PART B – AEIS

13. AQUATIC FAUNA

13.1. Transfer of exotic species into the water storage area

Several submissions sought additional information on the potential for transfer of exotic species into the water storage area. Section 13.2.1 of the EIS acknowledged the risk of transfer of exotic fish species into the water storage, when used as live bait by fishers or simply through release of aquarium fish into the storage by members of the public. The risk was assessed as low. It must be noted however that it is very difficult to stop deliberate release of aquarium specimens or the use of noxious fish species as live bait, despite these activities being illegal. No part of the construction or operation of the project will of itself aid the spread of noxious species but the water storage will provide suitable habitat.

Tilapia has been recorded in the Fitzroy catchment (Rockhampton, Bajool and Moranbah) and it is also known from several other catchments extending from the wet tropics to southern Queensland. The DAF (2016) website describes the impacts of Tilapia as:

- have successfully invaded and dominated many aquatic habitats due to their highly efficient reproductive strategy, simple food requirements and their ability to live in a variety of conditions;
- unlike many native freshwater fishes, tilapia are able to retreat downstream into highly saline waters during drought and move back upstream when conditions improve, and
- affect native species when competing for habitat and food, behaving aggressively and disturbing plant beds when building nests.

Fitzroy Basin Association (FBA) collaborated with Fisheries Queensland to conduct education programs in the catchment. Jerry *et al* (December 2014) conducted surveys on behalf of FBA at 10 locations and found DNA of the species at 5 of the sites.

A Fisheries Queensland Policy Officer stated (The Morning Bulletin 24 May 2014) that "human aided movement of the pest fish is the most likely cause of the spread of Tilapia." As such, SunWater will provide signage at the boat ramps regarding exotic species and will follow *Control of pest fish; An operational strategy for Queensland fresh-waters 2011-2016* DEEDI (2011) or updates as appropriate as well as the Fisheries Queensland *Stop the Spread* program. Environmental monitoring teams associated with the Project will be provided with the training package associated with this program. The Pest Fish Advisory Group will be contacted for further advice should Tilapia or other species currently not known from the area be reported from within the Dawson Valley Water Supply Scheme.

SunWater is not aware of any means to filter exotic species at the fish transfer device without detrimentally affecting native species.

13.2. Transfer of exotic species from the dam via the pipeline

A number of submissions requested clarification of the techniques that may be employed to manage the potential transfer of exotic species via the pipeline. Section 13.2.2 of the EIS noted that the risk of spread of exotic species is negligible because the only two such species known from the upper Dawson River are already well established

in the Condamine Balonne and Murray Darling catchments. Similarly for any transfer of a species to be successful (that is, to result in a breeding population in any discharge location) both a mature male and female need to be transferred and discharged at the same point or enough viable eggs need to be transferred such that both males and females hatch and survive to breeding age. The likelihood of either of those scenarios is remote because:

- the intake is in deep water remote from the habitat of most fish and certainly remote from egg laying areas;
- screens on the intake will prevent entry of all except small bodied fish;
- there is a strong probability of death as fish pass through the several pump stations or outlet valves / meters on route;
- there is a significant risk of death or severe injury via abrasion during transport along the pipe;
- there is a strong likelihood of death at the discharge location because most are inhospitable; and
- there is a very low likelihood that if adults managed to survive that both a male and female would be discharged at the same hospitable site.

To provide further surety, a filtering mechanism will be employed within the 5 ML balancing storage and this is detailed in **Section 2.2.2** of Part B of the AEIS. That storage is still within the Dawson River catchment, minimising the risk of transfer beyond that catchment. SunWater has experience in the use of such screens in the Mareeba Dimbulah Irrigation Area and at the intake to the Burdekin Moranbah Pipeline at Gorge Weir. This experience will be applied to the operations of the Project and the risk of successful transfer is again, therefore considered negligible.

As a provider of bulk raw water, SunWater does not treat water prior to distribution. Given the low initial risk of successful transfer, treatment would not be considered a practical or reasonable alternative mitigation measure.

13.3. Fish stocking

Several submissions requested additional information on the stocking of fish within the water storage area. Fish stocking is managed by Fisheries Queensland, not SunWater. Therefore, any clarifications regarding the appropriateness and/or continuation of stocking or monitoring the effects of stocking should be directed to Fisheries Queensland or the Freshwater Fishing and Stocking Association of Queensland.

13.4. Impact of the waterway barriers and effectiveness of the transfer systems

One submission requested additional information in relation to the potential impacts of waterway barriers and the effectiveness of the fish transfer device to be constructed as part of the dam. Issues were raised in reference to three scales of structures:

- relatively minor or temporary barriers associated with road works or pipeline crossings of watercourses, amongst others,
- the dam wall itself (including construction phase impacts of the diversion channel); and
- existing downstream barriers in the Dawson River.

As a matter of course, SunWater will consult with Fisheries Queensland during detailed design of any fish passage infrastructure required by the project (as discussed in Section 2.1.1 of the EIS).

All pipeline related waterway crossings and dam construction site haul roads will be conform to the applicable code for self-assessable development:

- minor waterway barrier works Part 4: bed level crossings (Code WWBW01) – for the maintenance and any access track and haul roads; and
- temporary waterway barrier works (Code WWBW02) – for placement of the pipeline through the waterway.

Rehabilitation of the waterway bed and banks will conform to the code, the conditions of related permits if required (Riverine Protection Permit for example), the Construction EMP and to SunWater's Surface Protection Works specification which attaches to contract documents and informs the EMP. These documents are standard practice and include items such as replacement of disturbed material in the original order and to the original profile, rehabilitation using local native plant species, planting density specifications, watering schedules, target survival rates and weed control. They also specify the period within which rehabilitation works must commence following construction and the requirement for temporary sediment and erosion control until such works commence.

With respect to the fish transfer device at the dam, the EIS committed for it to be designed in general accordance with the Fisheries Queensland process which has now been superseded by the requirements of State Development Assessment Provisions (SDAP) module 5 (Table 5.2.1). SunWater has committed to provide adequate funding for the process and the device.

There are many operational fishways in Australia, including on facilities operated by SunWater. The best studied site of relevance is Paradise Dam on the Burnett River and the concept design for the fishway at Nathan is based on this design. The final monitoring reports (DEEDI 2012a and b) concluded that the fishway performed well but its operation was limited because of drought and some mechanical failures (which were corrected). Example relevant conclusions with respect to upstream movement include:

- The current study identified that during low to medium flows the fishlift has provided passage for 25 of the 29 species identified in the vicinity of the dam.
- Results collected throughout the monitoring program demonstrate that extremely high numbers of fish can be safely moved.
- Results from the monitoring program have demonstrated that the fishway operation and works were constructed to maximise attraction, capture and transfer of fish at the Paradise Dam.
- The Paradise Dam upstream fishway has operated during all four seasons of the year during low to medium flow releases. A wide range of fish species and size classes have successfully migrated upstream through the fishway.

Relevant conclusions with respect to the downstream fishway, which was also affected by low water levels in the storage during the drought, include:

- The current study identified that the Paradise Dam downstream fishway provided passage for 21 of the 26 species of fish identified upstream of the dam. Most of the species that were abundant upstream of the dam successfully utilised the fishway and were well represented in fishlock captures.

Final sections of the reports provided advice to improve the operation of the facility and to assist to mitigate impacts of future water resource developments. SunWater used this information in developing the preliminary design for the fishway at Nathan Dam. All information available on the performance of relevant fishways is taken into account during the planning process to finalise fishway design as nominated in the State Development Assessment Provisions. It can therefore be expected that the waterway barrier works will include a fishway that adequately provides for the movement of fish across the barrier.

With respect to the existing downstream barriers, one submission requested discussion on the effect of reduced flooding downstream of Nathan Dam on drown out of existing weirs and thereby any reduction in opportunity for fish to pass these barriers. The weirs were shown in Figure 13.4. Updated hydrological modelling to assess passage was based on the current IQQM model for the catchment and incorporated the latest dam operations strategy. Downstream passage opportunity was defined as periods where a depth of water of at least 30 cm was passing over the weir. For upstream passage, the difference between headwater and tailwater levels needed to be less than 20%.

The potential for fish passage improves at Glebe Weir because it currently has no fish transfer device and will be replaced by Nathan Dam which will incorporate such a device. At the five downstream weirs within the water supply scheme, downstream passage is currently possible between 3% and 12% of the time (over a simulation period of 108 years or 39,446 days) while upstream passage is possible between 0.4% and 3.7% of the time. With the dam in place these will reduce to between 2% and 11%, and 0.3% to 2.7% respectively. The impact varies between years with higher flow years being less impacted but with extended periods of no opportunity during droughts. The comparable opportunity for passage in the natural case is unknown because the location of natural barriers was not mapped before the weirs were constructed however drought or very low flow periods would always have provided little or no opportunity for fish movement. Opportunity for upstream movement past weirs without fish transfer devices is limited to flood periods.

Figure 13-1 and **Figure 13-2** show the improvement at Glebe Weir while **Figure 13-3** and **Figure 13-4** show the reduced opportunity for downstream fish passage at Gyranda Weir which is the most impacted because it is closest to the dam. Moura Weir and Neville Hewitt Weir currently have fish transfer devices fitted so drown-out is not the only period of available fish passage. Operation of the water storage has been modelled with no change to the operating rules of these downstream storages hence the operation of the existing fish transfer devices will not alter.

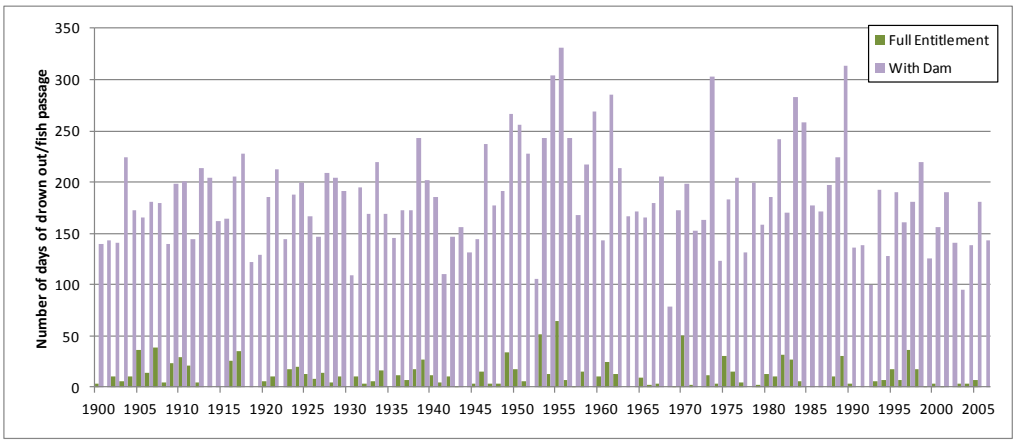

Figure 13-1 Glebe Weir/Nathan Dam – days of drown out / downstream fish passage per water year

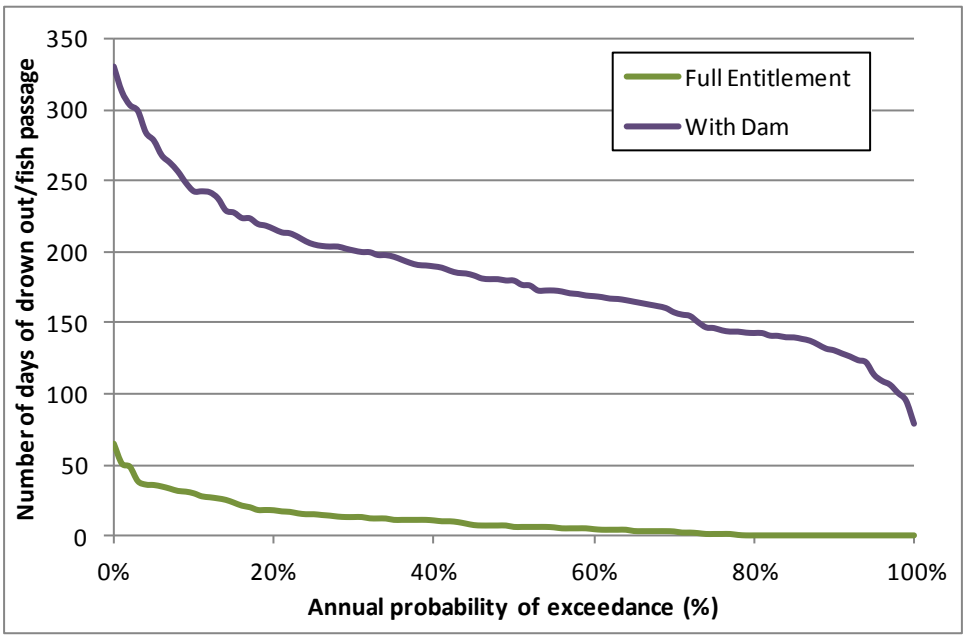

Figure 13-2 Glebe Weir/Nathan Dam – annual probability of exceeding of number of days of drown out / downstream fish passage

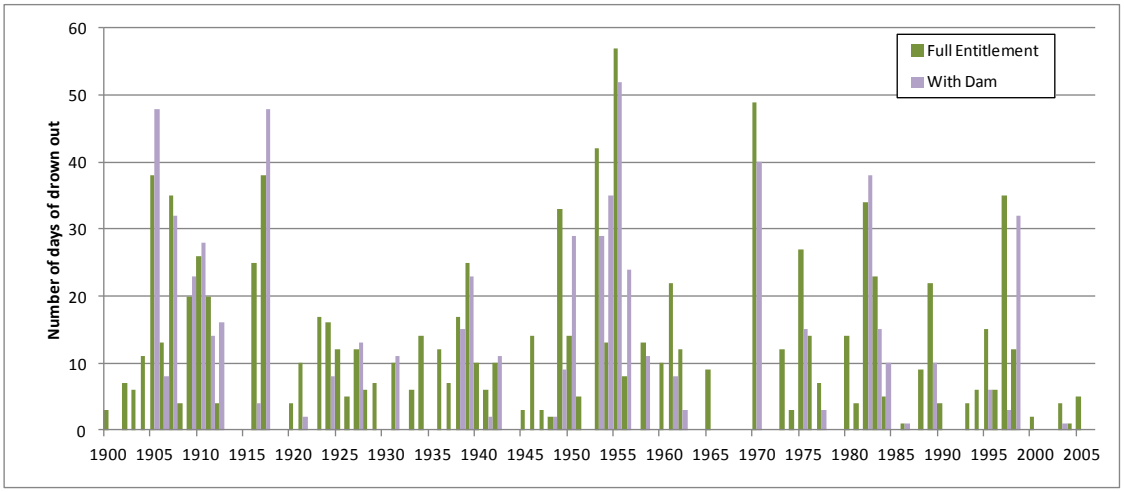

Figure 13-3 Gyranda Weir – days of drown out / downstream fish passage per water year

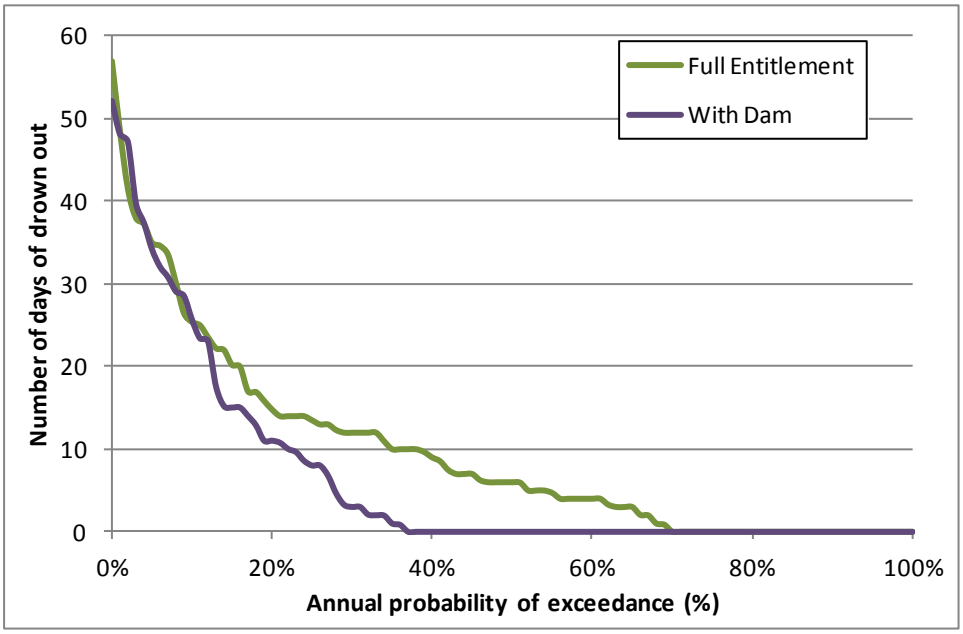

Figure 13-4 Gyranda Weir – annual probability of exceeding of number of days of drown out / downstream fish passage

As a result of this hydrologic modelling investigation assessment SunWater considers it appropriate, should the Project be approved, to commit to investigate the need to improve aquatic fauna passage (including fish and turtles) at Gyranda Weir.

The purpose of the existing weirs within the Dawson Valley will not alter as a result of the dam, hence none are planned for removal or lowering. Readers are also referred to **Section 27.3.1** of Part B of the AEIS with respect to cumulative impacts from all current SunWater proposed projects associated with waterway barriers in the Fitzroy catchment.

Climate change related impacts on the flow regime were assessed in Section 14.2.2.6 of the EIS. That modelling showed that the 90th and 50th percentile climate change scenarios (at year 2050) would decrease the frequency of flows which would lead to weir drown-out relative to the "with-dam, current climate" scenario while the 10th percentile scenario would increase those flows. Low flows are better maintained and connectivity within a river reach is improved with the dam in place.

13.5. Turtle movement and impact of water storages

Limpus *et al* 2011 summarises the information available on the distribution and movement of all turtle species in the Fitzroy catchment. Chapter 13 of the EIS used an unpublished version of this document (referenced as Limpus *et al* 2007) as its major information source to discuss these issues. SunWater is not aware of any more recent information to expand on this discussion. The EIS addressed the likely use of the storage by the various turtle species. Section 13.2.1.2 of the EIS for example, noted that *Emydura macquarii krefftii* was likely to dominate the turtle fauna in the water storage area, as it does in other water storages in the region, but other turtle species would also likely utilise the water storage area as is evident elsewhere. The turtleway was modelled (Section 14.2.2.1 of the EIS) as operating during the natural movement periods of January to February (inclusive) and August to November (inclusive). Design of the turtleway will be refined as the Project progresses

with potential alterations to flow periods based on advice from agencies and relevant experts. Water supply to the turtleway is physically independent from other releases from the storage so release strategies related to other needs can be managed independently from the turtleway. The volume required to operate the turtleway is very small (up to 2 ML/d) so will have negligible effect on dam operations.

SunWater's experimental turtle movement project at Tartrus Weir is not part of the Nathan Dam and Pipelines Project but the EIS noted that it was likely to produce information that would be relevant to the design of turtle movement facilities. Due to economic circumstances the turtle movement project at Tartrus Weir was discontinued but investigations at the site by DEHP staff as part of the project provided important data on local populations and the impact of the barrier. SunWater will commit to undertaking a study in conjunction with members of DEHP with specialist turtle knowledge specifically directed at obtaining information of direct relevance to the design of the structure at Nathan Dam. The study would be conducted at the commencement of the related detailed design phase to ensure outcomes could be appropriately incorporated. The commitment above (Section 13.4) related to provision of aquatic fauna passage at Gyranda Weir will include requirements for turtle movement.

13.6. Turtle nesting areas

One submission requested further information on the potential impacts of changes to upstream flooding on turtle nesting habitat. For the majority of the water storage area, the new waterline is significantly beyond the existing river bed and banks on what was terrestrial (non-nesting) habitat. In the upper reaches of the storage, the changes to flood levels are minor as discussed in Section 14.2.3.1 of the EIS. For example, no measurable change in flood levels was observed in Taroom for events up to the 1 in 10 year AEP while the 1 in 20 year event resulted in a 0.1 m increase. These were modelled with the dam at FSL, which itself is modelled as occurring only 7% of the time. When such flow events occur and the dam is below FSL, there is less and often no change to the upstream flood levels. As a result, any flood related impact on turtle nesting areas upstream from FSL is negligible.

13.7. Impacts on breeding cycles of fish and turtles.

One submission was concerned with potential impacts of the flow regime on the breeding cycles of native fish and turtles, particularly as it related to inundation of downstream wetlands. These issues were discussed in Section 13.2.1.2 of the EIS which incorporated a section entitled "Extent and importance of downstream wetlands to be impacted by reduced flooding". Additional discussion has also been included in **Section 9.1** of Part B of the AEIS. Operation of the dam will be in accordance with the Water Resource Plan (WRP) and supporting plans for the catchment. That Plan includes Environmental Flow Objectives that aim to minimise changes to the natural environment while also acknowledging that the Dawson Valley Water Supply Scheme exists for the benefit of society so a level of change is acceptable. SunWater intends to conform with the Plan and the most recent modelling (**Chapter 14** of Part B of the AEIS) shows that the operation of the water storage can meet the mandatory requirements of the WRP and improves compliance with some of the non-mandatory requirements relative to the (pre-dam) full entitlement scenario.

13.8. Offsets for fisheries habitat

A submission noted that there may be a requirement for provision of offsets for fisheries habitat. A waterway providing for fish passage is a matter of State Environmental Significance and a Prescribed Environmental Matter under Schedule 2 of the *Environmental Offsets Regulation 2014*.

Significant Residual Impact (SRI) Criteria for this prescribed environmental matter are described in the DSDIP guideline (2014) as below.

"An action is likely to have a SRI on a waterway providing for fish passage if the action will result in:

(a) a permanent modification to the volume, depth, timing, duration or flow frequency of the waterway;

(b) permanent modification or fragmentation of fish habitat including but not limited to in stream vegetation, snags and woody debris, substrate, bank or riffle formation necessary for breeding and/or survival of native fish species;

(c) the mortality or injury of fish species; or

(d) works that permanently reduce the level of fish passage provided in a tidal waterway or a waterway identified as a major high risk waterway for waterway barrier works, to a level that would increase stress on fish populations.

Notwithstanding the above, an action is unlikely to have a SRI on a waterway providing for fish passage if:

(a) measures have been put in place to provide equal or better fish passage for the waterway during construction and operation activities; and

(b) the waterway is restored to its existing condition immediately on completion of the works; or

(c) for works that permanently alter existing fish passage, equal or better passage will be provided immediately on completion of the works."

Temporary or permanent waterway barriers related to roadworks or temporary construction works will satisfy the criteria for an unlikely significant residual impact however the dam wall and resultant water storage area will not.

Offsets relate to significant residual impacts after they have first been avoided or minimised. While the alteration of habitat as a result of filling of the water storage area cannot be avoided, various design, construction and operational plans and commitments have avoided certain impacts. For example the use of a diversion channel avoids impacts on the flow regime during construction. Similarly the appropriate design of waterway barrier works associated with road works at all scales (minor, temporary or major and permanent) will avoid creation of permanent barriers. Impacts have been minimised through the many mitigation measures noted in the EIS such as:

- provision of habitat within the water storage through not clearing within 1.5 m (vertical) of FSL so structural habitat is created in relatively shallow water;
- salvaging of tree parts suitable to use as snag habitats within the water storage;

- provision of a fish transfer device designed in general accordance with the process nominated by Fisheries Queensland in order to mitigate effects of creation of the barrier;
- compliance with the Environmental Flow Objectives of the WRP, including the APFD statistic which is specifically fisheries related;
- providing improved low flow river connectivity within reaches between weirs; and
- mitigating the loss of recreational fishing access associated with the flooding of the camping area and boat ramp at Glebe Weir via provision of two larger areas, one on either side of the water storage.

The net impact on fisheries or fisheries habitat must take into account the negative impacts of the Project but also any positive impacts. In the case of the water storage area, while it physically replaces current riverine habitat it provides:

- a permanent water body that will act as a refuge during drought;
- a larger area of potential lacustrine habitat;
- greater lengths of shoreline than the existing river and in a variety of configurations;
- shallow open water habitat which will provide greater opportunity for macrophytes to develop and support an associated fish community;
- a fish transfer device which the present Glebe Weir does not have and the increase in the number of days in which transfer is possible is very significant;
- a multi-level offtake thereby providing better capacity to manage water quality of releases when compared to the present Glebe Weir which releases water from the bottom; and
- enhanced recreational fishery value in a regional context.

The EIS also concluded that while a change in the relative composition of aquatic fauna communities is expected to shift towards those species preferring pool habitat, the diversity of aquatic fauna communities is not expected to decrease. No listed threatened fish species or commercial species are impacted by the Project.

SunWater suggests that it is very difficult to quantify the residual impact but investigation of fish passage at Gyranda Weir is a significant financial commitment.

SunWater suggests no further specific offset for fisheries habitat is necessary.

13.9. Management of biting insects

Submissions raised concerns about the potential for detrimental health impacts that may occur via mosquito borne diseases associated with the water storage area. The documents “Guidelines to minimise mosquito and biting midge problems in new development areas” (Qld Health 2002) and the “Mosquito management code of practice” (LGAQ 2002) were reviewed during preparation of the EIS. Though these documents were not prepared with reference to major new water storages, some of the suggested approaches to mitigation and monitoring are considered relevant. These requirements, where practical, will be incorporated within Section 10.7 of the draft EMP in **Appendix B29**. In accordance with these documents, the requirements will be prepared in consultation with stakeholders including Banana Shire, Queensland Health, Fisheries Queensland, DEHP and local residents.

The risk profile regarding mosquitoes was also reviewed during preparation of the EIS. Much of the water storage area will be of a depth greater than that which supports mosquito breeding. In contrast, the water storage area will replace a well vegetated, relatively shallow river and a flat floodplain with various depressions which hold water following flooding or heavy rainfall. It is therefore considered that the depth of the water storage area is less likely to foster suitable breeding habitat when compared with the current topography along the Dawson River. The water storage area is located within a sparsely populated rural area where the residences are generally separated from the shallow edge of the water body by cleared agricultural land which provides a buffer to mosquito movement. However some areas of the storage will generate higher risks, such as the shallow break-out area on "The Brae" which is within 2 km of the nearest residential subdivision in Taroom. While also separated from these areas by largely cleared agricultural land, it is these breakout areas that require planning to ensure actions are in place should they be needed.

13.10. Conservation status of White-throated Snapping Turtle (*Elseya albagula*)

The White-throated Snapping Turtle (*Elseya albagula*) was listed as Endangered under the Nature Conservation Regulation in August 2015. It was also listed as Critically Endangered under the EPBC Act in November 2014. With respect to the latter, as the species was listed as threatened after the proposed action was determined to be a Controlled Action, in accordance with Section 158A of the EPBC Act, it is not required to be included in the assessment.

With respect to the former, the EIS assessed impacts on the species as if it was listed because it was identified as a high priority for conservation in the former EPA's "Back on track" species prioritisation framework. The species has been confirmed as present within the water storage area and both upstream and downstream. Its distribution extends to the upper reaches of the Dawson River and other rivers in the Fitzroy, Mary and Burnett catchments. The environmental management strategies included in the EIS (pages 13-55 to 13-57) and based on advice from Dr Col Limpus were intended to mitigate impacts on Fitzroy river turtle and White-throated snapping turtle, as well as turtle species in general. These commitments were significant and the EIS concluded that residual impacts were minor and acceptable.

A Species Management Plan (SMP) will be developed for the species prior to commencement of any relevant works. A National Recovery Plan for the species is in preparation at the time of writing and will be taken into account when developing the SMP.

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