

Kylie Fitzpatrick
Department of Environment, Parks and Water Security
GPO Box 3675
DARWIN NT 0801

Dear Ms Fitzpatrick

Re: Referral under the *Environment Protection Act 2019*- Singleton Horticulture Project

The Department of Environment, Parks and Water Security (DEPWS) has assessed the information contained in the above referral and provides the following comments:

Bushfire NT

It is expected that the proponent has considered the potential significant environmental impacts. The referral determines the level of assessment required for the project (by referral information, supplementary environmental report, Environmental Impact Statement (EIS) or inquiry). Bushfire related impacts to the environment would be mostly lead by the Flora and Fauna Division of DEPWS.

As this land parcel falls within the Barkly Fire Management Zone, it is expected that the applicant is aware of their responsibility under the *Bushfires Management Act 2016* to maintain fire breaks to a minimum width of no less than 4m of bare earth or slashed to a height of no more than 50mm with the slashed material removed within the perimeter boundary of the land. Additionally, no burning may take place except where a permit to burn has been obtained from a Fire Control Officer or a Fire Warden. Please call Bushfires NT Alice Springs Office for more information (08 8951 9270).

Environment Division

All persons are required to comply at all times with the General Environmental Duty under section 12 of the *Waste Management and Pollution Control Act 1998* (NT). To help satisfy the General Environmental Duty, the proponent is advised to take notice of the list of environmental considerations below. The list is not exhaustive and the proponent is responsible for ensuring their activities do not result in non-compliance with NT laws.

A non-exhaustive list of environmental issues that should be considered to meet requirements under NT law are listed below:

1. Waste

If the proponent is constructing, installing or carrying out works in relation to the disposal of waste by burial, or will collect, transport, store, recycle or treat listed wastes on a commercial or fee for service basis as part of the development or operations of the action, then an Environment

Protection Approval or Licence may be required to authorise the activity under the *Waste Management and Pollution Control Act 1998* (NT).

2. Dust

The proposed activities have the potential to generate dust, particularly during the dry season. The proponent must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises.

3. Noise

The proponent is to ensure that the noise levels from the proposed action comply with the latest version of the Northern Territory Environment Protection Authority Northern Territory Noise Management Framework Guideline¹.

4. Water

If this action requires the discharge of waste to water or could cause water to be polluted then it is likely that a secondary authorisation is required, such as a waste discharge licence under the *Water Act* (NT). Without authorisation, the proponent must ensure that there is no discharge of contaminated water from the premises into the groundwater or any surface waters. Guidance on waste discharge licences is available on waste discharge licencing under the Northern Territory *Water Act 1992*.

5. Environmental Management Plan

To demonstrate reasonable diligence and compliance with the General Environmental Duty, the proponent should develop an environmental management plan (EMP). The EMP must be auditable and must identify the actual environmental risks and must demonstrate reasonable and practicable measures have been implemented to prevent or minimise the pollution or harm to the environment; and to reduce the amount of waste. An appropriate EMP, if fully implemented, reviewed and adapted on a routine basis may assist the proponent in meeting the obligations of the *Waste Management and Pollution Control Act 1998*. Responsibility for preventing environmental harm lies with the proponent at all times. EMPs will not be approved by the Environment Division.

6. Erosion and Sediment Control

The proponent must ensure that soil erosion control measures are employed throughout the construction stage of the development in accordance with Northern Territory Environment Protection Authority publications: *Guidelines to Prevent Pollution from Building Sites*² and *Keeping Our Stormwater Clean*³.

7. Storage

If an Environment Protection Approval or Environment Protection Licence is not required, the proponent should store liquids only in secure bunded areas in accordance with VIC EPA Publication 1698: *Liquid storage and handling guidelines*, June 2018, as amended. Where these guidelines are not relevant, the storage should be at least 110% of the total capacity of the largest vessel in the area. Where an Environment Protection Approval or Environment Protection Licence is required, the proponent must only accept, handle or store at the premises listed waste, including asbestos, as defined by the *Waste Management and Pollution Control Act 1998* (NT), in accordance with that authorisation.

¹ https://ntepa.nt.gov.au/__data/assets/pdf_file/0004/566356/noise_management_framework_guideline.pdf

² https://ntepa.nt.gov.au/__data/assets/pdf_file/0010/284680/guideline_prevent_pollution_building_sites.pdf

³ https://ntepa.nt.gov.au/__data/assets/pdf_file/0006/284676/guideline_keeping_stormwater_clean_builders_guide.pdf

Flora and Fauna Division

The Flora and Fauna Division has provided comment on related proposals during the pre-referral stage: Notice of Intent; the groundwater extraction license, the NPU application and the LCA. The groundwater model presented in this referral is based on a different pumping scenario (Scenario 45) to that used for the water licence application (Scenario 28). Additionally, the borefield configuration has been changed.

The Flora and Fauna Division has reviewed the referral documentation and comments are provided in **Attachment 1**.

The key recommendation is that further information is required to clarify how the potential impact on GDEs of pumping scenario 45 was calculated, and the apparent discrepancy with modelled impacts of scenario 28 used in the water licence application.

Parks

The subject land, NT Portion 653, is 5 km from Karlu Karlu / Devils Marbles Conservation Reserve (NT Portion 6621) and adjoins Iytwelepenty / Davenport Ranges National Park (NT Portion 4386), of which the Parks and Wildlife Commission (Commission) has care, control and management in partnership with joint management partners.

The Commission notes the actual horticultural plots are approximately 75 km from the boundary of NT Portion 4386 and 40 km from NT Portion 6621.

The potential effects on Karlu Karlu / Devils Marbles Conservation Reserve and Iytwelepenty / Davenport Ranges National Park in relation to the proposed horticultural project include the potential for the spread of weeds, increased fire impacts and introduction of feral animals onto the National Parks.

The Commission would appreciate being provided further information on the Bushfire Management Plan, and in particular, that it addresses consultation and fire management planning with neighbouring landholders.

Water Resources Division

The project proposes to develop 3300 Ha of land for agriculture use. The proposal plans to extract groundwater under groundwater extraction licence WDCP10358 (GWEL).

The proponent has indicated throughout the EIS that environmental impacts will be managed under the GWEL, broader environmental impacts may extend beyond impacts associated with water extraction. The Controller can only regulate the GWEL to monitor environmental, cultural and other social impacts as a result of groundwater extraction.

Detailed comments are provided in **Attachment 2**.

Rangelands Division

Land Assessment Unit

Land Assessment provided the following comment in April 2022 as part of the pastoral land clearing application DEPWS2022/0019.

"A site inspection was conducted over the proposed clearing areas on March 16 and 17. The proposal is divided into two sections, on both the eastern and western sides of the Taylor Creek flood-out.

The land suitability assessment provided with the application accurately describes and assesses the soil and site characteristics over the proposed clearing area.

The majority of the area is a level to gently undulating sand plain with well-drained, deep, sandy red soils (which classify as Red Arenosols and Red Kandosols in the Australian Soil Classification). These soils are suitable for the proposed use, namely irrigated horticulture.

Three isolated pockets of low broad, aeolian derived sand masses (Land Type 1) have been excluded from the clearing footprint due to wind erosion and excessive permeability constraints. These occupy a very minor proportion (34 ha or 1%) of the proposed development area.

A broad corridor approximately 8 km wide, which encompasses Taylor Creek flood-out has been excluded from the clearing proposal due to risk and uncertainty around flood frequency.

The main channel of Taylor Creek divides into several smaller distributary channels and then into a series of broad, non-incised, indistinct flood-ways approximately 15 km south of the clearing proposal. These flood-ways extend through to the proposed clearing area. While these are visible on satellite imagery, they are not distinguishable on the ground. Flood model data mentioned in the application indicates the frequency of inundation of the flood-out is in the order of one event in 2-10 years. This risk and uncertainty has influenced the proponent's decision to exclude these areas."

Land Management Unit

It should be noted that there is currently no capacity within the Land Management Unit to provide comment on this referral, however, the unit assessed and commented on the Pastoral Land Clearing application associated with this project (PL2022/0001), which will still be applicable to the referral.

Previous Land Management comment

Based on a combined desktop and field assessment (16-17 March 2022) of the Pastoral Land Clearing application associated with this project (PL2022/0001L) the Land Management Unit provide the following advice:

It would appear the proponent has implemented retained vegetation buffers from the Land Type 6 (flood out margins) of approximately 100 m to 470 m on the eastern side of the Western Production Block, and 250 m -1.4 km on the western side of the Eastern Production Block.

Proposed clearing footprint

Slope within the proposed clearing footprint is generally 0-1%. The LCG class slope of 0-1% as having a low risk of erosion. However, wind erosion is a significant risk in the area and will need to be managed appropriately.

Method, and timing of works

The proposed method, timing and staging of works described in the application are appropriate and in accordance with best practice. The applicant proposes to reduce the risk of erosion associated with the clearing and development works through measures such as clearing and ripping on contour (deeper ripping only on row lines proposed for planting), staged clearing and planting of cover crops (where possible) prior to seasonal rainfall and to reduce wind erosion risk.

The applicant proposes to implement short and long term windbreaks utilising retained native vegetation at horticultural plot boundaries, tree windbreaks within horticultural plots and further sorghum/maize windbreaks at reduced spacing within horticultural plots.

The application identifies monitoring of horticultural plots, corridors and buffer zones for water and wind erosion will be ongoing monthly and after major climatic events to determine the effectiveness of management practices.

It is recommended that the monitoring program details objectives, performance criteria, triggers for corrective actions, and corrective actions. Special consideration (and potentially additional monitoring) should be given to areas where raised beds and/or mounds are utilised.

Due to the size and proposed land uses, should the application be approved it is recommended that preparation and implementation of an Erosion and Sediment Control Plan (ESCP) be included as a condition precedent on an approval.

Pastoral Assessment Unit

The proposed development footprint lies within land that is subject to a pastoral lease, Perpetual Pastoral Lease No. 1022.

Pursuant to the *Pastoral Land Act 1992*, a clearing permit is required for clearing native vegetation on a pastoral lease, unless the clearing is permitted under section 91D of the *Pastoral Land Act 1992*.

Pursuant to section 91H(1) of the *Pastoral Land Act 1992*, before making a decision whether to grant a clearing permit, the Pastoral Land Board (the Board) must consider; public submissions, relevant guidelines issued by the Board, and any other matters the Board considers relevant. Matters the Board consider relevant, according to the Pastoral Land Clearing (PLC) Guidelines, consist of a number of environmental matters, including any environmental issues under the *Environment Protection Act 2019* and whether an application has demonstrated consideration of the NT Planning Scheme Land Clearing Guidelines.

A non-pastoral use (NPU) permit is also required on a pastoral lease to use the land for a purposes that is not a pastoral purpose.

Pursuant to section 87(2) of the *Pastoral Land Act 1992*, before granting a NPU permit, the Pastoral Land Board (the Board) must; comply with the *Native title Act 1992* (NTA), consider or take into account relevant government policy, likely effects on the environment and pastoral enterprise and public submissions, and may consider other matters as it sees fit. Matters the board considers fit, according to the NPU guidelines, include a number of environmental and cultural considerations.

Concurrent applications for a Pastoral Clearing Permit and a Non-pastoral Use permit associated with the proposed development are currently under assessment. Determination of each application is subject to the outcome of the referral to the NT Environment Protection Authority, a relevant current water extraction licence of sufficient volume and the approval of each concurrent application.

Pastoral Land Administration Unit

PPL1022 is subject to the reservations and conditions in section 130 of the *Pastoral Land Act 1992*, applicable as at 25 June 1992 to Perpetual Pastoral Lease Number 1022 entered in the Register Volume 201 Folio 100, being conditions not relating to the development of the lease.

PPL1012 is also subject to the conditions and reservations set out in Sections 38 and 39 of the *Pastoral Land Act 1992*.

There are no current compliance actions relating to PPL1012 under the *Pastoral Land Act 1992*.

All or part of NT Portion 653 is contained within the boundary of a native title application.

There are no other known lease administration issues that may affect the application.

PPL1022 is subleased to Robert Wayne Stainkey as trustee for The Clare Valley Pastoral Co Family Trust for grazing purposes.

The sublease area part of NT Portion 653 is located east of the Stuart Highway and excludes the North South Stock Route as shown hatched in Compiled Plan (CP) 5174 attached to the sublease document (LTO Dealing 878745)

The term of the sublease expired on 18 November 2022 and has a right of renewal.

There is an acquisition proposal on Singleton's search certificate. Further information can be sourced from Crown Lands Estate on 8999 6886 or email to CrownLand.Estate@nt.gov.au

Weed Management Branch

A site inspection was undertaken on March 16 for the non-pastoral use application. The basis of the inspection was to establish the presence of declared weeds within and in close proximity to the proposed areas outlined in the application. The inspection consisted of surveying for declared weeds by driving tracks and undertaking foot surveys where possible.

No declared weeds were observed in any of the areas surveyed. Further weed distribution information was sort from the NT Weeds Database. This dataset provided further weed information on, surrounding areas and adjoining land tenures. All of the weeds tabled below have been recorded outside of the proposed non-pastoral use area. The proponent should be aware of these weeds and the potential threat they pose to any proposed development.

Common name	Botanical Name	Declared
rope cacti	<i>Cylindropuntia sp.</i>	Class A
prickly pear	<i>Opuntia sp.</i>	Class A
neem	<i>Azadirachta indica</i>	Class B
rubber bush	<i>Calotropis procera</i>	Class B
parkinsonia	<i>Parkinsonia aculeata</i>	Class B
sida - spiny head	<i>Sida acuta</i>	Class B
sida - flannel weed	<i>Sida cordifolia</i>	Class B
burr - star	<i>Acanthospermum hispidum</i>	Class B
khaki burr	<i>Alternanthera pungens</i>	Class B
Mossman River grass	<i>Cenchrus echinatus</i>	Class B

The *Weeds Management Act 2001* (WM Act) enables the following weed declarations: Class A (to be eradicated); Class B (growth and spread to be controlled); and Class C (not to be introduced into the NT). All Class A and B weeds are also Class C.

All land in the Northern Territory is subject to the WM Act. The WM Act describes the legal requirements and responsibilities that apply to owners and occupiers of land regarding declared weeds. Section 9 general duties include the requirement to take all reasonable measures to prevent land being infested with a declared weed and to prevent a declared weed from spreading. There are additional duties including a prohibition on buying, selling, cultivating, moving or propagating any declared weed and the requirement to notify the Weed Management Branch of a declared weed not previously present on the land within 14 days of detection.

Under the Act it is an offence to move or spread declared weeds off or within the site.

The proposed non pastoral use activities may cause disturbance to vegetation and soils that could potentially create conditions favourable for the growth of weed species and control should be undertaken as necessary. Weed control prior to seed set should be carried out in all areas affected by the proposed project area.

The use of Poplar Tree on non-invasive rootstock as windbreaks to prevent wind erosion could potentially introduce a weedy problem. In other states throughout Australia Poplar Trees have become weeds. The proponent may need to consider the species of Poplar Tree which will be planted and the management of this species should it become problematic.

The proponent will need to ensure that all vehicles and machinery are free of weeds, weed seeds, soil and vegetative material prior to entering or exiting the site. Vehicles must avoid driving through weeds already present on-site to prevent further spread. Vehicles and machinery exhibiting such material must be thoroughly washed down before entering/departing.

The Weed Management Branch may conduct random inspections of the proposed site to ensure weeds have not been spread or introduced to the site.

Further information about management requirements is available on website⁴ or alternatively contact the Weed Management Branch for further advice on (08) 8951 9210.

In conclusion to this letter, should you have any further queries regarding these comments, please contact the Development Coordination Branch by email DevelopmentAssessment.DEPWS@nt.gov.au or phone (08) 8999 4446.

Yours sincerely



Jason Hill

A/Executive Director Rangelands

9 February 2023

⁴ www.nt.gov.au/environment/weeds

Attachment 1 – Flora and Fauna Division Comments

Fortune Agribusiness Funds Management Pty Ltd – Singleton Horticulture Project

Government authority: Flora and Fauna Division DEPWS

Section of Referral	Theme or issue	Comment
Appendix R - Groundwater Dependent Ecosystem Mapping and Borefield Design	Water/Hydrological processes. Modelled impact on % area GDEs.	The groundwater model presented in this referral (Appendix R) is based on a different pumping scenario (Scenario 45) to that previously considered for the water licence application (Scenario 28). Furthermore, the Division notes that the borefield configuration has also changed. Staff reviewing the referral noted that the 70% Groundwater Dependent Ecosystem (GDE) layer presented in the Referral (Figure 4-7) differed from the map previously provided by the Flora and Fauna Division. In particular, the map in the referral shows fewer GDEs overall. Following a request for further information, a spatial file with the GDE data file was provided to the Division on 1/2/23. Inspection confirmed that reported calculations of % GDE impact areas in the referral are consistent with expected values from the correct 70% GDE map.
		Under Scenario 45 (the current preferred scenario), the reported area of GDEs potentially impacted by groundwater extraction after 40 years is 1975ha on Singleton Station (13.7% of their modelled extent using the 70% threshold on the DEPWS mapping). By landform, an estimated 21.4% of the alluvial GDEs and 11.5% of the sandplain GDEs on Singleton Station will be impacted under the scenario. These projected impact areas appear to be lower than those under “Scenario 28” (i.e. 27% for alluvial, 17% for sandplain and 19% total). At the regional scale an estimated 2960ha of GDEs will be impacted (13% of modelled extent). By landform, 21% of the alluvial GDEs and 11% of the sandplain GDEs will be impacted regionally.
		Further clarification is required in respect of the difference in pumping scenarios. The metadata document (12580936, Metadata for GDE Impact Analysis Datasets2) states that: FAFM_SC28_Wells – includes the wells for production and accommodation area, <u>plus the existing wells in the region</u> . FAFM_SC45_Wells – only includes the wells for production and accommodation area. If other existing wells in the region are not considered in Scenario 45, it is possible that the figures provided for regional scale impacts on GDEs underestimate the regional scale % GDE impacts. This may also be inconsistent with the groundwater extraction licence.
		The Flora and Fauna Division recommends that the NT EPA requests further information clarifying the differences between the models and if the existing wells in the region were incorporated into the regional scale impacts for scenario 45. On receipt of this information, the Division will be able to comment further on the proportion of each GDE type and whether the negative impacts are within the thresholds of acceptable change as set by DEPWS.

		It is noted however, that the Division is unable to comment further on the accuracy or robustness of the provided modelled groundwater drawdown scenarios. The referral does not provide sufficient information to assess any risks from the proposed extraction to stygofauna.
Appendix G Groundwater Monitoring and adaptive management plan	Water/Hydrological processes. GDE monitoring.	A review of the current "Groundwater Monitoring and Adaptive Management Plan" found that a detailed methodology for GDE health monitoring had not been provided. The proponent has, however, committed to the development of a detailed GDE drawdown response monitoring plan in consultation with DEPWS and other expert agencies. The five identified plan requirements (baseline condition assessment, periodic on-ground condition monitoring, review of remote sensing data sets, monitoring of nearby water levels and water quality near these features, and the periodic update of the hydrogeological model) appear to be appropriate and, if implemented, should provide an effective framework for tracking GDE responses to groundwater drawdown. The monitoring frequency is proposed to be quarterly for the first 5 years and then reviewed after this period. This appears to be appropriate and should yield sufficient data to assess trends in GDE condition and implement an adaptive response (e.g. changed pumping) as required. Based on the existing modelling, after 25 years the overall impact on GDEs across Singleton Station is projected to be less than 6%. The proponent correctly identifies that sufficient data could be obtained during this period to inform adaptive management. Notably though, under Scenario 45, the modelled drawdown area that exceeds the threshold at <u>years 2 and 5</u> is far <i>greater</i> than the impact area <u>through to year 20</u> under Scenario 28. Given the much shorter time frame for approximately the same area of impact, Scenario 45 is less conservative than Scenario 28 in the initial phase of the project. This potentially limits opportunities for adaptive management and pumping adjustment if there are significant deviations in observed versus modelled GDE impacts. Immediate implementation of monitoring and reporting is therefore critical to ensure that GDE impact limits are not exceeded. The planned monitoring bore network is an immediate priority for effective monitoring and it should be implemented prior to commencement of the proposal.
Main Document and Appendix C	Land/ Terrestrial ecosystems. Native vegetation clearing.	The proposed extent of native vegetation clearing (4037 ha) is unlikely to have a significant cumulative impact on any native vegetation type, including at the bioregional, subregional and property scale. The proposed clearing of native vegetation will increase the total area of the Tanami Bioregion (25,997,270 ha) cleared by approximately 0.02%, with the total area of uncleared native vegetation remaining above 99%. The proposed clearing of intact native vegetation will increase the total proportion of the Wycliffe Subregion (1,622,003 ha) cleared by approximately 0.25%, with the total area of uncleared native vegetation remaining above 99%. Finally, the proposal will result in a total of approximately 1.4% of Singleton Station (294,100 ha) being cleared of native vegetation.

		The current arrangement of the horticulture operation and clearing area has been designed to largely avoid key biodiversity values including areas of sensitive and/or significant vegetation, with two exceptions: • Approximately 5 ha (0.05 km²) of modelled Groundwater Dependent Vegetation (GDV) will be removed during the staged vegetation clearing for the proposal. This area of impact is included in the total impact area calculation for GDEs which is below the allowable 30% threshold (noting the reservations in Appendix R above). • Approximately 6.6 ha (0.07 km²) of potential habitat of inflow dependent vegetation dominated by <i>Melaleuca lasiandra</i> (Sandhill tea tree shrubland) will be impacted by the proposal. The referral accurately states that the actual area of impact to this vegetation type is unknown but is likely to be considerably less than 6.6 ha. As a control measure, the 25 m x 25 m borepads will be micrositied at the time of construction to avoid this vegetation community where practicable. The impact on this vegetation type is therefore justifiably not considered significant.
		The Thring Swamp Site of Botanical Significance (SOBS) and the Davenport and Murchison Ranges Site of Conservation Significance (SOCS) both overlap Singleton Station; however, neither are within the proposed clearing area. The proposed clearing area is at least 7 km distance from Thring Swamp SOCS and at least 20 km distance from the Davenport and Murchison Ranges SOCS.
Appendix C	Land/ Terrestrial ecosystems. Threatened species impacts and BMP	The referral correctly identifies that two threatened species – Greater Bilby, <i>Macrotis lagotis</i> (Vulnerable, <i>Territory Parks and Wildlife Conservation Act 1976</i> and <i>Environment Protection and Biodiversity Conservation Act 1999</i>) and Grey Falcon, <i>Falco hypoleucus</i> (Vulnerable, <i>Territory Parks and Wildlife Conservation Act 1976</i> and <i>Environment Protection and Biodiversity Conservation Act 1999</i>) potentially occur within the proposal footprint. The risk to Greater Bilby is accurately assessed as low, due to an absence of recent records. The referral correctly states that negative impacts will occur to GDEs that provide potentially suitable nesting habitat for Grey Falcon, but that the overall risk to this species is low given its low density of occurrence in the region and very extensive areas of potentially suitable habitat regionally.
		The management and mitigation strategies outlined in the BMP (Appendix C) for the protection of biodiversity values potentially impacted by the proposal (GDEs; Thring Swamp SoCs and Coolibah and River red gum woodland communities; Sandhill melaleuca shrubland community; Bilby and Grey Falcon) are sufficient and appropriate. These strategies include GDE monitoring, minimisation of grazing impacts in sensitive vegetation, implementation of a weed monitoring and control program (including Buffel Grass), implementation of a fire management plan, minimisation of disturbance to sensitive vegetation during the vegetation clearing phase, implementation of a pest monitoring and control plan (includes include feral cat, European red fox in the broader Singleton Station area); pre-clearance surveys for Bilby by suitably qualified ecologists; pre-drawdown surveys for Grey Falcon by suitably qualified ecologists in alluvial GDEs that will be impacted, and threatened species monitoring as required.

Attachment 2 –Water Resources Division Comments

Fortune Agribusiness Funds Management Pty Ltd – Singleton Horticulture Project

Government authority: Department of Environment, Parks and Water Security–Water Resources Division

Section of Referral	Theme or issue	Comment
General comments	References to allocable 30% reduction in GDEs	Multiple references are made in the referral to the effect that the proponent's water extraction licence (WDCP10358) allows up to 30% of GDE's to be lost as a result of the project. The applicants licence relates specifically to impacts associated with the extraction of groundwater, under the licence. Further, the conditions of the licence relate to protection of 70% of GDEs in both the Aeolian sandplain and alluvial plain land classes. Any changes associated with the extraction of groundwater should result in equal to or less impact on GDE's as determined under the GWEL assessment.
Referral report		Very little data on surface water hydrology exists for this region as a result of infrequent flow events and little development focus. The surface water assessment provided in the Referral Report is appropriate. Similarly, hydraulic modelling is appropriate using industry standard packages and techniques. Use of SRTM data to supplement LiDAR data is problematic (as acknowledged in the report). Collection of reference height data distributed throughout model domain area may have allowed correction of SRTM data, however this does not appear to have occurred. The report does discuss these limitations and a sensitivity analysis was provided to assess impact.
Main Document Figure 3-1	Proposed area of assessment	The map in Figure 3-1 shows in red the proposed area of assessment. In comparison Figure 4-7 in Appendix R shows the full extent of aquifer drawdown with respect to guidelines for acceptable levels of change. Consideration should be given to aligning the assessment area with the impact area.
Executive summary – Aboriginal and Cultural values	Reference to water extraction licence conditions as cultural value assessments	The proponent describes an Aboriginal cultural values assessment required under the conditions of its water extraction licence (WDCP10358), and related general conditions, as measures which assure the protection of sacred sites. While assessments and management measures relevant to cultural values are required under the water extraction licence, the scope of any such assessment is limited to the impact of taking groundwater. Cultural value impact of other aspects of the project are likely to extend beyond the impact of extraction groundwater.

Section of Referral	Theme or issue	Comment
Executive Summary – Consideration of Environmental protection Principles	Reference to Water licence as control measure for adverse impact	The proponent describes staged entitlements under the water extraction licence (WDCP10358) as part of its approach to the protection of natural resources, including wording “must demonstrate no adverse impact”. The water extraction licence includes staging conditions which provide for continual review and adaptive management of impacts from the licenced water extraction. The conditions of the licence aim to ensure impact is in line with that predicted and assessed as part of the water extraction licence application, it does not prevent impact from occurring in its entirety.
2.2 Regulatory Framework – Allocation and use of water	Applicable provisions of the <i>Water Act 1992</i> not considered in full	Description of the <i>Water Act 1992</i> (including at Table 2-2 Other NT Legislation) does not reflect all relevant regulatory controls which may be applicable to the project under the <i>Water Act 1992</i>. Additional regulatory controls which should be considered by the proponent under the Water Act include: • Permit to interfere with a waterway – section 41 • Bore work permits – section 57
2.2.1 Outcomes and conditions precedent of the water extraction licence	Reference to condition precedent reporting provided as part of referral	The proponent has referred to condition precedent documents, required under the water extraction licence (WDCP10538), being supplied to support the referral. The documents referenced (monitoring and adaptive management plan) have not been approved by the Controller of Water Resources, and are not yet being implemented under WDCP10358. The monitoring and adaptive management plan are addressed in further detail in comments on Appendix G below.
3.5.9 Borefield	Change to borefield design compared with water extraction licence	The proponent has described the borefield design as scenario 45 in Appendix Y. The applicants water extraction licence was assessed and granted on considering a different borefield design known at the time as ‘scenario 28’. It is not unusual for modelled borefield designs to be refined as additional information is obtained in the planning and assessment phase of a large scale project, as is the case in the Singleton Horticulture project. In addition, water extraction under the water licence cannot commence until further technical assessments and management plans are completed under the conditions precedent of the water extraction licence. These outstanding assessments may result in further refinement of the borefield prior to commencement of extraction, as provided for by CP5(c) of the licence. A change to the licensed borefield design would trigger an amendment to the GWEL. Amending a licence would require an application with supporting information. The Controller when amending a licence must consider relevant factors under section 90(1) of the Water Act.

Section of Referral	Theme or issue	Comment
Section 5.12.1	Map not included in report	In the <i>Singleton EPA Referral Report</i> , Section 5.12.1 references the GDE model 70% probability of occurrence map (Brim Box 2019) at Figure 5.13, however, this map seems to be missing from the document. The map that has been provided at Figure 5.13 is <i>GDE sacred sites within the Singleton Water Licence Area</i> (Donaldson, 2021). The report should be updated to include the GDE probability map referenced.
7.4.2.4 Proposed mitigation and mitigation measures (cultural and heritage)	Reference to water extraction licence conditions as risk mitigation measures for cultural impacts	The proponent has referred to Conditions Precedent 7, 8, 9 and 10 of its water extraction licence (WDGP10358) as assurance that sites of cultural significance are protected. The requirements of the water extraction licence are also referred to as mitigation/management measures to address risks to sacred sites or Aboriginal cultural values related to groundwater drawdown. While assessments and management measures relevant to cultural values are required under the water extraction licence, the scope of any such assessment is limited to the impact of taking groundwater. Cultural value impact of other aspects of the project are likely to extend beyond the impact of extraction groundwater.
Appendix G – Adaptive management plan	Section 6.2.6	Missing Figure 6 – comment says “information cannot be publically displayed” but this is problematic as the monitoring network needs to be displayed spatially for an adequate assessment. However using the data in the table it appears GHD have modified their monitoring to install bores in the GDE impact zone around Wycliffe Wells and Ilyarne earlier than originally planned, i.e., year 1. The bores to the south are being installed in year 9 which is also an improvement over year 15 as originally proposed.
Appendix G – Adaptive management plan	Section 8.4 Trigger, Actions and Response	Table 14, Criteria: <i>Changes in specific hydrochemistry parameters and rates of change</i> , it is not clear how the Tier 1 (Alert) and Tier 2 (Action) for exceedance of ANZG (2018) water quality objectives operates. The proponent should provide further explanation on the operation of the tiered system. The explanation should consider which and how many analytes exceed ANZG (2018) and the frequency of exceedance.
Appendix G – Adaptive management plan	Section 9.4 Stakeholder consultation	It is understood that this document is a “live document and additional versions will be prepared” (pg. 3), however it is assumed that at this stage in the project key stakeholders have been identified and contacted already. Section 9.4 should reflect the initial stakeholder consultation that has taken place (e.g. with DEPWS as part of the GWEL application process).

Section of Referral	Theme or issue	Comment
Appendix G	Status of monitoring and adaptive management plan approvals under water extraction licence.	The monitoring and adaptive management plan provided relates to Conditions Precedent 7 and 8 of the proponents water extraction licence (WDCP10358). The plan uses an expanding network concept to establish the full network over 9 years. This is considered a suitable period. The plan provides for monitoring at GDE locations (bores 23-26) to the northeast of the development site from the beginning of the program, enabling high quality background information to be obtained prior to predicted impact occurring. To meet the requirements of the water extraction licence, the plan will need to further detail bore construction and provide detail how the solute transport (salinity) model will be updated over time. It must include detail into the roles and responsibilities of staff responsible for decision for implementing adaptive management action, include salinity management measures and the timeframes for implementing adaptive management measures. The monitoring and adaptive management plans are required to take into account field verified mapping of Aboriginal cultural values and groundwater dependent ecosystems required under CP5. The deliverables under CP5 have not yet been provided to, or approved by the Controller of Water Resources, and are therefore not addressed in the current iteration of the plan.
Appendix L – Salinity impact assessment	Reference to salinity at depth of bore screens	The salinity impact assessment states that after 30 years groundwater extracted will be 100 – 500 mg/L higher in concentration than at the start of production. While this increase must arise from some salty leached water ending up at screen depth and mixing with the fresh water coming in horizontally to the bore screens, the fate of all the salts applied as irrigation water is not considered. Without broad scale infield groundwater sample analysis, the proponent should consider a wider range of anticipated pre-development groundwater salt content (e.g. 500 > 1500 mg/L TDS). The salinity impact assessment is based upon a 2-D slice model through the borefield. To assess the regional fate of solutes that accumulate over the 30 year period it is recommended the proponent incorporate solute transport functionality into the 3-D numerical model and extend the model runtime to 150 years assuming a 50 year calibration period. Salinity data needs to be collected to calibrate and constrain the solute transport model. The 3-D numerical model with solute transport functionality should be upgraded within the first 12 months or irrigation, and annually thereafter as field data is collected. Should the rate of flow and concentration of solutes exceed the 2-D predictions presented above, then mitigation measures should be implemented as a matter of urgency. These might include, for example:

Section of Referral	Theme or issue	Comment
		• Modification of pumping regime • Installation of recovery bores and drains Installation of a salt treatment facility (e.g., RO)
Appendix L – Salinity impact assessment	Figure 15 (pg. 53)	The colour ramp scale used for Figure 15 is not representative of the actual salt content moving through the root zone. A truer representation of the impact of irrigation might show the salinity of the leached water fraction. Most of the salts will build up in the soil / unsaturated zone (above the dotted line) so the representation in Figure 17 is misleading. Without the pumping bore the plume would extend even further. After 30 years  Capturing of solutes by pumping bore Figure 17 <i>Modelled solute transport – effect of irrigation adjacent to borefield</i>
Appendix L – Salinity impact assessment	Section 2.5 - modelling	The proponent presents a 2-D slice model but have calibrated a 3-D numerical model which would be far preferable as regional impacts could be predicted. The 2D slice is misleading as it shows the theoretical placement of bores within the path of the plume. The 2-D model parameters are similar to DEPWS Mike SHE model for Lake Surprise and as such so are travel times. The main issue is that the solute transport prediction is not incorporated into the 3-D numerical model, which would allow presentation of solute movement rate and direction regionally and over the long term post-closure. Regionally we know the groundwater direction is to the NE, i.e., away from Ali Curung, NJ and Desert springs, however, solutes might make their way towards Ilyarne and Wycliffe Wells in dry years.

Section of Referral	Theme or issue	Comment
Appendix L – Salinity impact assessment	Salinity mitigation strategy	Considering above, it is likely that a large amount of salt will persist at the end of the 30-year irrigation period, consideration should be given to mitigation measures to implement prior to project commencement. For example, installation of a drainage system beneath crop areas may assist in intercepting leached water prior to percolation into deeper groundwater. As a minimum: the proponent should undertake 3-D groundwater solute transport modelling to determine the rate and direction of movement of the salt plume post-30 years. Salinity data needs to be collected to calibrate and constrain the solute transport model.
Appendix L - Salinity Impact Assessment	Consistency of impact assessment with requirements of the Water Extraction Licence WDCP10358	A salinity impact assessment is required to be undertaken by the proponent as part of Condition Precedent 6 of Water Extraction Licence WDCP10358. The salinity impact assessment presented as Appendix L has not been provided, reviewed or approved under the conditions of the water extraction licence. To date the salinity impact assessment prepared does not meet the requirements of CP6, it is anticipated that the principles and proposed further investigations would enable a compliant plan to be prepared. Significant conceptual issues (including total salt volume) have been raised above which should be considered and resolved in next iteration of the impact assessment, and in determining appropriate risk mitigation measures.
Appendix N	Stygofauna desktop assessment	The desktop assessment make the case that stygofauna are most likely to occur in shallow groundwater where there are GDEs that provide elevated carbon levels to sustain stygofauna. The report makes an assumption that stygofauna will be similar to those found in the Beetaloo Basin, however, there is no evidence to support this assumption. A survey of stygofauna in existing bores would better assess the significance of stygofauna and the impact of groundwater extraction on them.
Appendix Q – stormwater management plan	Interference with a waterway provision of the Water Act 1992 not addressed	The stormwater management plan makes reference to the <i>Water Act 1992</i> as relevant legislation. It further explains potential impact and management measures associated with flood out areas of Taylor Creek. The proponent should consider and address the relevance, if any, of provisions of the <i>Water Act 1992</i> not currently identified: - section 40 interfering with a waterway without authorisation - section 41 grant of a permit to interfere with a waterway - the definition of interference with a waterway in section 4 of the <i>Water Act 1992</i>.

Section of Referral	Theme or issue	Comment
		It is noted that the proposed works may not meet the definition of an interference with a waterway as parts of the definition require change to be material. Current draft guidance in relation to determining if an activity results in material change ⁵ .
Appendix R - GDE mapping and borefield design	Section 4.0 Borefield planning	It is understood that the borefield configuration is related to the scenario 45. Given this states "scenario 45" then it stands to reason that borefields represented in other scenarios have different configurations. It would be useful to understand the difference in impact given the GWEL was granted under scenario 28.
Appendix R - GDE mapping and borefield design	Section 4.2.4 Modelled GDE impact area	Figure 9 (Scenario 45 – Spatial extent of 70% model GDE impacted by landform over time) – The GDE impact by landform appears to be outside the radius of influence caused by pumping at the borefield. It is assumed that impact refers to the criteria presented in Section 3.4.2 and Section 3.4.3, including were drawdown less than 1 m causes the maximum depth to groundwater to exceed 10 m. It would be prudent to include the 1 m drawdown contour line to show the total extent of the pumping radius of influence.
Appendix R – GDE mapping and borefield design	Section 4.2.5 Modelled GDE impact area	GDE Mapping presented in Appendix R has used DEPWS GDE probability mapping at 70% probability. The map appears different to previous reports prepared by the proponent (as part of water licence application), and by DEPWS. The visual difference in the maps over time appears be attributed to finer graphics used in this iteration of modelling. The difference in visualisation is not anticipated to impact calculations for impact to GDEs however the proponent should verify the cause of the visual differences between the maps and explain and change in impact area. In addition broader impact assessments by the Department in the region are now using 50% probability mapping, which is also presented by the proponent (e.g. at table 4.3) and appears to be within the thresholds provided in the guideline.
Appendix R – GDE Mapping and borefield design	Inconsistencies in mapped and tabulated data.	In Appendix R <i>Groundwater Dependent Ecosystem Mapping and Borefield Design</i> , the graphical (Fig. 4.8) and tabulated (Table 4.2) representations of modelled GDE impact area at Section 4.2.4 do not align for the sandplain landform. The same inconsistency occurs for sandplain data between Figure 4.10 and Table 4.3. The proponent should clarify these data inconsistencies such that an accurate representation of modelled impact can be assessed.
Appendix S – Flood study		Flood study undertaken by GHD is likewise appropriate and undertaken using industry standard modelling package and techniques. Loss parameters are similar to those used by the Department for comparable areas as are the areal

⁵ [Interference with a Waterway Guideline \(amazonaws.com\)](https://www.amazonaws.com/)

Section of Referral	Theme or issue	Comment
		reduction factors. No data exists within the study area to allow model calibration or validation which adds considerable uncertainty to the hydrological model results.
Additional information: FAFM model pumping rates excel file S28_vs_45_pumping scenarios word doc	Pump file does not reflect licence entitlements	Additional information provided to support the referral details pumping rates for other users applied in the "scenario 45" groundwater modelling. The pump rates for other users are not consistent with existing water extraction licence entitlements in the region. Scenario 45 pump rates are also inconsistent with that assessed as part of the groundwater extraction licence "scenario 28". No detailed groundwater model report has been provided to support the referral, as such the rationale for the scenario 45 pump rates is unclear, and the impact of varying the pump rates has not been explained. Variation in pump rates from other users has potential to impact on drawdown estimates, which informs impact assessments for groundwater dependent ecosystems.