

## partment of Planning & Environment

North Byron Parklands Development Application Wastewater review

April 2018

GHD | Report for Department of the Environment - North Byron Parklands Development Application, 2316318 | i

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## 1. Introduction

### 1.1 Background

North Byron Venue Management has applied to increase attendance numbers at festivals held on the North Byron Parklands property. This has a number of associated social and environmental impacts, including increased sewage / wastewater generation and their required management as detailed in the EIS dated December 2017.

The Senior Planning Officer – Industry Assessments from the Department of Planning and Environment (DPE) engaged GHD to conduct an independent review on the Wastewater Assessment Report and related information provided in Application Number SSD 8169. This report forms part of the North Byron Parklands Cultural Events Site - Environmental Impact Statement dated December 2017. The Applicant is Billinudgel Property Pty Ltd and the 259 hectare site is known as North Byron Parklands (NBP), address 126 Tweed Valley Way, Yelgun NSW 2483. The proposed land development is on:

- Lot 1 in DP 1145020;
- Lots 46, 402, 403, 404 and 410 in
- DP 755687;
- Lots 2 and 12 in DP 848618;
- Lot 101 in DP 856767;
- Lot 30 in DP 880376;
- Lots 100 and 101 in DP 1178907;
- Lots 101, 102 and 107 in DP 1001878;
- Lots 12 and 14 in DP 875112;
- Lot 312 in DP 1163830

The site currently hosts two major music festivals i.e. the Splendour in the Grass and Falls Festivals under a trial project approval. A proposal is currently with the DPE for assessment, which is seeking permanent approval of the site to host events for up to 50,000 patrons (SSD 8169). In terms of wastewater and sewage management, the Applicant is proposing to expand its existing on-site sewage management system and has considered a number of options for on-site treatment of solid and liquid sewage waste including on-site effluent disposal.

The current trial period's maximum attendance is 35,000 patrons per 5 day event. The application is to expand up to 50,000 patrons per large event. DPE wishes to be advised if the proposed wastewater treatment and management systems are appropriate for the scale of events considering human health and environmental protection.

This summary report presents the findings and recommendations of GHD's review of available reports, site visit (March 2018) and discussions with the NBP Site manager and Byron Shire Council.

### **1.2** Purpose of this report

DPE requires that GHD to review Chapters 1, 2, 3 and 6 of the Environmental Impact Statement (EIS) and Appendix R – Wastewater Assessment and provide independent advice on the suitability of the proposed wastewater management approach outlined in the EIS and technical report. GHD reviewed these chapters and Appendix R as well as Appendix Q "North Byron

Parklands Drinking Water Supply" by JED Civil Engineering and Drafting dated November 2017, provided by Byron Shire Council to GHD on 28<sup>th</sup> March 2018. This report contains essential data for GHD to review the proposed water consumption for the development. The scope of works required is included in the following table.

#### Table 1 Wastewater assessment

Scope of works	Outcomes	Progress
Undertake review of Wastewater Assessment Report and relevant chapters of the EIS to determine suitability of the proposed wastewater management approach. Engage with Applicant's consultant and Byron Shire Council.	Prepare report with recommendations if approach is suitable; OR Prepare advice letter if further information has been requested Obtain more information and/or clarifications for review	This report Done
Where further information has been requested, review Applicant's Response to Submissions Report. Additional engagement with Applicant's consultant and Byron Shire Council.	Prepare final report with recommendations	To be completed

This report covers the Stage 1 investigation, which includes:

- Review of available documentation;
- Site visit on 29<sup>th</sup> March 2018; this included inspection and discussions with NBP site management and their consultant;
- Discussion with Byron Shire Council on 28th March 2018;
- Assessment and quantification of the proposed on-site treatment system capability and key requirements vs. the EIS Appendix Q and R data and event requirements;
- Identification of additional information required.

### 1.3 Scope and limitations

#### 1.3.1 Scope of Work

GHD's Stage 1 task is to analyse the wastewater requirements and plans relating to the proposed development and comment on the proposed solution components whilst identifying additional data and information that may be required. This investigation is necessary to advise the appropriateness of the proposed wastewater management system for the desired levels of occupancy. It is noted that the current trial event approval allows up to 35,000 patrons attending 5-7 day events twice per year. The proposed development is to expand the on-site activities to 50,000 patron events twice per year, and incorporate a 180 person conference facility and 120 person overnight accommodation facility. It is noted that large events require up to 5,000 staff on-site. Arrival of staff and campers extend prior and after event days.

In assessing the proposed development, GHD reviewed the current composting treatment of solid waste from the existing toilet facilities as well as the grey water collection, storage and subsoil discharge. The proposed water demand and wastewater volume are reviewed for consistency between the two. The site inspection included the proposed expansion of the grey water treatment and disposal areas, as well as the area earmarked for stabilised solid waste burial.

#### 1.3.2 Limitations

This report has been prepared by GHD for Department of the Environment and may only be used and relied on by Department of the Environment for the purpose agreed between GHD and the Department of the Environment as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Department of the Environment arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.4. of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Department of the Environment and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

### 1.4 Assumptions

The following assumptions have been adopted for this study:

- Existing amenities are of a temporary nature: dry composting toilets, collected wastewater removed via tanker truck to the treatment facility, composted solids removed manually for burial. Potable water is piped to various dispensing tanks across the site.
- The existing sewage / wastewater disposal is to be expanded by duplicating and adding more of the same amenity units on the site (i.e, use of dry composting toilets). The proposal is for the addition of fixed plumbing to pump seepage water, urinal water and shower/basin grey water to the proposed wastewater treatment facility.
- Acceptance of liquid wastewater from the toilets has, to date, been managed via Council at the local sewage treatment plant.
- Burial of solid waste is proposed to be at the same site as per the current practice, which is located outside of the flood plain area. Available area for burial appears to be limited to approximately 300 m<sup>2</sup> due to the sensitive native vegetation on site. Tree planting using composted solids will be in the flood plain area.
- Only solid waste from sewage is considered in this analysis. Other waste potentially generated on-site, such as garbage, is not considered in this report.
- The purpose of this report is not to present possible solutions for identified problems or risks. Any mitigating measure in this report should be read in context and not be accepted as a confirmed or guaranteed solution.

## 2. Current and Proposed Wastewater Management Practice

## 2.1 Current Amenities and Disposal Practice

Existing amenities comprise of dry composting toilets, showers, urinals and drinking water dispensing tanks across the camping and festival areas. Figure 1 depicts the existing on-site amenities. The proposal is to duplicate these and add plumbed wastewater pump out to the proposed larger treatment facility.















#### Figure 1 Existing amenities

Composting toilet seepage water, urinal, shower and hand basin grey water is trucked to storage tanks and underground disposal as shown in Figure 2. Dried compost from the mobile bins is buried on-site above the flood-line - Figure 3.



Figure 2 Existing wastewater treatment and disposal on-site



#### Figure 3 Compost burial area

Up to 35,000 people are catered for over 5 - 7 day large events. The proposal is to add more of the same amenities and additional treatment / wastewater disposal facilities to cater for annual attendance of up to 130,288 patrons and staff over 28 days per annum and up to 325 patrons and staff throughout the year at the conference centre, overnight facility and spa.

Toilet solid waste is collected and stored in wheelie bins, which are swapped out of the active area during the event and kept in the roofed space between the toilet and shower sections of the amenity blocks. Seepage is piped to underground wastewater collection tanks at each amenity block for pump out and trucking to the treatment plant.

Pumping out of the storage tanks involves connecting a vacuum pipe to each tank. A small amount of wastewater can be spilled onto the ground during this process, as also happens when emptying into the long term greywater holding tanks.

There is partial greywater treatment via tank storage and gradual disposal on-site into a subsurface absorption trench.

Kitchen and excess other wastewater is trucked offsite to Ballina and Byron Bay STPs (per event agreements are normally established with Council).

#### 2.2 Proposed Wastewater Practice

A significant change to the current practice will involve implementation of a conference centre, with presumably collection of sewer and higher wash water volumes for toilet flushing and washing.

Due to the differences and risks associated with storing and treating trade waste quality effluent from kitchen sullage during the medium to large events compared to the blackwater/greywater mix that will be generated from the amenities and conference centre, it is proposed to continue to remove all medium-large event kitchen waste off-site. The smaller kitchen volumes generated at the conference centre will be stored and treated on-site.

Future proposed system involves batch compost toilets and partial greywater treatment and disposal on-site, with excess wastewater trucked offsite to Ballina and Byron Bay STPs.

Effluent (liquid disposal) is proposed to be irrigated after treatment via a reed bed system and chlorine disinfection. The site is located on a moderately sloping elevated position underlain by medium clays, with downslope native vegetation. These soils reportedly have good nutrient uptake abilities. Further detail is outlined in Section 5.1.

## 3. Byron Shire Council Perspective

GHD received and reviewed the Byron Shire Council submission dated 9<sup>th</sup> March 2018 to DPE for the proposed development. GHD's representative (Chrisjan Joubert) met with Byron Shire Council on 29<sup>th</sup> March 2018. Council officers representing the Planning, Environmental, Water and Wastewater Treatment Departments present were: Chris Larken, Tim Fitzroy, Emma Holt and Sarah Nagel.

The following sections outline the key issues relating to water and wastewater were raised by Council.

### 3.1 Off-site wastewater disposal

The application requires up to 544 kL/annum<sup>1</sup> of kitchen sullage to be trucked off-site for treatment at Ballina or Byron Bay STPs.

#### Byron Council's stated concerns:

- No contract, agreement or evidence of concurrence exists between the Applicant (NBP) and the Local Authorities for trucked liquid waste disposal and treatment.
- Liquid wastes that are transported to Byron Council STP are logged (volume and concentrations). Incidents associated with the Applicant have previously occurred where the NH<sub>4</sub>-content of received liquid waste exceeded the licence limits of the treatment facility.
- Council will have to consider:
  - Fees for accepting liquid waste based on contaminant concentration and volume, and
  - Financial contribution from the Applicant for expansion of the Byron Shire Council STP which is currently designed for 10,000 Equivalent Persons (EP).

#### **NBP comment:**

Agreements in the past were established for liquid waste disposal and treatment on a per event basis. A standing agreement has not been established.

#### GHD comment:

NBP was requested to provide a copy of a previous event based agreement with Byron Shire and Ballina Councils.

Based on preliminary review, if there are say 2 events per year and 544 kL/annum of kitchen sullage to be trucked to the STPs, this potentially represents around 5 % of the daily flow to Byron STP. The organic load is likely to be 10 - 20 % which is regarded as significant, and GHD would support Council's view that some significant upgrade of the STP would be required.

### 3.2 Irrigation of flood prone land (EMA2)

Festival precinct kitchen sullage and laundry wastes will be trucked for treatment off-site. The remaining balance of wastewater will be stored and gradually treated and irrigated as follows: Up to 35 kL/day of secondary treated and chlorine disinfected wastewater effluent (on-site treated compost seep, urine, hand basin water, shower grey water, conference centre kitchen sullage) to be surface sprayed onto an area designated as EMA2. This area is flood prone and used for camping during the proposed events -Figure 4.

<sup>&</sup>lt;sup>1</sup> Wastewater Assessment for North Byron Parklands. Whitehead & Associates. 2017/11/13 piii



#### Figure 4 Camping area proposed for irrigation

The camping area has a drainage system comprising of lateral sub-surface drainage pipes feeding into drainage channels – refer Figure 5.



#### Figure 5 Camping ground / irrigation area drainage

#### Byron Council's stated concerns:

- Council's policies require:
  - No wastewater irrigation on flood prone land;
  - If treated wastewater is irrigated, a sub-surface system is preferred. Sprinkler irrigation is not acceptable due to pathogen risk to the public.
- Council has a policy against the implementation of sewage pump-out systems as these systems are considered difficult to control reliably, costly and comprising high risk to public and environment.
- Even though irrigation is stated to be discontinued two days prior to campers' due arrival, Council is concerned that at the proposed scale of events, a large number of staff and patrons are exposed to health risks associated with irrigated effluent.
- The complexity of the proposed wastewater handling and management systems, if approved, will have to be regulated by Council, at a cost, to ensure effective functionality.

- The sustainability of the proposed compost burial and tree planting operations is questioned.
- The actual total volume of wastewater generated for the last five years has not been reported to Council and is deemed not verifiable. The proposed wastewater generation for the development is well below any urban design principles and rely heavily on stated water savings measures.

#### **NBP comments:**

- The solid waste proposed to be either buried or used as compost for tree planting is used when its physical condition is stabilised by microbial activity in the bins and its residual volume significantly reduced. The existing (and proposed) area used as compost burial site is above the flood level and also used to safely store all waste bins in advance of flood conditions Figure 6.
- NBP Management advised that solid waste, due to its relatively compact volume, could be disposed off-site at an approved waste management centre if required.





Figure 6 Stabilised compost burial area

#### **GHD comments:**

The suggested irrigation value (treated effluent volume) is considered to be very low and much lower than standard volumes adopted for wastewater generation. GHD consequently has two significant concerns – there is an error in volume calculation and consequently the irrigation area required is likely to be much greater than nominated and irrigation of flood prone land using (treated) wastewater is not acceptable due to high contamination risk on- and off-site.

The importation of composted material into a flood prone area for tree planting needs to be monitored. Stabilisation degree and microbiological viability needs to be properly verified via laboratory testing prior to disposal / burial in accordance with NSW EPA Environmental Guidelines – Use and disposal of biosolids products.

The designated burial area is limited in size – approximately 150  $m^2$  and located on a sloped area previously excavated - Figure 7. The proposal will require future expansion of the burial area as well as erosion and access control. It is noted that the proposal limits vegetation clearing for the proposal to 300  $m^2$ . A projection of available non-flood prone area and the burial area required was not presented by the Applicant.



#### Figure 7 Stabilised compost burial area – stormwater management

The potential for unlimited burial disposal on-site into the distant future may require a) repeated burial in the same location or b) vegetation clearing and levelling. The wastewater assessment in the EIS states (p10) that approximately 67% of the site is used for events (flood prone) and the remaining 33% area which is generally located above the flood level, comprise of "dense vegetation identified as High Conservation Vegetation within Council mapping".

The site is located in a relatively high rainfall area (mean rainfall 1,732 mm/annum<sup>2</sup>). The proposal anticipates that compost compliant to AS/ANZS1546.2.2008 (SAI 2008) will be used for tree planting. The available area for future tree planting is limited to the generally low lying areas used for camping and events. The stormwater leaching of contaminants into the flood plain and groundwater system is considered a potential risk.

### 3.3 Data and design premise used in proposal

#### Byron Council's comments:

- Council will verify if a) previous 5-year waste monitoring reports were received by Council as per the conditions of the previous consent and b) comparison of data with logged volume received at Byron and Ballina STPs.
- The design safety factor for the proposal has to be verified.
- Council considers the design premise of the proposal to be wrong:
  - Low flow discharge values adopted per patron for events and conference / permanent overnight facilities are considered unrealistically low;
  - Liquid waste disposal off-site whilst the high concentration of contaminants previously posed problems to Council's STP;
  - The long-term sustainability of solid waste burial and tree planting is questioned considering the potential (uncontrolled / unlimited) occupancy of the proposed conference and permanent overnight facilities comprising of up to 300 patrons, the extent of flood prone areas, dense vegetation and foliage on sloped areas limit the extent of potential burial and tree planting areas. The high annual rainfall and surface run-off are considered as increasing the risk of contamination.

<sup>&</sup>lt;sup>2</sup> www.bom.gov.au

 The proposal of progressive design and implementation of the on-site sewage management system (OSMS)<sup>3</sup> for progressively larger festivals, and addition of conference and overnight facilities following incremental OSMS capacity expansion is not acceptable to Council. Council requires development approval on the basis of complete and detailed plans clearly delineating any stages prior to approval.

#### **GHD comments:**

Table 2 summarises the water consumption for the proposed development extracted from the proposed Stage 3 events scenario<sup>4</sup>

Event	Event patrons + staff <sup>5</sup>	Event patrons & staff <sup>6</sup>	Events x days per year <sup>78</sup>	Water Demand (L/pp/day)*	Design wastewater flow (L/pp/day)	Total Estimated Water Usage (kL/d)
Large	55,750	50,000	1 x 5 days	27	9.5	1,505
Large	39,888	35,000	1 x 5 days	39	13.5	1,556
Medium	27,500	25,000	1 x 3 days	27	9.6	743
Small	5,500	5,000	5 x 1 days	24	8.4	132
Minor	1,650	?	2 x 1 days	11	3.7	51
Conference Centre & Overnight	325	300	347 days	113	52 (average)	37

#### Table 2 Water consumption per person

Note that it is a legal requirement to provide free drinking water (Best Practice Guidelines for Live Music Venues, Music Victoria).

#### \*Based on typical return flows

With reference to Table 2, it is noted that NBP attributes the exceptionally low water consumption / demand and wastewater generation proposed per staff / patron to the excellent on-site water savings measures, which will be applied in the proposed expansion. However, no historical records were presented to substantiate data used in estimating water demand and wastewater discharged.

Furthermore, apparent anomalies appear in the data presented and used for water consumption and wastewater generation:

<sup>&</sup>lt;sup>3</sup> Wastewater Assessment for North Byron Parklands, W&A p35

<sup>&</sup>lt;sup>4</sup> Ibid Table 12 p31.

<sup>&</sup>lt;sup>5</sup> Ibid p31

<sup>&</sup>lt;sup>6</sup> North Byron Parklands Drinking Water Supply, JED Civil, November 2017, p7 Table 1

<sup>&</sup>lt;sup>7</sup> Ibid p37 Table 15

<sup>&</sup>lt;sup>8</sup> Ibid p8 Table 2

- The two large event water consumption figures are different with no justification provided (whereas the first large and medium events show consistency in usage per person). It is unclear from the proposal why per-person-per-day usage would differ for different large events.
- The water consumption study<sup>9</sup> does not account for staff on-site and minor events, whereas wastewater generation does. Staff numbers are typically 10% of the patron attendance (see water balance below);
- A percentage of camper patrons tend to arrive and depart before and after the main event days;
- Staff attendance for site preparation, training and induction for minimum 1 day prior to events and cleaning up minimum 1 day after each event appear not to have been allowed for in water and wastewater generation calculations;

The available data presented pertaining to the wastewater generation for the proposal is analysed below in 4.1 and 4.2.

The site inspection confirmed that currently, the compost burial area and intermittently dosed sand filter beds (IDSFB) are not bunded. Stormwater run-off from these areas flows into the flood plain area.

The functional basis of the IDSFB is wetting and drying of the constructed sub-surface sand filter beds and allowing wetting and drying effects to recharge the sand medium. The design data presented<sup>10</sup> states that volumetric charging is limited at 4.8 kL/day such that the risk of oversaturation and surface charging is avoided. The application indicates that the existing IDSFB is proposed as a back-up for effluent receival in instances when wet weather storage for irrigation is exceeded<sup>11</sup>. This is of concern as the IDSFB is likely to be saturated during the same wet weather conditions as evaporation will be limited.

Evidence of surface erosion in the existing IDSFB area was noticed during the site visit – Figure 8.



Figure 8 Stormwater action on IDSFB sloped area

<sup>&</sup>lt;sup>9</sup> North Byron Parklands Drinking Water Supply. JED Civil. Final 2, November 2017, Table 1 p7.

<sup>&</sup>lt;sup>10</sup> Ibid p43

<sup>&</sup>lt;sup>11</sup> Ibid p45

## 4. Water balance

A review of the water demand and wastewater assessment reports presented was undertaken by GHD. A comparison of stated water demand and wastewater generation is detailed below.

### 4.1 Water demand

The projected annual water demand used by NBP in the EIS is stated as being based on water usage data from historic events and conservatively assuming full patronage of the proposed (larger) events. It is noted that the demand estimation does not account for:

- 70% of staff are on-site the day before the first event day;
- 30% of staff are on-site the day after the last event day;
- 15% of camping patrons arriving the day before the event day;
- 100% of camping patrons depart 12-16 h after midnight of the last event day.

It is also noted that staff generally work in shifts to provide a 24 h service and most staff stay overnight off-site.

Table 3 depicts the adjusted water demand allowing for staff attendance during event days, staff and patrons attendance before and after event days. The adjusted demand is based on the per person usage stated in the EIS and is 18.4% higher than demand proposed in the current EIS.

Event	Event patrons + staff <sup>12</sup>	Events x days per year <sup>1314</sup>	Design wastewater flow (L/pp/day)	Water demand (ML/year) Proposed	Water demand- adjusted (ML/year) Adjusted	Total Estimated Water Usage (kL/d) From Table 2
Large	55,750	1 x 5 days	9.5	2.34	3.04	1,505
Large	39,888	1 x 5 days	13.5	3.96	5.03	1,556
Medium	27,500	1 x 3 days	9.6	3.66	4.24	743
Small	5,500	5 x 1 days	8.4	2.08	2.32	132
Minor	1,650	2 x 1 days	3.7	0.70	0.71	51
Conference Centre & Overnight	325	347 days	52 (average)	5.23	5.67	37
TOTAL:			9,187 ML/y	15.63 ML/y	18.51	

### Table 3 Adjusted water consumption for Stage 3

No correlation could be found between the Proposal's demand and discharge volumes – see numbers in red in Table 3 as extracted from the Proposal Annexures Q and R. The adjusted

<sup>&</sup>lt;sup>12</sup> Ibid p31

<sup>&</sup>lt;sup>13</sup> Ibid p37 Table 15

<sup>&</sup>lt;sup>14</sup> Ibid p8 Table 2

water demand of 18.51 ML/year (by GHD) is based on Annexure Q corrected for staff on-site and campers and staff arriving and departing before and after event days, respectively.

Rainwater from existing and proposed roofs during median rainfall years is reportedly considered adequate to provide up to 18.1 ML/year for 50% of the years. Shortages will be supplemented from alternate sources.

### 4.2 Wastewater generation

The wastewater assessment report utilised wastewater generation data<sup>15</sup> obtained from NBP and conducted modelling and extrapolation to determine wastewater volumes for the proposal. No detail on how the actual wastewater volumes were measured and/or estimated, is presented.

The wastewater report states on p28 that: "This has been modelled in detail to assess storage and treatment requirements (Section 5.2) (Appendix C), and indicates that the total annual estimated wastewater generation for NBP for (proposed) Stage 3 is **9,187 kL**."

Comparison of this proposed annual wastewater generation volume with the adjusted annual water demand (Table 3) shows that proposed wastewater volume is significantly lower than the adjusted water demand of 18.51 ML/year and the stated annual water demand of 15.63 ML/year. Thus, only approximately 50% of water demand is accounted for in proposed wastewater flow and management. The festival precinct kitchen sullage and laundry waste proposed to be trucked off-site for treatment at the Byron and/or Ballina Council's STPs is not quantified separately, but is included in the total wastewater flow estimation presented in the Proposal Annexure R, p29.

### 4.3 Impacts of wastewater management requirements

The likely impacts of doubling the proposal's annual wastewater generation volume to meet the stated (and corrected) maximum demand for the proposed development areas, will require as a minimum the doubling of:

- Storage volume;
- Treatment capacity;
- Treatment footprint (located within "dense vegetation identified as High Conservation Vegetation");
- Flood plain irrigation area EMA2, and
- Consideration of the risk to soil and groundwater contamination.

<sup>&</sup>lt;sup>15</sup> Ibid p27 Tables 7, 8.

## 5. Review of proposed On-site Sewage Management System (OSMS)

### 5.1 Overview

A number of treatment options were considered as a precursor of the application<sup>16</sup>. The main effluent waste streams are proposed as:

A - Festival kitchen sullage and laundry waste - trucked off-site for Council STP treatment

- B Sewage composted and dried solids burial on-site and/or used as tree planting compost
- C All other liquid waste streams comprising of:
- 55,000 Person staff, camping and festival amenities compost seep blackwater;
- 30,000 Person staff, camping shower grey water;
- 180-Person conference centre blackwater and shower greywater;
- 120-Person overnight toilet pods compost seep; and grey water
- Day spa compost seep and grey water

A reticulated pumping system is proposed to collect the liquid streams into the 8 treatment storage tanks comprising of 2.2 ML polyethylene storage tanks. Controlled discharge to the 74 kL septic tanks (4 tanks) is proposed followed by 4 x 100 m<sup>2</sup> reed beds, chlorine disinfection, 35 kL storage and surface spray irrigation.

### 5.2 Detention time

The proposed estimated wastewater flow is significantly less (50%) than the proposed water demand.

Storage capacity is proposed to be at the maximum at the onset of a major event. Proposed wastewater flow (maximum 534,063 L/d + 16,935 L/d) will fill the storage tanks (2,2 ML) on day 4/5 of the largest event. Anaerobic activity would be possible if tanks were not completely emptied before such an event, and odours are certainly likely. In this instance, microbial digestion would not have improved wastewater quality by the time the tanks start overflowing on day 4/5.

The EIS p173 states that maximum 2,120 kL wastewater will be generated during the proposed largest event and 17 kL from the conference centre and associated accommodation, which is considered very low per capita wastewater generation even considering the water savings measures proposed to be implemented. The stated total annual wastewater production of 9,190 kL/year represents 49.6% of the stated annual water demand corrected to include on-site staff and arrival/departure days.

The only treatment proposed is via 4 septic tanks and 4 x 100 m<sup>2</sup> reed beds. The storage tanks will not provide any treatment during a major event apart from crude settling (detention time during a major event = 4 days).

Based on the total septic tank volume (74 kL), the calculated minimum detention time in the septic tanks is 3.2 h. This will likely occur after all storage tanks are filled on day 4 during a large event. Septic tank minimum design detention time is usually 2 h, however, in the order of 12 h detention treatment is normally required for significant BOD reduction for irrigation. Thus at

<sup>16</sup> lbid p33 41

best, partially treated wastewater is expected to be discharged from the septic tanks during a large event.

The reed bed loading would be expected to be of the order of 1 - 2,000 kg BOD/ha.day on days 5 - 7 of a major event, which is considered not acceptable and will represent significant overloading, and consequently chlorine disinfection will be ineffective.

Incompletely treated effluent will likely be discharged via the reed beds and disinfection stage to irrigation on days 5 - 7.

The proposed arrangement allows only for expected daily flow of 35 kL/day which would theoretically enable 2 days storage in the septic tank and loading of some 1-200 kg BOD/ha.d, on the reed beds which may be suitable. However, BOD monitoring results would need to be confirmed from the proponent and further justification of volumes, before the system would be regarded as acceptable.

### 5.3 Treatment efficiency

Usually the predicted treated wastewater quality is based either on known similar sites and systems as proposed. Alternatively: if wastewater analysis for the existing operations (to be scaled up as per the proposal) are known, the proposed treated wastewater quality could be estimated based on the predicted flow and treatment technology.

The Proposal summarises the expected treated effluent quality in Table 18 (p42). However, no wastewater analysis for the existing system or estimated raw wastewater loading (concentration) for the proposal are presented in the application. The predicted effluent quality presented in Table 6.28 (EIS p174) is presented as a target. It is not clear how this target will be achieved.

The proposal states (p34) that Option D1 – chlorine disinfection will be used. However p33 states that D1 is ultra-violet disinfection.

According to GHD's assessment, the predicted treated effluent volume is significantly lower than expected usage. GHD do not agree that the predicted quality can be achieved based on the current proposed treatment arrangement.

#### 5.4 Treated wastewater irrigation

GHD have not verified the calculations of the determination of the proposed EMA areas. The proposed irrigation area (Fig 6.4 EIS p176) depicts irrigation within the flood prone low-lying areas of the site. This is the areas used for camping during events – typically as shown in Figure 9. Surface saturation is evident on this photo. Inspection of the site showed that recent rainwater on the EMA area continuously collects via sub-surface drainage pipes into a drainage network and carried off-site -Figure 5. (Byron Shire Council's concern is that at least one of the large events usually occurs during December months which is one of the highest rainfall months in the area.



#### Figure 9 Surface saturation of EMA area

The potential for partially treated / contaminated wastewater being irrigated and subsequently washed into the drainage system is considered a high risk. Drainage water flows off-site entering waterways through neighbouring farmland and native bushland to sea. Potential impacts have not been assessed as part of this investigation.

Table 7.1 (EIS p209) provides statistics of similar and much larger events staged internationally. However, no detail is provided of the wastewater infrastructure and treatment quality achieved at these venues.

## 6. Risk analysis

A risk analysis is attached as Appendix A. The identified risks and mitigation options together with respective consequences and likelihood of occurrence are listed. Mitigation measures and residual risks are also listed.

The major risks identified are listed in Table 4.

### Table 4 Major risks and potential outcomes

Hazard	Potential Outcome
Footprint of OSMS	Destruction of native vegetation, erosion
Slope of OSMS & sub-surface recharge	Surface and groundwater contamination, erosion
Flood plain irrigation	Human health
	On-and off-site contamination
Treatment storage / capacity / efficiency:	Human health
Raw sewage to irrigation	On-and off-site contamination
Insect and airborne disease spreading	Human health
Wastewater overflow	Human health
	On-and off-site contamination

## 7. Conclusion

GHD's review of the information presented in the Application, discussions with Byron Shire Council and site data collected during the site visit, the following key issues relating to the Proposal are raised:

- The irrigation of treated wastewater on a flood plain area is considered a contamination risk on- and off-site.
- Water demand for the proposal does not account for staff on-site.
- Water demand for the proposal does not account for any staff and patrons arriving on the day before and leaving on the day following each major event.
- Proposed discharge volumes are stated to be based on historical data yet are only 49.6% of the stated demand for the Proposal. The discharge values adopted in the proposal are not substantiated.
- Areas designated for treated wastewater sub-surface discharge, irrigation and compost burial are not proposed to be equipped with infrastructure to control stormwater run-off in case of contamination.
- Only 49.6% of the proposed Stage 3 annual water demand is accounted for in the proposed wastewater discharge volume and on-site management systems.
- The wastewater composition for on-site treatment is not substantiated with historic site or other data.
- Proposed wastewater storage capacity of 2.2 ML will fill on day 4/5 of a large event.
- Significant reed bed overloading will occur on days 5 7 of a large event with the consequence that chlorine (or UV) treatment will be ineffective.
- The stated treated water quality for irrigation is considered not to be achievable especially on days 5-7 of a large event.
- The proposed arrangement allows only for expected year-round average daily flow of 35 kL/day treated wastewater which would theoretically enable two days storage (outside events) in the septic tank and loading of some 1-200 kg BOD/ha.d, on the reed beds which may be suitable. However, BOD monitoring results would need to be confirmed from the proponent and further justification of demand and discharge volumes, before we would be able to regard the acceptability of the system.
- The proposed disposal of treated wastewater via irrigation on a flood prone area is considered a high risk. The major risks are listed in Table 4.

Based on the review of the documentation provided and using GHD's technical experience, the number of issues and potential risks highlighted in this report leads to the conclusion that the application is problematic and is likely to impact on the human health and the environment.

## 8. Recommendations

GHD recommends the following:

- Clarification and substantiation are required for water demand and discharge values proposed.
- Confirmation to be sought from the EPA: a) irrigation allowable on the designated flood prone areas, b) treated water quality for irrigation c) wet weather storage requirements and c) discharge / irrigation control requirements.
- On-site wastewater treatment, storage and disposal requirements to be reconsidered in conjunction with potential hazards and consequences as detailed in the Risk Analysis.
- The Applicant should seek permanent agreement with Council for trucked wastewater disposal and confirm quantities per day or event as well as wastewater strength limits acceptable. The possible contributions requirement should also be clarified.

### 8.1 Information required

The following information is required for further analysis of the Proposal:

- Quantification of solid waste generation, burial area, tree planting area requirements and sustainability analysis.
- Substantiation of wastewater generation volumes proposed.
- Reconciliation of water demand and wastewater discharge volumes proposed.
- Substantiation of wastewater composition (contaminants loading).
- Substantiation of treatment efficiency to achieve targeted reduced wastewater contaminants loading.

## Appendices

GHD | Report for Department of the Environment - North Byron Parklands Development Application, 2316318

## Appendix A – Risk analysis



## HSE010 Health, Safety and Environment (HSE) Risk Assessment



											ENVIRONMENT & PEOPLE	
Guidance Documentation		11.01 HSE Manual, 11.01.01 HSE Practice Management Procedure, 11.01.02 HSE Job Management Procedure										
Purpose of Form		To facilitate a risk management approach on the HSE issues facing GHD operations and enable identification of appropriate control strategies to eliminate or mitigate HSE risk. For Jobs: The HSE Risk Assessment is used to provide subcontractors and GHD service groups undertaking different site activities with known site hazard information (as identified during previous site visits or advised by Client) prior to commencement of site work.										
Responsibility for Completion		Busines	s Service	es HSE, OC HSE, J	IMs, PDs, Staff							
Frequency of Completion		For Jobs General be perfor	: As requ Use: 1. \ med	uired by Job HSE P When a significant c	lan, when engaging subcontractors, when multiple change is proposed at the workplace, 2. When purc	service groups are hasing, operating o	e undertaki or maintain	ng differe ing equip	ent site activities or oment, 3. When legi	slation requires a risl	c assessment to	
OC:		ALAR	P Rep	porting Fram	ework Source of Risk:							
Office/ Job Name & description:	North Byron Parklands W	Vastewater Review				Version Number:			on Number:	1		
Office/ Job Location:	Wagga Wagga				Job Number:	2316318		Date:		2018.04.11		
Hazards	Event & Potential		Event & Potential Initial Risk		l Risk ting	Control Measures	Ref		Residual Risk Rating			
What could cause injury or ill health, damage to property or damage to the environment (e.g. Water way, Refuelling)	What could go wrong (e.g. fall in water / diesel spill) and what might happen as a result (e.g. person drowns / soil contamination)	Consequence	Likelihood	Risk Rating	(Consider Hierarchy of Control - Elimination, Substitution, Isolation, Engineering Controls, Administrative Controls, Personal and Environmental Protective Equipment)	(e.g. Legal/ Hazard Guides)	Consequence	Likelihood	Risk Rating	Notes		
Note: Consequence should be ass	sessed first so that the likelihood rating	g is the lik	elihood	of the selected cons	sequence occurring.							
Patron access to waste bin, waste water storage areas	Human contact with unstabilised compost	D	3	Significant	Isolation: lockable entrance in addition to signage		D	1	Moderate			
Size and slope location of OSMS	Destruction of high conservation vegetation	D	5	Extreme	Elimination: connect to Council sewage treatment OR Substitution: implement alternative compact on-site treatment technology		С	3	Moderate			
Pump failure: pump wells for black and grey water	Overflow and contamination, health and odour impacts	D	3	Significant	Engineering controls: duty/standby pump design; alarm signalling to site management		D	1	Moderate			
Flood plain irrigation camping area EMA2: drainage water contamination on-site flowing off-site	Nutrient build-up, discharged into drainage channels	D	4	Significant	Elimination: treat irrigation water to required standard for flood plain irrigation AND Engineering controls: Monitoring, remove Vetiver grass cuttings (containing		Α	2	Negligible			
Flood plain irrigation EMA2 - (camping area) causing human health issues	Pathogens in treated effluent / human contact	E	4	Extreme	Elimination: treat irrigation water to required standard for flood plain irrigation		Е	1	Moderate	IN		

Wet weather storage overflow	Environmental contamination, human health impact	D	3	Significant	Engineering controls: storage capacity		D	1	Moderate	
Wet weather charging of in- ground sand filter system, low evaporation conditions	/ Flood plain contamination	D	3	Significant	Elimination: storage capacity & treatment standards. Engineering: bunding and controlled release		D	1	Moderate	
Odours from storage / treatment vessels, tanks	Nuisance value to patrons and staff	с	3	Moderate	Engineering controls: location, vent control, installl refesheners during events		в	1	Negligible	
Nutrient build-up in reed bed, stormwater overflow	Environmental contamination, human health risk	D	4	Significant	Elimination: alternative treatment considered		Α	1	Negligible	Reed bed to be used for polishing tertiary treatment only. Biomas management required to remove trapped
Surface irrigation of camping grounds	Human health risk	D	4	Significant	Elimination: sub-surface irrigation, disinfection		в	1	Negligible	
Patron access to treatment areas	Human health risk, spillage risk	D	2	Moderate	Elimination: fencing. Controls: staff patrols during events		с	1	Low	
Manual handling of sewage bins	Human health risk	D	3	Significant	Elimination: alternative closed system OR training, protective clothing OR sliding lid design as for caravan toilet systems		D	2	Moderate	
Raw sewage to irrigation, sub surface discharge	Human and environmental risk	E	5	Extreme	Engineering: review volumetric discharge, storage detention time / treatment capacity		с	1	Low	Anaerobic digestion in storage tanks. Average 61 days detention, only 4 days for Large festival
Waste water system overflow and overload	Human and environmental risk	E	4	Extreme	Engineering: Review water demand & waste water generation statistics, assumptions, standards for accurate design inputs		с	1	Low	See water balance demand vs waste water generation anomalies. Account for patrons and staff, actual days on-site
Septic tank system maintenance	Human and environmental risk: sludge drying not allowed for in concept design	D	3	Significant	Engineering: Add design for sludge drying and control		с	1	Low	Increased footprint will have residual environmental impact
Insect and airborne disease spreading from amenities to drinking water bucket collection systems	Human health risk, large patronage concentrated area	E	3	Extreme	Eliminate: implement water flush/sealed system OR Control: spraying for flies, insect control, ventilation filters on drinking water tanks		E	1	Moderate	FEMILE FEMILE FEMILE FEMILE CASE
Erosion	Topsoil, treated waste water ingress to flood plain	D	3	Significant	Eliminate: alternative close treatment system; engineering designs		D	1	Moderate	
People involved in					-	· ·	•			

Risk Assessment:

C Joubert / M Laginestra / P Chier

## **Guidance information**

GHD HSE Consequence Descriptors



	Consequence Descriptors									
	A - Insignificant	B - Minor	C - Moderate	D - Major	E - Catastrophic					
Health and Safety	Incident requiring no first aid	Incident requiring first aid only and no medical treatment Reversible health effects of little concern, requiring first aid treatment at most Minor irritations of eyes, throat, nose and or skin, or minor unaccustomed muscular discomfort	A medical treatment or minor lost time injury E.g. Sprains and strains and minor fracture (including fingers, thumbs and toes) Reversible health effects of concern that would typically result in medical treatment	A significant lost time injury E.g. Significant fracture (other than digits), amputations, dislocations; loss of sight, electric shock or injuries requiring admittanceto hospital Severe, reversible health effects of concern that would typically result in a lost time incident	Fatality(s) or permanent disability Irreversible health effects or disabling illness					
Environment	Negligible on-site / off-site environmental impact and of low significance	On-site / off-site environmental localised impact, immediately contained	On-site / off-site environmental short term impact, immediately recoverable	On-site / off-site environmental medium term impact or repeated non-compliance with potential in some juris dictions for prosecution	Significant on-site / off-site environmental long term harm that is not recoverable. Significant fines and prosecutionat company and individual level may apply in some juris dictions					

#### GHD Likelihood Descriptors

Likelihood Descriptor	Guidance	Exposure
5 – Almost Certain	Expected to occurin most circumstances	Frequent (daily) exposure at > 10 x Occupational Exposure Limit (OEL)
4 – Likely	Will probably occurin most circumstances	Frequent (daily) exposure at > OEL
3 – Possible	Is conceivable that it may occur	Frequent (daily) exposure at > 50% of OEL. Infrequent exposure at >OEL
2 – Unlikely	It is improbable that it may occur	Frequent (daily) exposure at > 10% of OEL. Infrequent exposure at > 50% of OEL
1 – Very Unlikely	Highly doubtful but could occur in exceptional circumstances	Frequent (daily) exposure at < 10% of OEL. Infrequent exposure at > 10% of OEL

#### **GHD Risk Matrix**

Likelihood	Consequence					
	A - Insignificant	B-Minor	C-Moderate	D- Major	E- Catastrophic	
5- Almost Certain	Low	Moderate	Significant	Extreme	Extreme	
4 - Likely	Low	Low	Moderate	Significant	Extreme	
3 - Possible	Negligible	Low	Moderate	Significant	Extreme	
2 - Unlikely	Negligible	Negligible	Low	Moderate	Significant	
1 - Very Unlikely	Negligible	Negligible	Low	Moderate	Moderate	

#### **GHD Potential Hazards**



GHD Potential HSE Hazards				
Alcohol& drugs	Work at heights			
Fatigue	Noise and vibration			
Asbestos	Office spaces			
Biological hazards	Outdoor exposure			
Chemicals/radiation	Rail corridor			
Confined spaces	Remote/isolated/lone working			
Dust	Slips and trips			
Electricalhazards	Soil erosion and unstable areas			
Excavations	Hand Operated Tools			
Fixed plant	Utilities - overhead and underground			
Flora and fauna	Vehicles/ driving			
Heritage/ cultural artefacts	Waste management/contamination			
Laboratories	Water - Working Above, Overand Around			
Manual handling	Traffic - Working Around			
Working Around Mobile plant				

#### GHD ALARP Reporting Framework

ALARP Actions					
Residual Risk Category	Negligible/Low Residual Risk	gible/Low Moderate Residual Significant Residual Risk Risk		Extreme Residual Risk	
Actions	Continue task or activity within existing systems, processes and controls	Continue task or activity considering all practicable controls to reduce risk Active monitoring of the risk is required	Adopt and implement all practicable risk reduction measures to reduce risk Active management of the risk is required	Do not accept the Job / Do not commence work/Stop task or activity and notify management immediately Do not proceed until level of risk has been reduced	
Source of Risk	ALARP Management Responsibility				
Job Specific		Project Director	Project Director If risk reduction not achieved – Service Group Manager	Operating Centre Manager If risk reduction not achieved – Practice Management Group Representative	
Service Group Specific	Listed on relevant risk assessment and JSEA	Service Group Manager If risk reduction not achieved-Business Group Manager / Office Management Group.	Service Group Manager If risk reduction not achieved— Business Group Manager / Office Management Group	Operating Centre Manager If risk reduction not achieved- Practice Management Group Representative	
Operating Centre Wide		Business Group Manager If risk reduction not achieved – Operating Centre Manager	Operating Centre Manager	Operating Centre Manager If risk reduction not achieved– Practice Management Group Representative	

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