

## Executive Summary

QMM engaged JBS&G in October 2024 to undertake an initial post-study environmental radiation monitoring event at Mandena consistent with the recommendation made in the 2023 Community Radiation Study, as well as provide recommendations for ongoing environmental radiation monitoring. The scope also acknowledged feedback provided by the Andrew Lees Trust from a review undertaken by Dr Stella Swanson of the 2023 study.

The 2024 monitoring event confirmed that QMM's contribution to radiation dose within the community remains consistent with conclusions from the 2023 Community Radiation Study, which found that the mine's contribution is far smaller than the variation in natural background radiation levels and below national and international regulatory limits for radiation.

Key Findings	Key Recommendations
<b>Ingestion - Water</b>	
<ul style="list-style-type: none"> <li>Water samples collected outside the mine perimeter during mine process water discharge (three separate events) showed gross alpha and beta activity concentrations below WHO screening levels at all tested locations, including nearby drinking water sources and surface water near critical communities – Refer <b>Figure 1</b>. <ul style="list-style-type: none"> <li>Water Ministry and community representatives were present during water sampling.</li> </ul> </li> <li>Consistent with the 2023 study, radiation levels in drinking water across the surrounding environment, including the MMM River catchment, southern lakes, and community groundwater bores, remain low – refer <b>Figure 2</b> and <b>Figure 3</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Gross alpha and beta activity concentration is added to all discharge points, as well as locations within the MMM and Enandrano River on a bi-annual basis (every six months) during a discharge event.</li> <li>Gross alpha and beta activity concentration is tested in both Emanaka and Andrakaraka community wells annually, to continue verifying no impact on these water sources.</li> </ul>
<b>External – Terrestrial Gamma</b>	
<ul style="list-style-type: none"> <li>During review, a gap was noted in available data. Gamma surveys ceased in 2020 following a change in operations to recover rare earth concentrate (REC) as a product stream in 2017. <ul style="list-style-type: none"> <li>The justification is the assumption that the removal of REC has reduced the net radioactivity of post-mining spoil. Although technically correct, the collection of pre and post mining gamma levels would quantitatively support this assumption.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Recommence pre and post mining gamma surveys, including retrospective post mining surveys for all areas mined since surveys ceased in 2020, and any area rehabilitated before 2020, but not surveyed.</li> <li>To support release of former mining areas, a limited study of fruit harvested both from the trial crops and similar crops from unmined areas should be undertaken. The acquired data should be used for communication to stakeholders. If however the collected data indicates an unexpected change in the potential exposure to communities, then more detailed studies of the foodstuff may be justified.</li> </ul>
<b>Inhalation – Dust</b>	
<ul style="list-style-type: none"> <li>Changes have occurred within and around the Mandena Project since 2021. These operational changes constitute a change to the assumptions established within the 2023 study. The changes have the potential to increase dust concentrations and alter radionuclide activity concentration ratios.</li> <li>Regardless, since doses associated with dust inhalation were previously estimated to be below 0.1 mSv/y and average gravimetric dust concentration has decreased since, exposures from inhalation of airborne dust are still considered to be negligible.</li> </ul>	<ul style="list-style-type: none"> <li>Previous assumptions need to be validated for current conditions.</li> <li>Pre 2022 air quality data was identified as erroneously high due to instrument calibration errors, which have been subsequently corrected and independent instrument calibration validated.</li> <li>Dust deposition (passive) gauges should be re-installed in key communities for the dry windy season to assess radionuclide concentrations in dust and verify whether changes to mining methods have impacted the dust inhalation pathway and exposures to communities.</li> </ul>

## Key Findings

## Key Recommendations

- Should there be any indication of higher potential doses from the inhalation pathway, then introduction of long lived alpha activity in dust using air samplers and alpha counters should be considered.



Figure 1 JBSG and QMM Groundwater and Surface Water Sample Locations

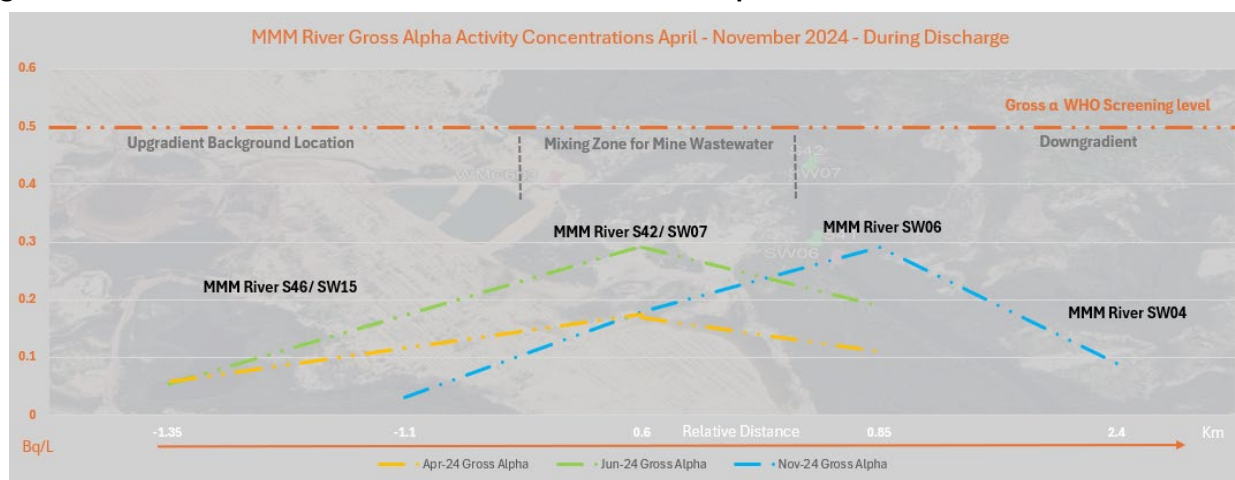


Figure 2 Measured Gross Alpha Activity Concentrations in the MMM river during discharge

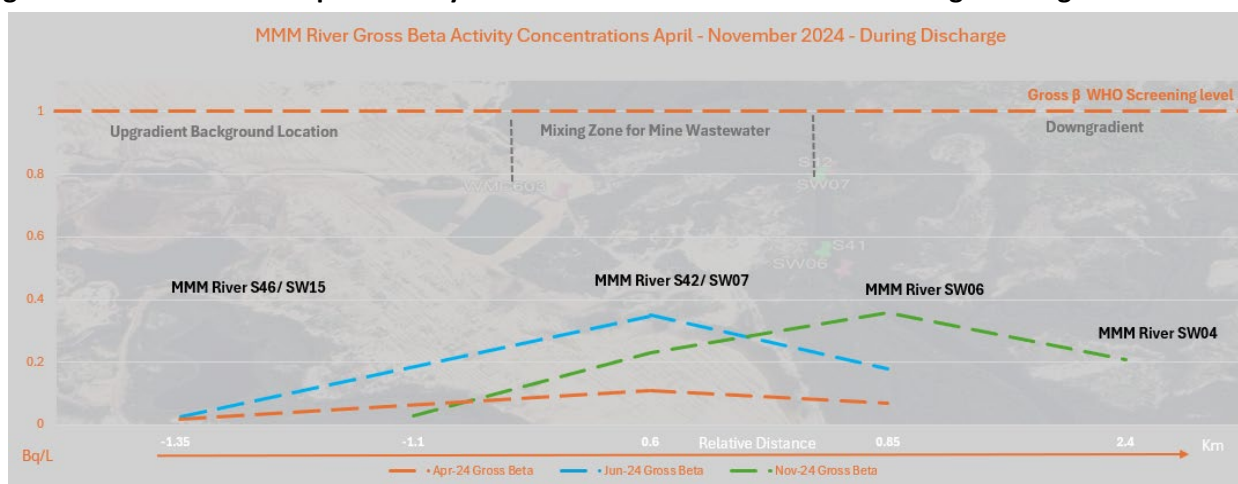


Figure 3 Measured Gross Beta Activity Concentrations in the MMM river during discharge