



KUMBA IRON ORE

Sishen Mine – Water Management

Gamagara Local Municipality – Water Workshop
28 June 2023

Sishen Mine maximizes the sustainable and beneficial use of water resources through effective management that ensures safe, stable and productive mining in line with the Kumba Iron Ore Water Management Vision. As an operation, we are always looking for opportunities to engage, empower, support and work hand in hand with key stakeholders to monitor and manage the limited resource.

Kumba Water Management Vision

To Empower Our Water Stakeholders Through Meaningful Engagements To Ensure The Beneficial Use Of Kumba's Water Resources For All



Kumba Water Management Elements

Increased
predictive capabilities

Adaptive Water
Management Plan

Stabilization of
Dewatering Network

Optimization of
Water Distribution

Sishen Mine aligns to the Kumba Adaptive Water Management Plan, a proactive management practice for implementing actions, monitoring the resultant effects and adapting or continuously improving the actions for the future based on the observed outcomes and lessons learned. The plan equips and empowers Sishen and key stakeholders to:

- Understand and learn from their respective water systems;
- Map out future threats and opportunities to the systems over time and situational changes (e.g., induced migration, climate variation); and
- Prepare, set mitigatory and/or management measures to adjust to the change.

Kumba Adaptive Water Management Plan Underlying Principles

Polycentric Governance

Where there is collaborative decision-making across diverse stakeholders and social learning is key for successful governance

Organizational Flexibility

Where water management practices, policies and procedures are continuously updated based on learnings from outcomes of existing practices

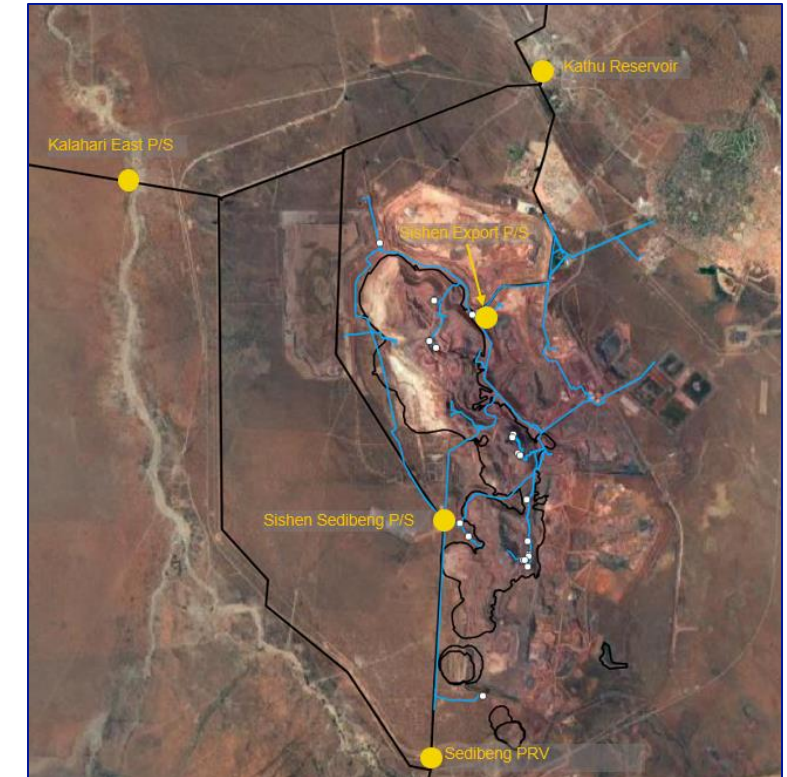
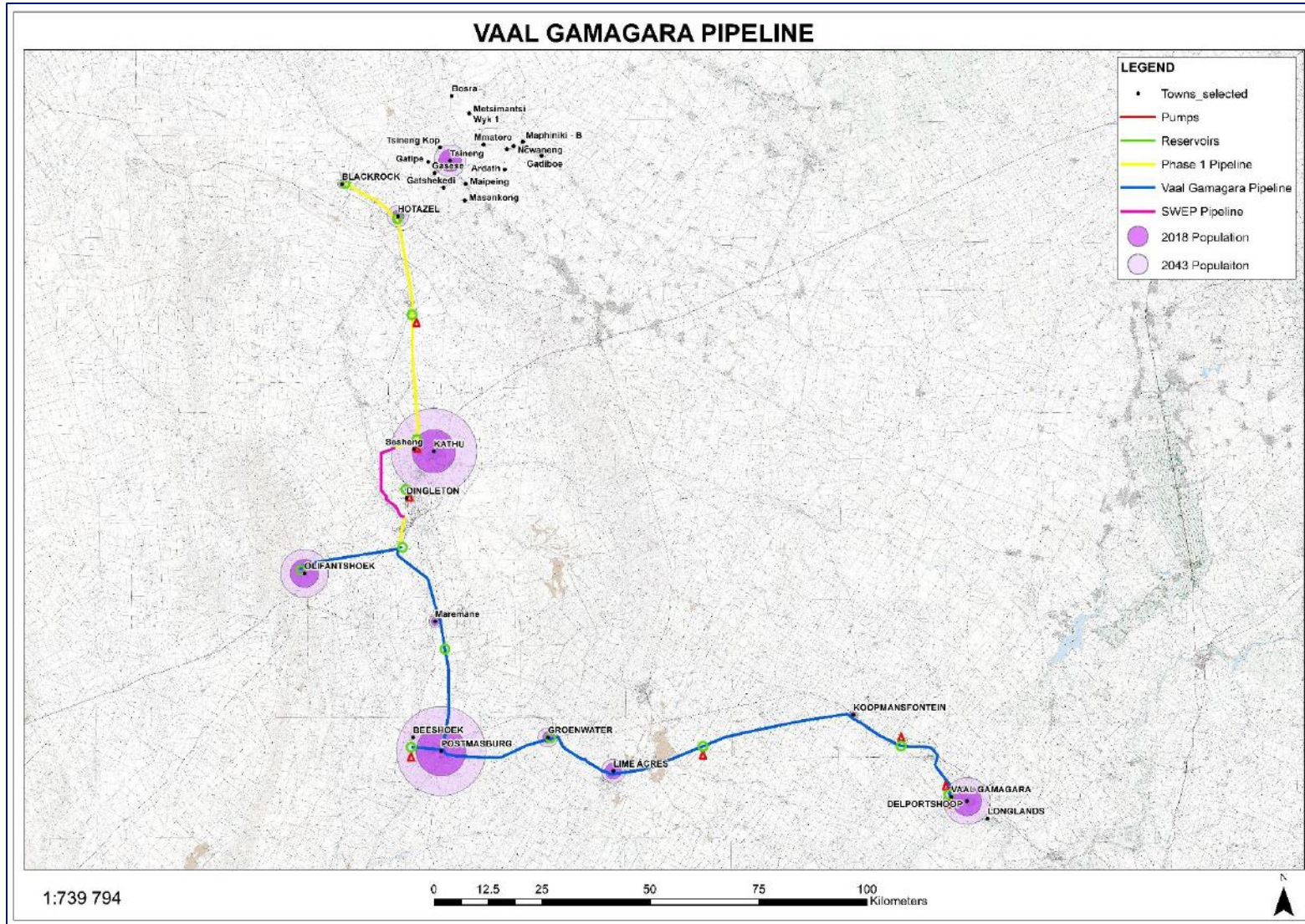
Public Participation

Where the main purpose is to encourage the participation of all stakeholders in the decision-making process and to equip these stakeholders with the necessary knowledge to contribute meaningfully to the decision-making process

System Component	Sub-Components	Interaction with Other Components
GROUNDWATER	Dewatering Boreholes Groundwater Exploration Drilling Groundwater Quality	• Dependent on pipeline and pumping infrastructure to operate • Influenced by stormwater reclamation • Influenced by Export Water capacity (i.e. 3rd party needs) • Rates set by Sishen WUL
SURFACE WATER	Raw Water Storage Pollution Control Dams Stormwater Infrastructure In-Pit Surface Water Unsaturated Zone (Clay Areas) Surface Water Quality	• Storage volumes set by Sishen WUL • Reclamation of stormwater set by Group and BU targets • Dewatering rate for groundwater impacts reclamation ability
WATER DISTRIBUTION SYSTEM	Water Pipelines Borehole Pumping Infrastructure Water Telemetry System Flow Meters Export Water Infrastructure	• Export volumes dependent on performance of dewatering boreholes • Export volumes set by Sishen WUL • Ability of 3rd parties to receive water impacts Export volumes

Sishen Water System Overview



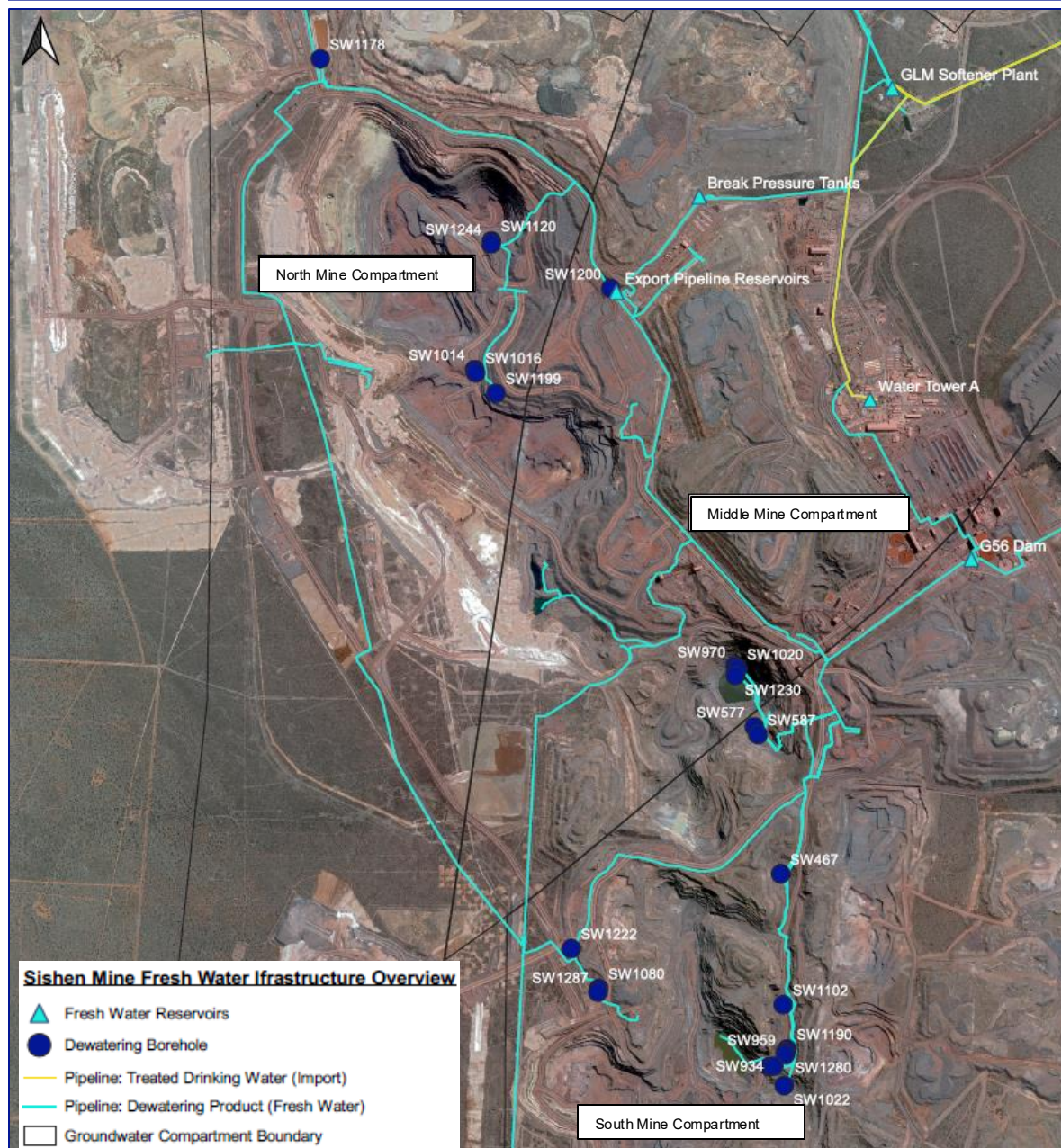


- The Vaal Gamagara pipeline (operated by Bloem Water) supplies water to communities, municipalities and mining operations situated along the pipeline route, sourced from the Vaal River (at Delportshoop) reaching Blackrock.
- Kumba supports the supply pipeline through its Kolomela and Sishen mine operations.
- Locally, Sishen supports the supply to the Gamagara Local Municipality

Sishen Freshwater Water System

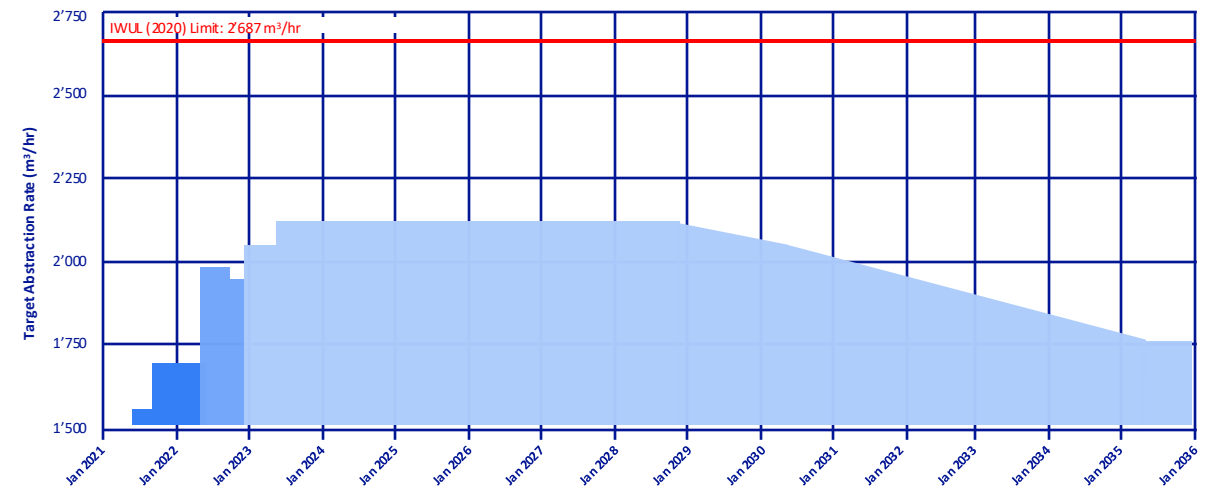
Local Context





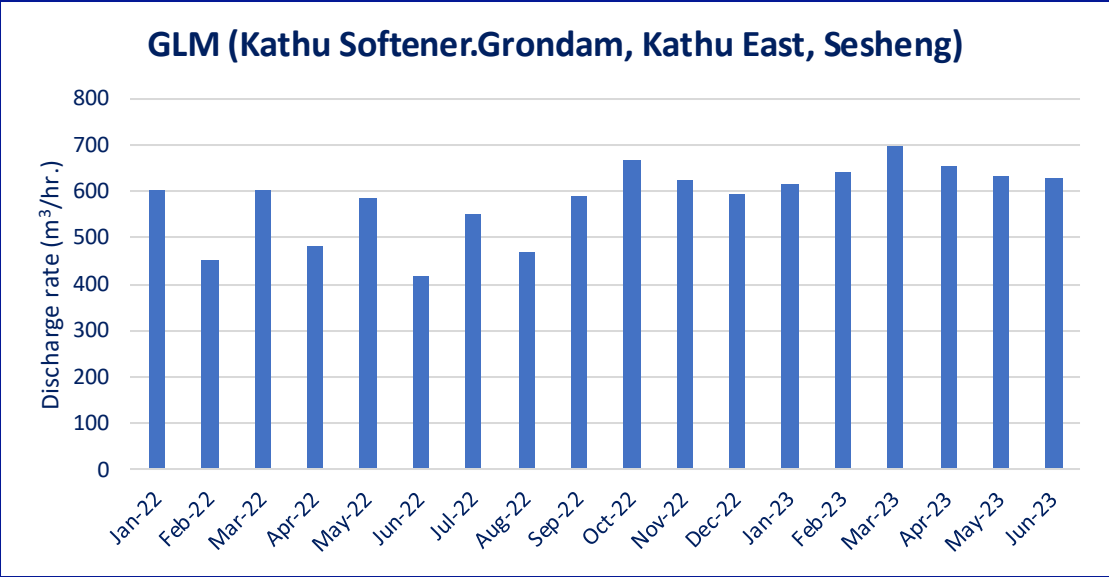
Freshwater (Groundwater) Infrastructure

- Groundwater abstracted from 21 (20 on-site & 1 off-site) dewatering boreholes across the operation is pumped via steel and HDPE pipelines forming part of a ring main system.
- These boreholes supply the operation (mining & plant), Gamagara Local Municipality (GLM) and Bloem Water.
- A bulk ($\pm 60\%$) of the abstracted water is transferred to 3rd parties via the Export and G56 Dam Pump Stations.
- Water reporting to the Export Pump Station is pumped to the GLM Softener Plant, then distributed to Kathu town and Potable Water Reservoirs on the Mine.
- Water reporting to the G56 Dam Pump Station is pumped to the plant (to cover shortfalls and drinking requirements), GLM Softener Plant and Kathu town Central garden water supply system Priority is given to the GLM Softener Plant.
- The offsite borehole pumps directly into the Vaal Gamagara Pipeline and supplies Bloem Water.
- Current average abstraction rate is 1 482 m³/hr
- Plans to ramp up to 2 000 m³/hr.

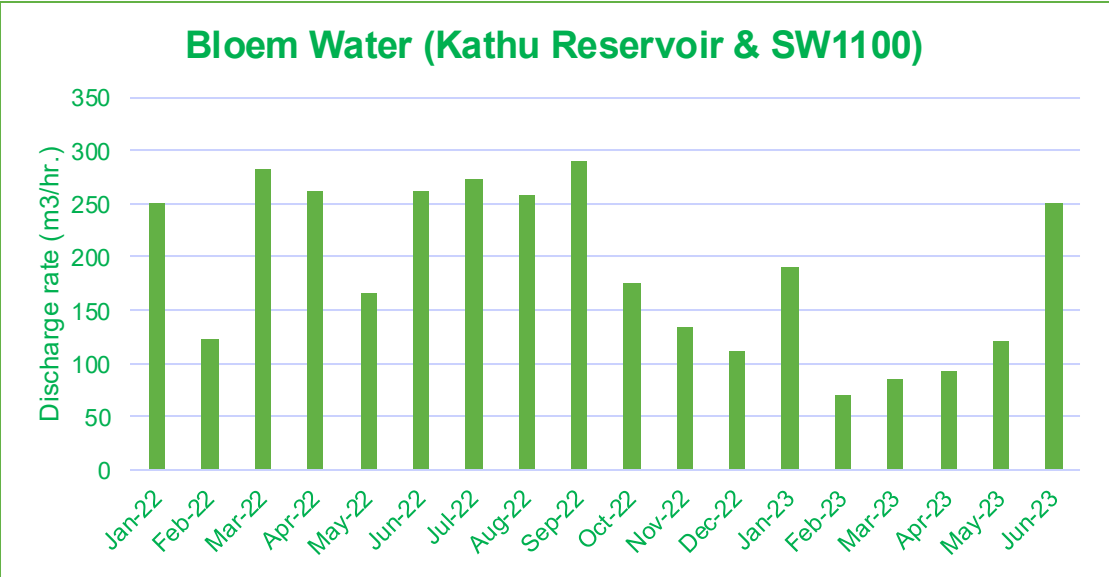


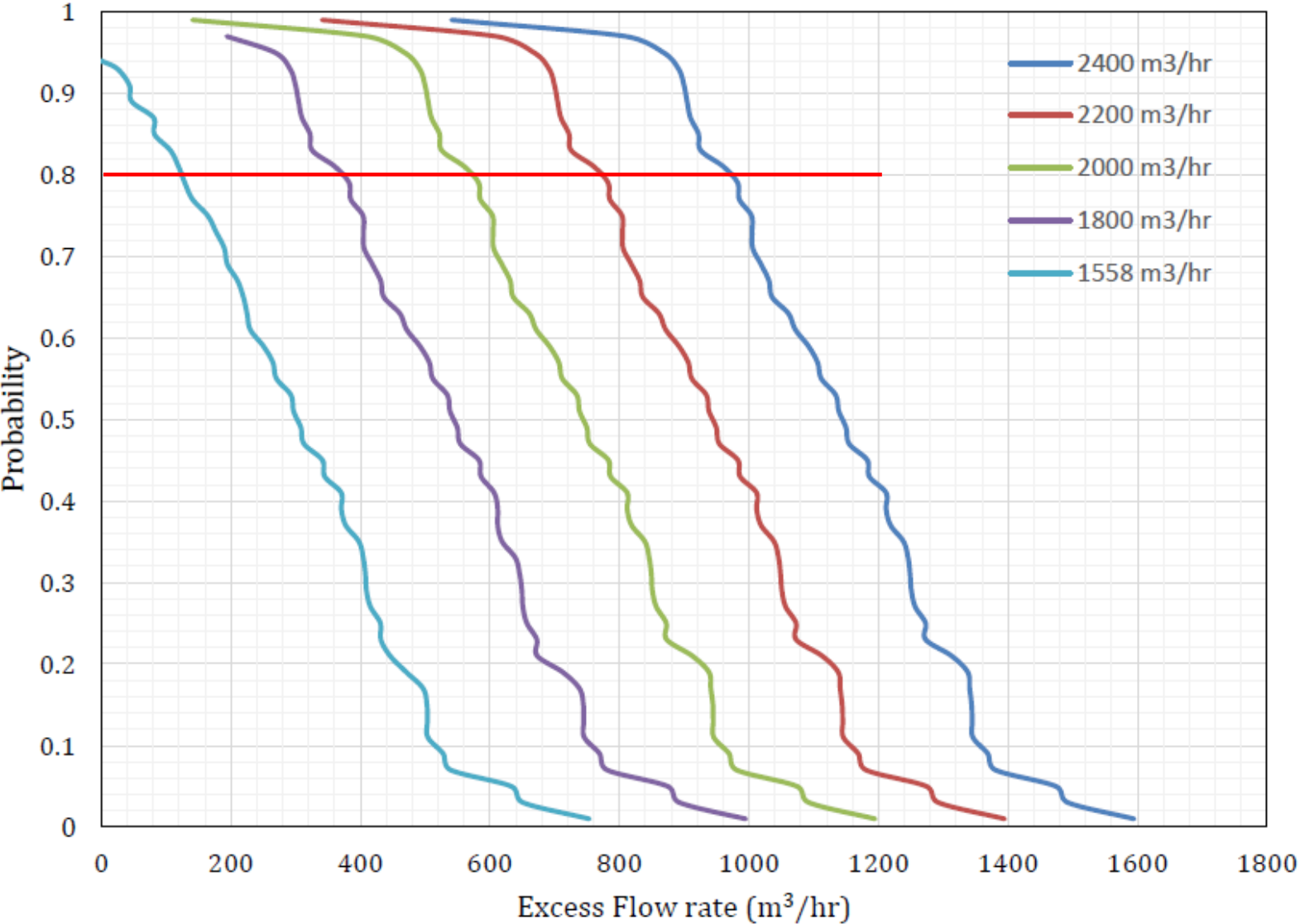


Total supply (YTD) – 2 837 705 m³
Average supply rate 646 m³/hr



Total supply (YTD) – 594 036 m³
Average supply rate 135 m³/hr





Probabilistic Modelling was run using GoldSim and the Sishen Water Balance information up to mid-2022 to evaluate potentially available excess groundwater for distribution to 3rd parties.

If a probability of 80% is set as the threshold for forecasting available volumes, the following excess volumes will be available depending on the abstraction rates:

Rate of Dewatering (m³/hour)	Year of Achievement	Excess Flow Available (m³/hour)
1558	2023	129
1800	2023	383
2000	2023	583
2200	2024	783

Sishen Water Projects





Agreement between Khumani and Sishen Mines to transfer accumulated stormwater

Transferred over 378 000 m³ from Jan 2023 to date

Pumping at an average rate of 148 m³/hr

Alleviating demand on the Bloem Water Vaal Gamagara pipeline

Providing an opportunity for Bloem Water to supply water to communities, municipalities and other mining operations along the pipeline route



	Initiative/Project	Water Strategy Element(s)	Milestone/Target
2023	Develop integrated dewatering, engineering and water balance strategies	Stabilization of Dewatering Networks	- Reduce variance of total abstraction rate to within 10%
			- Achieve dewatering target abstraction rate
			- Reduce losses to within the engineering design parameters
			- Increase average availability to 80%
	Development of an integrated regional water balance to optimize diversion opportunities.	Optimization of Water Distribution	- Reduce variance of export to third parties to within 15%
		Increased predictive capabilities	- Zero discharge from system relief valves
	Development of a KIO Adaptive Water Management Plan to be implemented at Site Level	Adaptive Water Management Plan	- Increased adaptability of operation to environmental, social and engineering changes
			- Reduced vulnerability of operational water balance to change
2024	Hydraulic optimization of water distribution at Sishen	Optimization of Water Distribution at Operation	- Reduce losses to within the engineering design parameters
		Optimization of Water Distribution at Operation	- Increased availability of freshwater for diversion to third parties
	Integration of Horizon 3 Agriculture into Sishen Water Balance	Optimization of Water Distribution at Operation	- Socially beneficial use of Sishen water sources
	Expansion of Stormwater Transfer between Sishen and Khumani Mine	Optimization of Water Distribution at Operation	- Increased availability of freshwater for diversion to third parties
	Develop integrated dewatering, engineering and water balance strategies per operation	Stabilization of Dewatering Networks at Operation	- Reduce variance of total abstraction rate to within 10% of target abstraction rate
			- Reduce losses to within the engineering design parameters
			- Increase average availability to 85%
			- Critical spares availability of 85%

Enablers, Risks and Opportunities



Enablers

- Hydraulic optimization of Sishen's water distribution network will improve stability of both the dewatering network and export systems
- New dewatering pumps to be installed during Q3 2023 are VSD pumps which will allow for stable operating with lowering groundwater table
- PSV installed at SW1100 has been effective in reducing pipeline fluctuation impacts on the pump system, reducing downtime

Risks

- When Sishen systems are stable, the volume of water sent to Kathu Reservoir does not always remain constant, changing with short notice to Sishen
- Currently, Sishen has limited capacity to adapt the water balance to accommodate unexpected volumes of water into the system.

Opportunities

- Collaborative water balance management between Sishen, Kolomela and Bloem Water will improve adaptability and sustained delivery of water into the Vaal Gamagara Pipeline
- Transfer of affected water between Khumani and Sishen Mine can alleviate distribution pressure on the Vaal Gamagara Pipeline due to lowered demand for mining activities
- Long plant shuts planned for Q3 will require additional groundwater export to 3rd parties due to lower demand internally



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Thank you