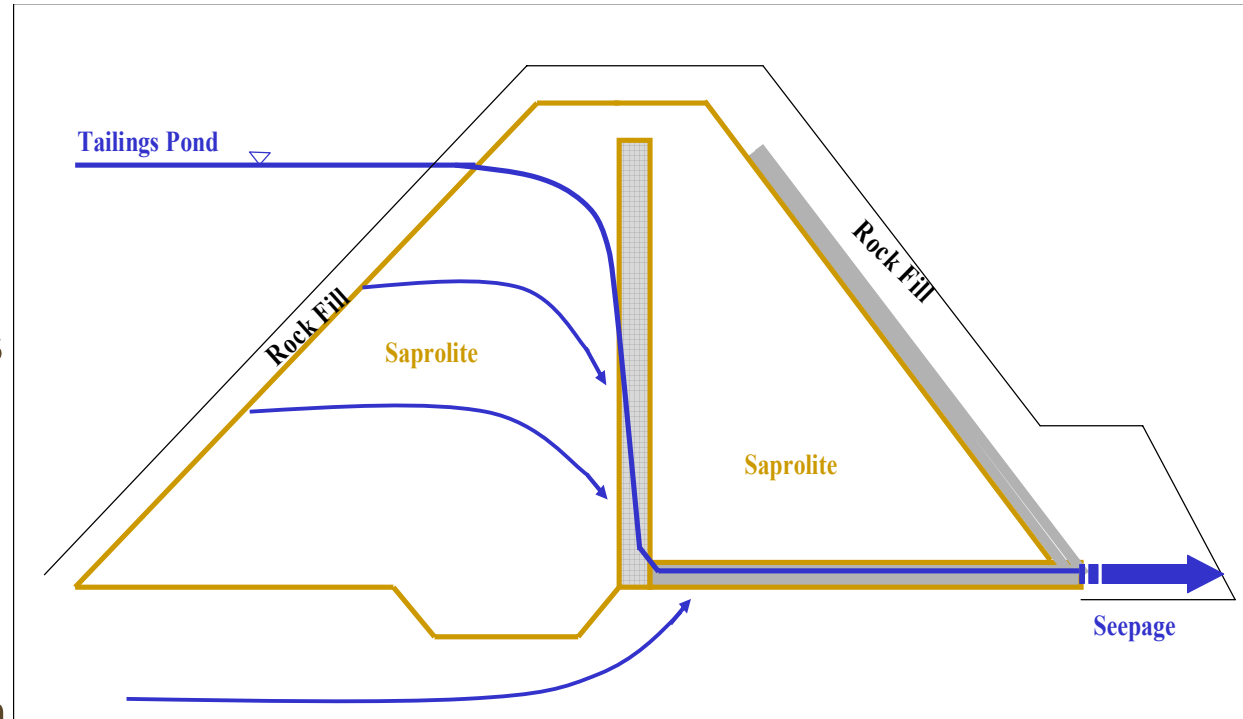
### **Closure Phase**

- Costly clean up required after dam failure
- Closure costs were extensive and work on the impoundment culminated in 2008
- Though no ARD issues, impoundment had to be backfilled with rock for stability of remaining embankment and slimes

# Application of Key Learnings

## No. 2 Tailings Impoundment - Design

- No pipes through dams
- Very generous central impervious zone
- Phased construction provided minimum freeboard- 2 m



- Internal drainage system incorporated: vertical chimney drains, core drains at base and blanket drains beneath the section's outside shoulder



# Application of Key Learnings

## No. 2 Tailings Impoundment - Construction

- Careful gradation of materials for filter compatibility
- Continuous on-site management and supervision & thorough records
- Geotechnical Review Board panel instituted and operational during construction
- Guyana Geology and Mine Commission had third party consultant review No.2 Tailings for Government



# Application of Key Learnings

## No. 2 Tailings Impoundment - Operation



- Tailings spigotted against dams
- Geotechnical criteria and failure modes included in site Emergency Response Plan

(linked to monitoring & inspection program)





# ***Application of Key Learnings***

## **No. 2 Tailings Impoundment - Operation**



- Process changes to maintain low CN concentrations in pond
- Effluent discharge to maintain freeboard
- Operations plan for tailings deposition and dam inspections, maintenance
- Records maintained on dam operations
- Dam performance monitoring
- Environmental monitoring
- Independent review by Geotechnical Review Panel
- Guyana Geology and Mining Commission (GGMC) retained third party review

# Third Party Observations

## No. 2 Facility Construction & Operations

- **Safety** of operation “*clearly improved with the new design specifications for the tailings pond*” and would “*reduce the risk of dam failure to an acceptable level*”  
(United Nations/United Nations Development Programme representative specialists with special reference to hydrogeology and environmental monitoring)
- No.2 Tailings Impoundment design **showed significant improvement over the original** tailings impoundment design  
(The Winters Company)
- Board is satisfied that dams associated with impoundment were **constructed as intended with appropriate quality control measures** (Geotechnical Review Board/Panel)
- **No evidence of deterioration of groundwater quality or contamination** due to seepage or from the tailings pond water and **at no time was there any detection or indication of cyanide** in groundwater, finger drain seepage or in the receiving environment  
(Third Party Consultant, Geotechnical Review Board/Panel)
- It was concluded and confirmed that **engineering and construction procedures for No. 2 met or exceeded accepted standards of practice** (Third Party Consultant)



# Application of Key Learnings

## No. 2 Tailings Impoundment - Closure

- After successful operation, a less costly and effective closure compared with the failed impoundment No. 1 could be implemented:
- A small permanent pond maintained in basin – basin can accommodate Probable Maximum Precipitation event
- Vegetation established on tailings surface to inhibit erosion and re-introduce biodiversity
- Closure performance monitoring
- Permanent spillway



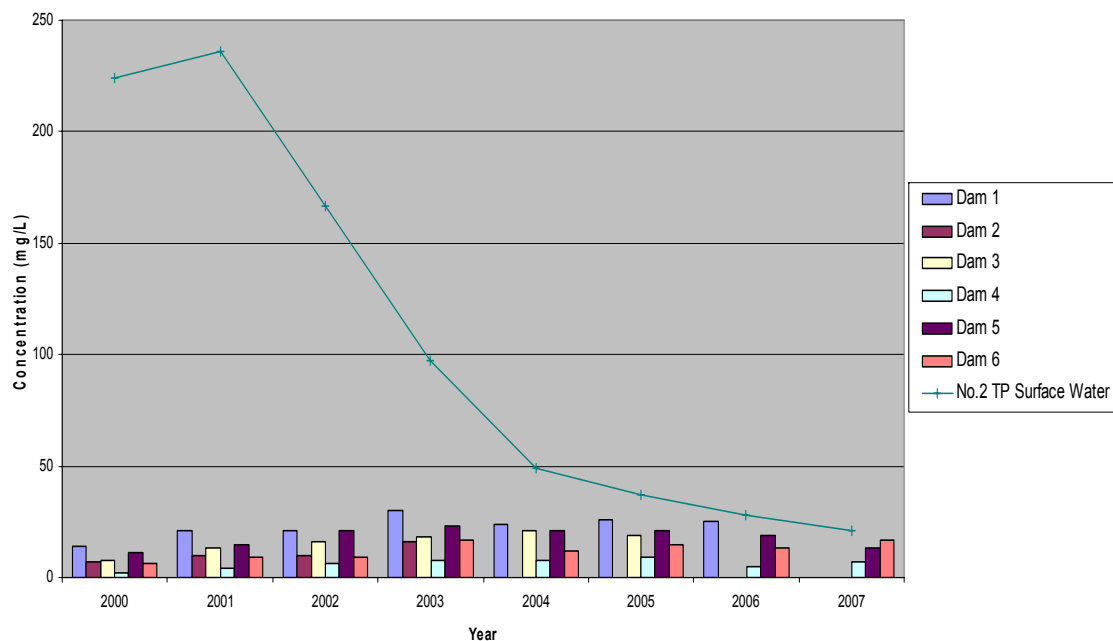
# Application of Key Learnings

## No. 2 Tailings Impoundment - Performance



- Due to the successful construction, operation & closure key learnings the **results achieved** were:
- Excellent environmental performance (no groundwater/seepage impacts)
- Instrumentation measurements consistent or better than estimates/anticipations
- Evolution into successful, populated terrestrial and aquatic habitats
- GGMC & Guyana EPA inspected and recommended sign off by the Government of Guyana-June 2008
- Sign off by the engineer of record

Summary of Sodium in No.2 Tailings Impoundment Surface Water versus Groundwater Representatives of Each Dam (Dams 1 to 6)





# ***Application of Key Learnings***

## **Lessons Learned AND Applied**



**No. 2 Tailings Impoundment was designed, operated and closed without incident. Key aspects resulting from the No. 1 impoundment included:**

- ‘Belt and suspenders’ design - multiple redundancies for safe control of internal seepage that enhance reliability
- Strict design and construction criteria and strict management of the construction employed in No. 2 Design
- Incorporated ‘ready for disaster’ model, which quickly establishes control through emergency planning, response and early detection which will avoid or minimize impact
- Constructive review makes the system robust and gives management confidence in their tailings management – independent reviews of design, construction and operations

# Application of Key Learnings

## Lessons Learned AND Applied

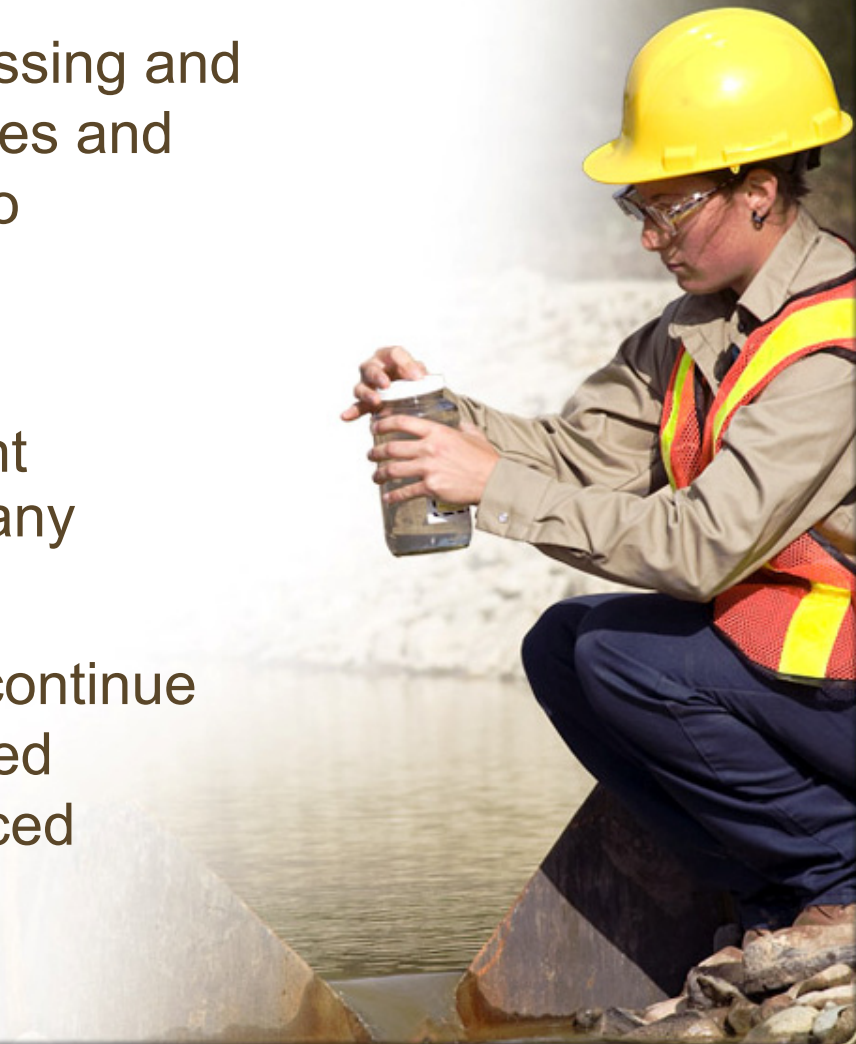
- Good water quality and water management – effluent treatment and maintaining sufficient freeboard decrease the risk to the environment in the event of an accident
- **Consultation, Consultation, Consultation** must have a working relationship with stakeholders before an incident, it will be doubly hard to establish trust when accidents happen
- Monitoring for purpose – monitoring designed to confirm the performance of the impoundment and to trigger actions if specific criteria exceeded



# ***Omai Spill***

Catalyst for Change

- Omai spill was a catalyst for change within the industry
- Moved the industry forward in discussing and resolving tailings management issues and facilitated work on the MAC Guide to Management of Tailings Facilities
- ***HOWEVER***...while the environment recovered quickly, the loss in company value never recovered
- The initial reports of the spill event continue to be repeated, and will be referenced each time modern mining is introduced to a new area or new stakeholders





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C O R P O R A T I O N

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