

# Gulf Snapping Turtle (*Elseya lavarackorum*) Impact Assessment and Monitoring Proposal

**DRAFT**



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**Project:** Redbank Copper ERL 94

**Purpose:** Assess and monitor the potential impacts of proposed mining operations on the Gulf Snapping Turtle

**Scope:** Redbank ERL and surrounds (2010 – 2011)

**Authorisation:**

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## Purpose

The purpose of this assessment is to establish the potential impact of the proposed mine expansion and oxide operations on the Gulf Snapping Turtle, establish presence or absence in the project area and downstream waters, and in the event of presence, monitor population status.

## Species information

### *Species Status*

The Gulf Snapping Turtle *Elseya lavarackorum* is a species listed as vulnerable under the EPBC Act, and is listed as of Least Concern in the Northern Territory (*TPWC Act 2000*).

### *Key Threatening Processes*

There is some level of threat to this turtle through fisheries, nest sites may be raided by feral pigs and stock may degrade river banks and therefore nest sites (Woinarski *et al.* 2007).

### *Potential Presence in the Vicinity of the Mine*

*Elseya lavarackorum* is known to exist in the Nicholson River and may be found within the Settlement Creek Catchment. Discussions with Dr Col Limpus (2010) of DERM, Queensland, revealed that the Gulf Snapping Turtle and similar species may be located in streams from the upper reaches of the estuarine zone, through to the spring-fed headwaters. As a result, it is possible that the creeks surrounding ERL94 may contain populations of the Gulf Snapping Turtle.

The two streams that currently experience impact or may experience impact in the future from the mine site, are Hanrahans Creek and Redbank Creek. Currently, Hanrahans Creek has a high heavy metal content and a low pH, making this area uninhabitable for flora and fauna, however levels of contamination reduce downstream through 12 Mile Creek. Redbank Creek on the other hand is deemed to be relatively unimpacted at this point in time, however proposed oxide mining at pit locations adjacent this creek may have adverse affects on the water quality of this creek in the future (thus impacting upon Redbank Creek system and a further downstream section of Settlement Creek).

Humphrey *et al.* 2008 conducted biological studies in the area and confirmed that macroinvertebrate assemblages clearly demonstrated mine-related impacts from the Redbank Mine in Hanrahan's Creek and downstream as far as 35 km (Settlement Creek). Sites on Redbank Creek system, not impacted upon through legacy mining issues, were used as reference sites.

All of the relevant creek systems including the largest order stream – Settlement Creek are ephemeral. Large pools that do persist may act as refuge sites for the Snapping Turtle until flow resumes in the wet season (Limpus C, *pers comm.* 2010). To date no suitable habitat has been discovered on Redbank Creek within 10kms of the mine site and further investigations are planned. Suitable habitat may persist in the creek systems downstream of Hanrahans Creek, however the water quality conditions over the past 15 years have proven to be unsuitable for the survival most aquatic life forms.

## Life Strategies and Habitat Requirements

Deep pools with muddy, sandy or rocky bottoms that are usually associated with steep rocky gorges are the preferred habitats for Gulf Snapping Turtles (Freeman 2009). Gulf Snapping Turtles generally prefer river reaches with intact river banks (Freeman 2009) as they have a largely herbivorous diet that consists of leaves, fruits, flowers, bark and roots that fall or grow within the confines of the river (Woinarski J, 2006). This species is largely nocturnal, thus observation rates dramatically increase when surveying at night (Limpus C, *pers comm.* 2010).



Little is known about the reproduction of *Elseya lavarackorum* (Freeman 2009). It is believed that nesting occurs in aggregations where females will lay their eggs in close proximity to each other (within 2km) before dispersing throughout the river system again (Limpus C, *pers comm.* 2010). Nesting is not necessarily restricted to sandy banks, as Snapping Turtles have been observed to nest on riverine banks with *Melaleuca* and *Casuarina* growth (Limpus C, *pers comm.* 2010). Predation of eggs is thought to occur through a number of animal species including monitors (*Varanus sp.*), rats (*Hydromys chrysogaster*) and feral pigs (*Sus scrofa*). If important habitats are located in the vicinity of the mine, Redbank will explore avenues of protection against predation (from feral animals) where feasible.

## General Mine-Related Impacts to the Gulf Snapping Turtle

Values essential to the survival of the Gulf Snapping Turtle include maintenance of water quality, food source availability, and maintenance of preferred habitat integrity.

The oxidation of sulphides in rock is a natural process which normally occurs slowly as the surface of the earth erodes, however mining operations can greatly accelerate the oxidation process by allowing the release of levels of pollutants in surface and ground water at rates far greater than the downstream environment can sustain (Harries 1997). The term *acid mine drainage* is used to include all processes whereby the inadvertent oxidation of sulphides following mining leads to release of pollutants in the form of increased acidity and elevated levels of heavy metals (Harries 1997). Elevated acidity and metal levels through mine pollution in the Guadamar River in Spain resulted in negative impacts on the growth and survival of macroinvertebrates, disappearance of some macroinvertebrate groups from impact areas, and overall impoverished macroinvertebrate communities (Sola *et al.* 2004). Macroinvertebrate assemblages sampled within Redbank's mine impact zone (Hanrahans Creek) in 2008 clearly demonstrated mine-related impacts (today's legacy issues) in the macroinvertebrate communities.

Certain heavy metal loads can be toxic to aquatic life, and many metals bioaccumulate through food chains (Sola *et al.* 2004). Humphrey *et al.* (2008) has also shown at Redbank that contamination has reduced macroinvertebrate diversity in the current (legacy) mine impact zone. Macroinvertebrates are a potentially important food source of juvenile Snapping Turtles (Woinarski 2006). As such, the juvenile turtles are vulnerable to the lack of availability of food and the potential build up of toxic metals in their organs and soft tissues, potentially resulting in death.

Metals can also infiltrate through the aquatic environment directly to the organism, although published literature can only prove weak correlations between metal concentrations in the aquatic organisms and their environment (Sola *et al.* 2004). The turtle is likely to experience levels of stress relative to the magnitude of elevated heavy metals and acidity in their aquatic environment. This stress from reduced water quality may result in reduced health and fecundity, migration to less polluted reaches, or death.

Potentially poor quality mine drainage may impact on riparian communities (tree deaths, for example) downstream of the mine and impact aquatic ecosystems (Environment Australia 1997).



In summary, the following conditions could result from a mining operation, and these conditions will provide possible adverse impacts on the Gulf Snapping Turtle:

- Elevated heavy metal content (water quality);
- Reduced pH levels (water quality);
- Increased sediment levels (water quality)
- Reduced in stream and riparian vegetation (food source availability);
- Reduced in stream flora (habitat) due to decline in water quality;
- Reduced riparian vegetation (nesting habitat) due to decline in water quality; and
- Denudation and destruction of river banks through pest animals, erosion and / or disturbance (habitat integrity).
- Increased, or decreased egg predation by native and non-native fauna.

Some of these issues are present in the Hanrahans Creek system as a result of the existing environmental legacy.

## **Potential Impacts to the Gulf Snapping Turtle from Proposal**

The proposed expansion to oxide mining operations in the project area, particularly at newly proposed pits; Redbank, Bluff and Azurite (adjacent the currently healthy Redbank Creek); will incorporate the Redbank Creek system into the potential impact zone of the mine. The current impact zone through legacy mining issues occurs through Hanrahan's Creek system, to as far as 35 km downstream of the mine in Settlement Creek (refer to **Figure 1**). Redbank Creek has not experienced known mine-related impacts to date, however the potential impact zone should be extended to include Redbank Creek system as far as 35 km downstream of the mine.

Impacts from proposed oxide mining operations to the currently healthy Redbank Creek system will be minimal, primarily associated with an increased risk of water turbidity and sedimentation.

Positive impacts to the Gulf Snapping Turtle may result from Redbank Copper's remediation of the legacy issues to date, and their commitment to managing legacy issues so as to prevent further contamination of the Hanrahan's Creek system. Langford *et al.* 2009 highlight, however, the time lag in response or lack of response that macroinvertebrate communities may have to improvements in water chemistry dependent on availability of colonisers. Thus, the following paragraphs have focussed on the potentially adverse impacts to the currently healthy Redbank Creek system.



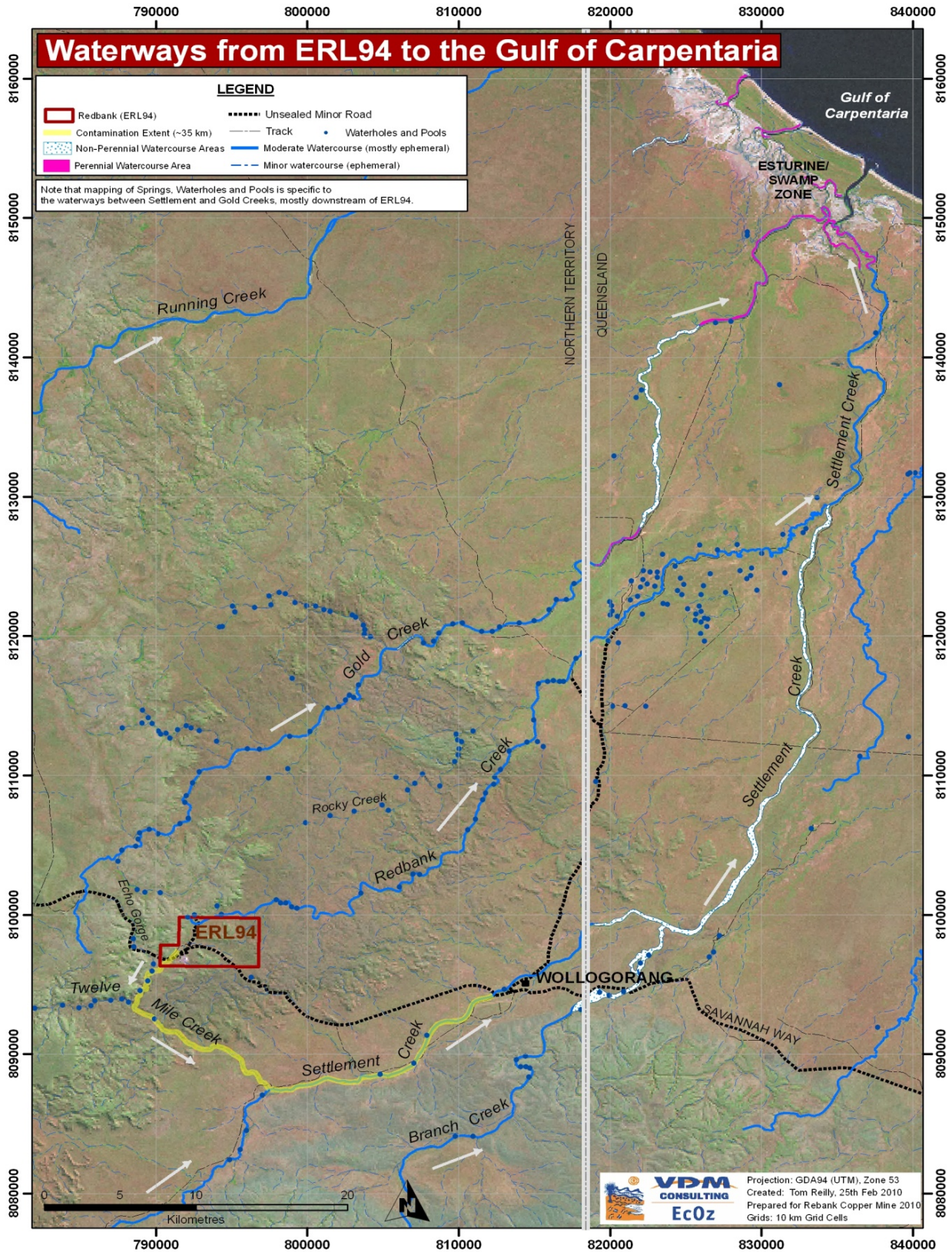


Figure 1: Impact Zone from the Mine and Downstream Permanent Water



### ***Potential Water Quality Impacts on Gulf Snapping Turtles***

Redbank plan to mine only oxides in this mining phase and have identified the depths at which sulphidic and potentially acid forming (PAF) material starts. Testing has shown the oxide material to be non acid forming and testing to date has identified no further potential issues associated with such wastes. The processing plant and all facilities other than waste rock dumps will be located in the currently impacted Hanrahans Creek catchment. Waste dumps will be managed and monitored to ensure that water flows to surface (and ground) waters are not resulting in an environmental impact. Turbidity and sedimentation are well known risks to surface waters should sediment control measures fail and management and monitoring procedures will prevent impacts from them. Short term turbidity and sedimentation are seen as minor threats to the Gulf Snapping Turtle.

### ***Potential Habitat Impacts in Redbank Creek System***

Redbank will manage erosion and will maintain a riparian vegetation buffer around all surface water systems, however reduction in water quality through potentially poor quality mine drainage and sedimentation may impact negatively on riparian vegetation and in-stream flora. Loss of, or changes to in-stream flora and riparian vegetation will likely alter the preferred habitat of the Gulf Snapping Turtle if it is present within the mine impact zone.

Small numbers of Feral pigs are known to inhabit the vicinity of the mine, and Wollogorang Station within which the mine is situated manages free grazing cattle. The risk of denudation and destruction of river banks through pigs and cattle is high throughout the waterways within the mine impact zone. Increased impact from pigs and cattle will further detriment the nesting habitat and general habitat quality for the Gulf Snapping Turtle. Pigs are also known to raid Snapping Turtle nests. Nesting sites within rocky gorge country are likely to be immune from pig and cattle impacts as these animals are unlikely to venture into these locations.

### ***Food Source Availability Impacts in Redbank Creek System***

There is a slight risk that poor quality mine drainage and sedimentation resulting from the proposed oxide mining will impact negatively on macroinvertebrate species (juvenile food source) and in stream and riparian flora (adult food source) that occupy Redbank Creek, reducing the availability of this food source for the Snapping Turtle.

## **Monitoring Proposal for the Gulf Snapping Turtle**

### ***Key information Gaps***

Very little information on the distribution, population status and habitat requirements of this species are available through scientific research papers. Improved information on this species through monitoring will be a valuable start to the successful management and conservation of *Elseya lavarackorum*.

### ***Presence or Absence Surveys within the Mine Impact Zone***

In order to improve the knowledge base of this species within the region, Redbank have committed to commissioning targeted surveys within the current and potential mine impact zone (within and downstream of ERL94). These surveys will be directed and undertaken by turtle experts and will aim to confirm presence in ideal parts of Redbank and Settlement Creek. Ideal parts of Redbank and Settlement Creek to target for survey will be assessed through desktop study and mapping exercises with relevant experts.

In 2010, Redbank will engage a turtle expert to scope out ideal sites for Gulf Snapping Turtle surveys, and potential breeding areas. If the turtle is confirmed present in Settlement Creek, further potential habitat closer to the mine, will be scoped out and surveyed in 2011, with the primary aim to identify potential presence or absence of the Gulf Snapping Turtle within the potential mine impact zone. This will be conducted in a series of stages;



- Desktop review to locate potential sites of preferred habitat, i.e. permanent water with sufficient riparian and instream vegetation;
- Survey areas of preferred habitat to ascertain the presence or absence of the Gulf Snapping Turtle in the potential Mine Impact Zone;
- Continued annual surveying if the Gulf Snapping Turtle is located within the Mine Impact Zone.

This additional information and survey reports will be provided to relevant authorities and research bodies to help fill knowledge gaps on the distribution of this species.

Redbank are committed to managing proposed mining operations in order to minimise impact to the current water quality and physical condition of Redbank Creek. Furthermore, the water contamination remediation program currently underway at Sandy Flat Mine will allow Hanrahan's Creek waters to recover and possibly improve condition sufficiently to accommodate the Gulf Snapping Turtle subject to available habitat.

### ***Ongoing Monitoring of Population Status***

In the case that the species presence is confirmed in the vicinity of the mine, further surveys will be conducted in an attempt to assess the current population status and to monitor the potential impact of mining operations on this species.

Concurrently, monitoring will be conducted along the areas in the mine impact zone identified as providing potential breeding habitat. General condition of banks and riparian will be assessed at the same sites on an annual basis (at the same seasonal timing each year). Noticeable disturbance, such as signs of predation and pig impact on bank stability and riparian vegetation will also be recorded at each site.

The monitoring results will further inform mine management practices through the Environmental component of the annual Mining Management Plan review. This additional information will also be provided to relevant authorities and research bodies to help fill knowledge gaps on the population status of this species.

### **Proposed Off sets**

Metrics for calculating necessary offsets to ensure a net gain for the Gulf Snapping Turtle will not be available until the presence of this species can be confirmed and population status estimated through targeted surveys.

Redbank are currently voluntarily reducing the water level in the Sandy Flat Pit (SFP) via a program of treating the water so as to neutralise it and have the very high levels of heavy metals drop out of suspension. This program is aimed at least reducing and hopefully eliminating the slug of highly contaminated water that the usually fully charged SFP provides Hanrahan's Creek each year as its final flows. The conditions prior to this current wet season have seen water qualities in the Hanrahan's Creek and downstream system unsuitable for aquatic life. This gesture by the company is aimed at demonstrating to stakeholders that Redbank are committed to managing, understanding and repairing the environmental degradation that has occurred on the site for the past 15 years. It has cost Redbank approximately \$1.5M to date and the economic levels of copper that are being removed from the waters are no longer in a state in which they can be accessed. This entire process will provide significant information regarding the future management requirements of the SFP, the local groundwater resources and the stream itself and should provide immediate benefits to aquatic life, including the potentially present Gulf Snapping Turtle. The current impacts on both juvenile and adult food sources will be reduced. This activity has been undertaken as a major environmental offset aimed at improving conditions for all species that may utilise the downstream environment.

Should preferred habitat of the Gulf Snapping Turtle be present within the currently contaminated stream reaches, remediation of these waters will provide an immediate gain for the Gulf Snapping Turtle in terms of increasing potential distribution and increasing health of existing populations.





A desktop analysis of the potential presence or absence and areas of preferred habitat of the Gulf Snapping Turtle will be performed in 2010. This may involve going to site to assess areas considered significant in planning for future monitoring. In 2011, the monitoring surveys described above will be implemented in order to establish presence or absence of Gulf Snapping Turtle within the potential zone of impact of the mine (including 35 km downstream of the mine through the Redbank Creek System; involving a new section of Settlement Creek). Should the presence of this species be confirmed within the potential zone of impact of the mine, appropriate off set measures for the following year and continuing thereafter will be agreed upon with relevant authorities and stakeholders.

If Gulf Snapping Turtle breeding habitat is confirmed in the vicinity of the mine, Redbank will explore avenues of protection against predation (particularly from feral animals such as pigs and rats) and bank degradation. This may involve fencing that reach of the river bank and returning annually to check the integrity of the fence and monitor the evidence of predation and degradation inside the fence.

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