Potential Mining Options for Heavy Minerals Sands extraction

What are heavy mineral sands?
These are minerals found in conjunction with sand deposits which have a specific gravity of not less than 2.8. These include such minerals as zircon, staurolite, rutile, titanium and monazite. These minerals would have been eroded elsewhere and concentrated in the river channels during deposition. The heavy minerals occur as sand grains mixed in with lighter clays and quartz sand grains. Depending on the area, the zones with high mineral content could be overlain with overburden clays or sands of no economic value.

Two mining methods are generally adopted for the mining of the heavy minerals sands. These are the dry mining method and the wet mining method.

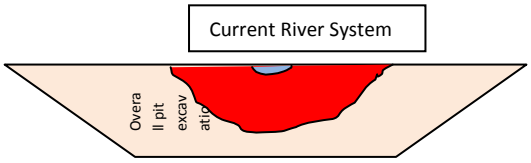
The Wet Mining method
This is also referred to as a dredging system, where an electrically-powered suction dredge floats within a man-made pond. The floating unit draws in through suction overburden, ore and water into a wet mill in which are located spiral centrifuges used to concentrate and separate the heavy minerals. The concentrate is then pumped to a separate stockpile where the material goes through a further series of gravity separations. The tailings of clay and quartz sand are discharged back into the pond behind the suction dredge.

Dry Mining Method
Because of a lack of water in the Mana Pools & Chewore areas, this is the most likely method for extraction of Heavy Mineral sands in the project area. In this method overburden is removed with heavy earthmoving equipment and stockpiled. The ore body is then mined and hauled to a holding stockpile for further feed into a wet mill plant for gravity separation. The tailings from the plant are pumped back into the mined out areas for back filling.

It is envisaged that an elongated open pit will follow the centre of the river system. The depth of the excavations will vary from 5m to about 15m depending on the profile of the ore body. The width of excavations for a depth of 15m will vary to about 25m on either side of the river system, allowing for a shallow slope angle for the pit walls.

Drilling and blasting operations to loosen the ground might be required depending on the nature of the ore.

The overall typical cross section of the pit excavation over the river system is as illustrated in the diagram below. The shaded red area indicates the likely ore body and the blue is the current river system.



Likely Major Negative Impacts of Mining within the Mana-Chewore area.

1. Mining is likely to cause damage to the river system and the likely erosion that will follow in the event of major flood from the upper catchment areas could be catastrophic if the area is not rehabilitated properly.
2. Disturbance *(devastation of the riverine fridge forests)* to the general ecosystem within the Ruckomechi /Mana Pools area could result in high migration of animals from the Mana Pools National Park. (Similarly in the Chewore area).
3. There might be elevated levels of radioactivity in the area due to the mining and processing of the heavy mineral sands. When mineral sands are mined and processed they result in residues of reject or waste heavy minerals that contain radioactivity. These residues are normally insoluble and are generally associated with the mineral monazite, zircom and rutile.
4. General high level of noise from earthmoving equipment.
5. Blasting operation if required can cause the animals to leave the national park.