What are you doing? An assault on semi-arid lands

Arid Lands Environment Centre's submission on the Draft Western Davenport Water Allocation Plan

Sunday 14 May 2023

Acknowledgement of Country

ALEC acknowledges the Traditional Owners, the Arrernte people, on whose land this submission was written. We also pay respect to the Kaytetye, Warlpiri, Alyawarr, Anmatyerr, Warumunga and Walmanpa who are culturally connected to the region of this water allocation plan. We pay our respects to their elders past, present, and emerging. We acknowledge Australia's First Nations were self-governing in accordance with their traditional laws and customs, and they never ceded sovereignty of their lands, seas, and waters.

Who we are

The Arid Lands Environment Centre (ALEC) is Central Australia's peak community environmental organisation that has been advocating for the protection of nature and growing sustainable communities in the arid lands since 1980.

Water is fundamental to the work ALEC is engaged in. This is unsurprising as water underpins everything: it dictates where people live, where biodiversity thrives and how culture is maintained. Water is life; everything comes back to water. In Central Australia, ephemeral rivers traverse landscapes tracking million year old paths, permanent waterholes sustain life and act as critical refugia in climatically stressed environments and ancient groundwater systems store water which connects and sustains much life on the surface.

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Introduction

1. The Arid Lands Environment Centre (ALEC) is calling for the The Draft Western Davenport Water Allocation Plan (Draft Water Plan) to be withdrawn and re-written.
2. The Draft Water Plan is an assault on the environment. It seeks to allocate too much groundwater for extraction, proposing an estimated sustainable yield based upon demand for extraction not the resource's sustainable capacity
3. This will result in the widespread destruction of groundwater dependent trees, soaks, springs and wetlands across a 100km stretch, transforming the identity of the Western Davenport region.
4. This assault on the environment also does not protect cultural values across the region.
5. The Draft Plan embeds bad science where it allows the widespread destruction of 30 percent of groundwater dependent ecosystems (GDEs). It does this without justification. The plan ignores the significance groundwater dependent ecosystems provide to semi-arid environments and their role in a changing climate has been totally ignored.
6. Further, the plan misrepresents salinity issues that may face the region. The Government's own report emphasises large areas of the region are at 'high risk' of salinisation and that 'the predicted salinity increases have very significant implications for the long-term viability of irrigated horticulture'.[1]
7. There are major governance issues with the Draft Water Plan, where it has been gutted of meaningful content. Changes to the water plan structure have occurred to deliberately 'prevent future opportunity for litigation'.[2] Accordingly, the Draft Water Plan fails to comply with the National Water Initiative.
8. Prior to the development of the Draft Water Plan, it was already recognised that 'water law and governance in the NT is amongst the poorest in the country'. This Plan deteriorates water planning further, reversing hardfought protections for the environment and Aboriginal cultural values.
9. ALEC has been engaged in this region for many years and is committed to a Water Plan that does not sacrifice this ecological and cultural landscape for short-term economic gain. ALEC participated in the 2017-2018 Wester Davenport Water Advisory committee and supported the objectives of the previous plan, understanding that GDEs would be protected. There has been a fundamental slippage without our endorsement. We are not alone in this.
10. ALEC's opposition to this plan is in accordance with Traditional Owners, custodians, as well as with every member of the Ti Tree Western Davenport Water Advisory Committee (TTWDWAC) who did not endorse the Draft Plan, this includes horticultural, pastoral, land council and independent scientific expertise.
11. ALEC's submission focuses on the estimated sustainable yield, environmental impacts, the bad/misinterpretation of science, governance issues and problems around consultation and engagement. These focus areas are integrated across ALEC's 21 areas of concern.
12. ALEC's concerns are:

[1] Cooke and Keane, 2021, p.67. 'The risk of salinity due to irrigation development in the Western Davenport Basin, Northern Territory'.
[2] Ti Tree Western Davenport, Meeting #6, October 3, p.6.

Concern 1: The Estimated Sustainable Yield is too high and constitutes water mining

Concern 2 - the estimated sustainable yield in the Draft Water Plan cannot be considered a 'sustainable yield'

Concern 3 - the estimated sustainable yield should not be based on depletion of storage and should assure the continued availability of water for environmental discharges.

Concern 4 - the 30,000ML regolith resource has mysteriously disappeared from the Draft Water Plan

Concern 5 - The estimated sustainable yield has not considered groundwater recharge in a changing climate

Concern 6: The Draft Water Plan restructure has been gutted of meaningful content

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Concern 8: The document restructure is anti-democratic and 'prevents future opportunity for litigation'

Concern 9: The Draft Plan does not comply with the National Water Initiative

Concern 10: The GDE Guideline has no scientific basis

Concern 11: The process to development of the GDE Guideline was unacceptable and in conflict with commitment arising from public consultation on the previous plan, which sought to preserved GDEs

Concern 12 The risk assessment in the implementation plan is highly problematic because:

Concern 13: Terrestrial GDEs are not protected

Concern 14: Aquatic GDEs will not be protected

Concern 15: Stygofauna will not be protected

Concern 16: The role of groundwater dependent ecosystems in a changing climate has not been considered but must be

Concern 17: Salinity impacts have been misrepresented and ignored

Concern 18: Cultural values are not protected

Concern 19: The Ti Tree Western Davenport Water Advisory Committee did not endorse the plan

Concern 20: Traditional Owners and custodians do not support the plan

Concern 21: The lack of consultation and engagement with the public

13. These critiques principally apply to the Central Plains Management Zone (CPMZ) within the Draft Plan. The two other management zones, the Davenport Ranges and Southern Ranges contain small amounts of groundwater that is location dependent. It is the CPMZ which makes up 93% of the water that is allocated as part of the estimated sustainable yield (ESY) and is the region where water licences currently exist and where competition for licences will increase into the future.

Allocating too much water

Concern 1: The Estimated Sustainable Yield is too high and constitutes water mining

Table 1: The estimated sustainable yield for the Draft Western Davenport Water Plan 2023-2033 - groundwater (ML/year).

Groundwater	Davenport Ranges	Central Plains	Southern Ranges	Total
Inflows	40	42,000	1,200	**43,240**
Recharge	16,100	96,000	40,300	**152,400**
Outflows	12,000	53,390	30,000	**95,390**
Evapotranspiration	2,600	49,100	5,600	**57,300**
Storage	7,084,000	137,986,000	8,651,000	**153,721,000**
Estimated sustainable yield	**4,400**	**81,500**	**1,800**	**87,700**

14. Principle to water allocation planning is the development of an estimated sustainable yield (ESY). This is required under Section 22B(5)(a) of the *Water Act* 1992, that 'water is allocated within the estimated sustainable yield to beneficial uses'.[3] Beneficial uses of water are defined under the Act to include agriculture, aquaculture, public water supply, environment, cultural, industry, rural stock and domestic, mining activity, petroleum activity and Aboriginal Economic development.
15. The line items in Table 1 do not present a logic that suggests the estimated sustainable yield.
16. At face value the Department appears to be suggesting a water balance where storage increases annually by around 35GL/year. We dispute this as a basis for going forward as it requires disputed assumptions around continuation of the recent wet period and uncertainty associated with climate change. It also requires aquifer storage starting from historically low levels at the start of the modelled period.
17. Based on the water balance elements and assuming inflows, outflows and storage are relatively constant, the estimated sustainable yield greatly exceeds net recharge (i.e. recharge - evapotranspiration) which is around 47GL. The ESY is 173% of net recharge.
18. As discussed in Cook et al., (2022)[4] water allocation plans typically allocate a fraction of recharge to environmental needs. No precaution is taken to ensure that this level of extraction is deemed sustainable.
19. This is borne out by the department's modelling in Appendix G, which shows a massive drawdowns over an expanse of around 100km after just 50 years. (We note that in the department's own recent animation it describes that effects should be considered over 100 years)
20. 'The utilisation of non-renewable groundwater resources, whether on a planned or unplanned basis, implies the mining of storage reserves' (Karin Kemper, World Bank, in the introduction

[3] P.21.
[4] Cook, P.G. et al. (2022). Sustainable management of groundwater extraction: An Australian perspective on current challenges. *Journal of Hydrology: Regional Studies* 44, 101262 *('Cook et al')*. p.3.

to Foster et al. 2006).[5] Note that 'the reduction of aquifer reserves (with or without side-effects) is essentially permanent' (p. 14). There are numerous studies on factors that lead to groundwater mining (e.g. Noyala-Medrano et al, 2009) and what the impacts of groundwater mining are.[6] These impacts include desertification and land subsidence (see, for example, Zektser et al., 2005).[7]

21. If the Draft Water Plan goes according to plan, then the groundwater table will be affected at a landscape scale. After 50 years, over a 100km of the groundwater table will be lowered by at least 5 metres, and across a 40 km stretch a 20 metre drop in the groundwater table will occur. This cannot sustain long-term development .
22. The Department should acknowledge the approach being taken is one of staged groundwater depletion. It is deeply concerning that the estimated sustainable yield appears to be based upon reductions in storage and evapotranspiration
23. We deeply oppose this as highly inappropriate in a shallow groundwater system. GDEs' access to groundwater and the volume of discharges to groundwater dependent ecosystems via evapotranspiration must be preserved.
24. The Draft Water Plan adopts an ESY that is too large, is not supported by evidence and constitutes water mining. Water mining in a shallow groundwater region will have a catastrophic impact on the landscape. ALEC's concern that the ESY is too large is justified.
25. ALEC position: The Draft Water Plan's ESY is wrong and too high. ALEC calls on the Northern Territory Government to develop an estimated sustainable yield that meets the water requirements of dependent ecosystems.

Concern 2 - the estimated sustainable yield in the Draft Water Plan cannot be considered a 'sustainable yield'

26. Section 3.1 of the WAP outlines key definitions and considerations that inform the development of the ESY. The 81,500ML is far greater than the net recharge and is based on depleting storage or pinching from other water balance elements.
27. The Statutory WAP states that 'the estimated sustainable yield means the amount of water that can be allocated from the water resource to support declared beneficial uses that is sustainable', It then states that:

    'In determining the estimated sustainable yield, the following matters have been considered:

    - available data concerning inflows, recharge, outflows, evapotranspiration, and existing storage, in order to **reasonably estimate the water available** for consumptive use
    - furthering the purposes of the Act stated in the Long Title, relevantly the 'allocation, use, control, protection, management and administration of water resources' by **sustaining long term** development of water resources and ensuring environmental integrity

[5] Foster and Loucks, 2006, 'Non-renewable groundwater resources: A guidebook on socially-sustainable management for water policy makers', *UNESCO IHP-VI, Series on Groundwater No. 10 ('Foster et al').*
[6] Noyola-Medrano, M.C., Ramos-Leal, J.A., Domínguez-Mariani, E., Pineda-Martínez, L.F., Lopez-Loera, H. and Carbajal, N., 2009. Factors causing the mining of aquifers in arid environments: case of San Luis Potosí valley. *Revista mexicana de ciencias geológicas*, *26*(2), pp.395-410.
[7] Zektser et al, 2005. Environmental impacts of groundwater overdraft: selected case studies in the southwestern United States, *Environmental Geology*.

- the **objective of the statutory scheme to protect environmental water quality**
- the Territory's commitment to the Intergovernmental Agreement on a National Water Initiative 2014, which defines 'environmentally sustainable level of extraction' to mean '**the level of water extraction from a particular system which, if exceeded would compromise key environmental assets**, or ecosystem functions and the productive base of the resource'
- 'environment' as defined in the Act includes the physical, biological, economic, cultural and social aspects of humans, and hence that an **estimated sustainable yield that maintains environmental integrity** therefore involves consideration of these aspects.'

[emphasis added][8]

28. Regarding a 'reasonably estimate the water available'. The WAP stated that the ESY of 81,500 ML/year is informed by scientific understanding of the water resources; however, given the scarcity of monitoring bores and lithological data in this area, it would be more appropriate to say that it was informed by modelling exercises based on assumed hydrologic characteristics.
    a. Firstly, storage is typically determined based on extensive pumping tests; this data is unavailable in the Western Davenport District.
    b. Secondly, unlike Knapton (2017),[9][6] who tempered storage estimates to an economically feasible depth, the proposed WAP treats the entire "storage" estimate as an equally accessible consumptive pool, which is incorrect.
    c. Moreover, Knapton (2017) acknowledges the high level of uncertainty in the aquifer parameters assumed for the model, which does not transfer to the proposed ESY.
29. As for 'sustaining long-term development'. Water mining and the sustained lowering of the groundwater table is incompatible with this goal. After 50 years, it is clear that over a 100km of the groundwater table will be lowered by at least 5 metres, and across a 40km stretch a 20 metre drop in the groundwater table will occur. This cannot sustain long-term development. Cook et al. (2022) state that extraction equal to recharge incurs impacts on GDEs.[10] These impacts are discussed in addressing Concerns 13-15, and are not in agreement with the goal of determining 'the level of water extraction from a particular system which, if exceeded would compromise key environmental assets' and 'that an estimated sustainable yield that maintains environmental integrity'. Thus the NTG must acknowledge that with the proposed allocations, they are proposing a permanent change to the environment, and these water supplies will not be available for future use (as also stated in Foster et al. 2006 on p. 17). Foster goes on to describe management considerations and planning that is imperative if the decision for planned groundwater mining is made; this planning process is not followed in the WAP.

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[8] p.8-9.
[9] Knapton, 2017, 'Development of a Groundwater Model for the Western Davenport Plains', *WRD Technical Report 27/2017 ('Knapton').*
[10]Cook, P.G., Shanafield, M., Andersen, M.S., Bourke, S., Cartwright, I., Cleverly, J., Currell, M., Doody, T.M., Hofmann, H., Hugmann, R. and Irvine, D.J., 2022. Sustainable management of groundwater extraction: An Australian perspective on current challenges. *Journal of Hydrology: Regional Studies*, *44*, p.101262.

> ‘The planning process for socially-sustainable mining of groundwater resources, or putting the existing mining of groundwater resources on a socially-sustainable basis, must incorporate the following key elements:
>
> ● evaluation of ‘social well-being’ on a periodic basis
>
> ● effectiveness of community participation in groundwater regulation
>
> ● appraisal of the extent to which ‘inter-generational equity’ is being met.
>
> Specific criteria or parameters for these elements should be incorporated into the management model developed for the aquifer under consideration.’ (p.28)

None of these factors have been considered in the Draft Water Plan. Further, there is no scientific basis for the landscape scale ecological destruction that this water plan promotes, nor any understanding of what impact this water plan will have on ‘ecosystem function’.

30. ‘Environmental water quality’ is not defined under the Act of the Draft Water Plan. Nonetheless, the WAP disregards the salinity risks that are posed to the groundwater resource.
31. Note that groundwater mining is in no way considered ecologically sustainable, and therefore this is not an ESY. ALEC’s concern that this ESY is not a ‘sustainable yield’ is justified.

Concern 3 - the estimated sustainable yield should not be based on depletion of storage and should assure the continued availability of water for environmental discharges.

32. The Draft Water Plan is incorrect in using groundwater storage as a basis for the development of an ESY. Currel and Ndehedehe (2022) make this abundantly clear:

> ‘Aquifers should not be described in terms of their total storage when considering sustainable yields or ‘safe’ extraction rates (this topic is covered in detail in Sections 2 and 3 of this report). It is the water flows to and from an aquifer sustaining other aspects of the water cycle and dependent values (e.g., groundwater flows to streams, springs and other aquifers), that is the most important factor in assessing the sustainable yield from an aquifer (not storage volume) (Theis, 1940; Alley et al., 1999; Ponce, 2007). These flows are normally very small in comparison to the total water in an aquifer’s storage; extracting even small proportions of overall storage can have significant water cycle consequences (e.g., reduced baseflows and/or loss of groundwater dependent ecosystems). Viewing the aquifer as a single connected ‘bucket’ of stored water that can be extracted without impacting the broader water-cycle, risks serious harm to water users and the environment (Alley et al., 2002; Bierkens and Wada, 2019).’[11]

33. The Northern Territory Government confirmed its intention to deplete groundwater storage as the basis for its ESY figure. In explaining what the public needs to know about the Draft Water Plan, the Executive Director of Water Resources, told the ABC’s Country Hour that:

[11] Currell, M, Ndehedehe, C, 2022, p.12. ‘Hydrogeology and management rules to ensure protection of groundwater dependent values’.

'this plan ensures that 97% of the groundwater resource in this district remains there to support environmental flows and 3% of that water will support public water supply and economic development in the region… as we talked about 97% of the water is already allocated to the environment'.

34. The above communication was unfortunate and deeply inappropriate as a first step in seeking informed consent on the plan. It is nonsense to allocate water for the environment if it is out of reach of the ecosystems which depend upon it. *We expand on this is relation to our concerns on communication and engagement*
35. ALEC position: The ESY should not be based on storage depletion. It should be based on sustainable level of extraction that meets the water requirements of dependent ecosystems and will be available on an ongoing basis for future generations.

Concern 4 - the 30,000ML regolith resource has mysteriously disappeared from the Draft Water Plan

The previous water allocation plan previously included 30GL/year that was outside of and additional to the modelled resource. The minutes of meeting 3 noted that the "regolith" component is now part of the total aquifer storage.

It is concerning that rather than lowering the ESY when the regolith water was discounted as per the adaptive management approach outlined in the previous plan, instead the new plan has increased its predictions of recharge by using a shorter climate record, reduced the assessment period to only 50 years and allowed an even greater level of aquifer drawdown to make a case for retaining a similar ESY.

ALEC deeply opposes the level of drawdown. We are highly concerned that the WDTTWAC was only presented with a range of modelling scenarios which were too large (see extract from WDTTWAC Meeting 4 modelling scenarios.

- SC20 = allocate 87 GL/yr across the 3 management zones
- SC25 = allocate 95 GL/yr across the 3 management zones
- SC30 = allocate 114 GL/yr across the 3 management zones
- SC40 = allocate 153 GL/yr across the 3 management zones
- SC80 = allocate 305 GL/yr across the 3 management zones

All of these scenarios are substantially larger than "net recharge" we call on the department to present scenarios with smaller extraction volumes. In doing this we note

1. that the ESY should be based on the resource not use/demand
2. The 2011 Western Davenport Water Allocation Plan established an ESY of around 27,000ML/yr in what is now the Central Plains groundwater management zone.

Concern 5 - The estimated sustainable yield has not considered groundwater recharge in a changing climate

36. In a nationwide assessment of groundwater recharge, Walker et al. (2021) discuss groundwater management options commensurate with recharge rates under a drying climate.[12] The authors acknowledge that declining rainfall is signalled for much of the continent, and that 'a 10% change in average annual rainfall will be amplified as a 20–35% change in the catchment runoff (and streamflow, and inflow into storages).' They further suggest that 'A reduction in recharge may cause the current extraction limit to be unsustainable'. This is supported by others, where reductions in rainfall and run-off and increases in evapotranspiration has been modelled.[13][14][15][16][17] However, given that under the proposed WAP, a significant portion of the allocated water goes to a large irrigator, irreversible damage will be done to native vegetation that will not be able to re-establish under drier conditions.
37. The difficulties in predicting the impacts of climate change on groundwater recharge are widely acknowledged. In a global study of groundwater recharge, Reinecke et al. (2021) estimated that groundwater recharge may drop by up to 1 mm/yr in the region of the District.[18] This may not seem like much; however, in one of the only studies of recharge in the central Australia, Harrington et al. (2002) estimated total recharge to the adjacent Ti Tree Basin to be… 1 mm/yr.[19]
38. Moreover, given that the Western Davenport District falls in a "Summer Dominant" rainfall zone (Peteram et al., 2000),[20] the increase in extreme heat days described in Healy (2015)[21] will result in:
    a. Warmer soil temperatures, which will cause lower soil moisture through evaporation
    b. Higher evapotranspiration, leading to both lower soil moisture and potentially lower groundwater levels where trees can access water
    c. Potential for hydrophobic soils

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[12] Walker et al (2021), 'Groundwater impacts and management under a drying climate in Southern Australia', 13 *Water* (*'Walker et al')*.
[13] Zheng, H., F. H. S. Chiew, N. J. Potter and D. G. C. Kirono, 2019: Projections of water futures for Australia: an update. In: 23rd International Congress on Modelling and Simulation, 2019, Canberra, Australia, International Congress on Modelling and Simulation,, 1000–1006
[14] Barron, O. V. et al., 2011: Climate Change Impact on Groundwater Resources in Australia. Commonwealth Scientific and Industrial Research Organisation,, 25 [Available at: https://publications.csiro.au/rpr/download?pid=csiro:EP121194&dsid=DS1].
[15] Chiew, F. H. S. et al., 2017: Future runoff projections for Australia and science challenges in producing next generation projections. In: 22nd International Congress on Modelling and Simulation (MODSIM 2017), 2017/12, International Congress on Modelling and Simulation (MODSIM),, 1745– 1751.
[16] Short, M, 2019. 'Projected climate change effects on diffuse recharge in the NT - Summary for major groundwater resources'
[17] Department of Environment and Natural Resources, 2020. 'Climate change in the Northern Territory: State of the Science and Climate Change impacts. NTG
[18] Reinecke et al (2021), 'Uncertainty of simulated groundwater recharge at different global warming levels: a global-scale multi-modal ensemble study', 25 *Hydrology and Earth System Sciences ('Reinecke et al')*.
[19] Harrington et al (2002), 'Spatial and temporal variability of ground water recharge in Central Australia: A tracer approach', 40 *Groundwater* 5 (*'Harrington et al'*).
[20] Peterman et al (2000), 'Towards a framework for predicting impacts of land-use on recharge: 1. A Review of recharge studies in Australia', *CSIRO Land and Water Technical Report 28/00*.
[21] *Healy* (n 2).

39. We note the climate services for agriculture[22] rainfall projections under different emissions do not give any assurance of a wetter climate, and not wetter than 1991-2020, with declines within the range of possibilities (See Appendix A). It does however provide almost absolute certainty that the climate will become much hotter. We contend that the regional groundwater dependent ecosystems will be key refuges for overall ecosystem resilience in the dry and extremely hot periods we inevitably face.
40. Given the likelihood of many factors that will decrease net recharge and extreme uncertainty about the frequency of very wet years which contribute recharge, we recommend
    a. scenario modelling should have been used to assess the variability of groundwater levels under a range of climate scenarios.
    b. The figure 5 in the technical report is misleading - the NTG should not be presenting recent weather as representative of climate change, under a future with vastly increased atmospheric carbon levels.

[22] https://climateservicesforag.indraweb.io/past-and-future-climate?commodity=General

Governance issues

Concern 6: The Draft Water Plan restructure has been gutted of meaningful content

41. Water allocation plans derive power under multiple sections of the *Water Act* where WAPs influence water licensing decisions.

    Section 22B(4) of the Act states that 'resource management in a water control district is to be in accordance with the water allocation plan'.

    Section 90(1)(ab) of the Act states that 'the Water Controller must consider any water allocation plan for the relevant water control district when making a decision about a water licence'.

42. The major restructure that occurred without the input of the Ti Tree Western Davenport Water Allocation Plan has cynically occurred to sideline the influence of Section 22B(4) and Section 90(1)(ab) of the Act.
43. The Draft Water Plan proposes to split the Draft Western Davenport Water Allocation Plan into three documents:
    a. Draft Western Davenport Water Allocation Plan 2023-2033 (Statutory WAP);
    b. Draft Western Davenport Water Allocation Plan 2023-2033 Background Report (Background Report);
    c. Draft Western Davenport Water Allocation Plan 2023-2033 Implementation Actions (Implementation Actions)

44. The structural problem is that Water Act 1992 only applies to the Statutory WAP, which will be the only plan which is to be gazetted.

    Cynically, the statutory WAP has been gutted of any meaningful content that gives assurance or guidance as to how water is to be taken safely. This includes a failure to have objectives that protect ecological and cultural values, the removal of considerations of risk and uncertainty out of the statutory WAP, the removal of the implementation and monitoring plans from the statutory WAP and the removal of the adaptive management framework out of the statutory WAP.

45. The Water Controller in making water licensing decisions under Section 90(1)(ab) does not need to consider the Background Report or Implementation Actions, and these may be varied. What remains is an empty document that backflips on commonsense and hard fought protections for ecological and cultural values. ALEC's concern that the Draft Water Plan has been gutted of meaningful content is justified.

46. ALEC's position: The Draft Water Plan should scrap the three-document structure. The statutory water plan should be one document and include meaningful content and align with the National Water Initiative. This includes objectives that will protect ecological and cultural values, considerations of risk and uncertainty, the implementation and monitoring plans, adaptive management frameworks and an ESY that is genuinely sustainable.

Concern 7: The environmental objective will not protect the environment

47. The objective **'balancing the retention and preservation of key environmental values dependent on water with the overall benefits provided by the water resources'** and its associated outcomes will not protect the environment. The associated objectives are:
    a. 'There is an **improved understanding** of the groundwater and surface water resources characteristics and environmental values.
    b. The condition of groundwater dependent ecosystems **is known and monitored as far as practicable**, and appropriately accounted for in water planning and licensing.
    c. **People are confident that key environmental values are appropriately accounted for** in water planning and licensing'.

    [emphasis added]

48. This objective majorly contrasts with the previous 2018-2021 and 2021-22 draft WAP plan where its objective was to 'Meet the environmental water requirements of water dependent ecosystems'. The 2011 plan for the region had an objective to 'To maintain and protect good water quality and flows in water dependent environmental sites'[23]
49. There is no attempt for the objectives or its outcomes to do anything to conserve or protect ecological values. They are vague knowledge gathering exercises where the associated outcome is for there to be an 'improved understanding' and that 'the condition of GDEs is known and monitored as far as practicable, and bizarrely around the perception of the public that 'people are confident that key environmental values are…'. None of these words have any meaning, the Northern Territory Government has not told us what an 'improved understanding' means. They are vague and they obfuscate any responsibility for environmental protection.

    This objective and its associated outcomes treat the environment with contempt. There is no attempt to even feign an interest to actually protect the environment or GDEs, rather the focus is to conduct a non-descript research program and evaluate success on whether the 'people are confident' in the Government's messaging that there are no problems around water resources. The objective from the previous plan to 'Meet the environmental water requirements of water dependent ecosystems' must be reinstated.

50. Table 4.1 of the Implementation Actions Report highlights the close to useless nature of the objective and its subsequent implementation actions. By 2033, the Northern Territory Government wants to 'define regional scale map of key environmental values associated with water including surface water springs'. Understanding the environmental values of the region by the plans conclusion in 2033 highlights how environmental values are not a priority for the Northern Territory Government. Further, it is not known what a 'key environmental value' is. Considering the approach taken by the Northern Territory Government to not protect environmental values across the Draft Plan, it must be recognised as a method to dilute the Northern Territory Government's management responsibilities.
51. ALEC's concerns that the current environmental objective will not protect the environment is justified.

[23] p.19.

52. ALEC's position: the objective 'meet the environmental water requirements of water dependent ecosystems' is reinstated from the Western Davenport Water Allocation Plan 2018-2021 and 2021-2022.

Concern 8: The document restructure is anti-democratic and 'prevents future opportunity for litigation'

53. The gutting of the Draft Water Plan has a sinister and anti-democratic objective. The Northern Territory Government has been explicit that the new structure that guts the water plan has been developed to 'prevent future opportunity for litigation'.[24]

    This was publicly published in the Western Davenport and Ti Tree Water Advisory Committee meeting minutes on 3 October 2022. As outlined above, most of the important and key information has been taken out from the statutory WAP. This removes key safeguards which allow for water licence decisions to be legally challenged. If this plan is declared, it will be extremely difficult to challenge water licence decisions in the NT Supreme Court

    Preventing decisions made by the Government from being challenged in the courts is anti-democratic and undermines a key pillar of our Westminster system of government.

    ALEC's position: See ALEC's position for Concern 6.

Concern 9: The Draft Plan does not comply with the National Water Initiative

54. ALEC instructed the Environmental Defenders Office to brief natural resources and environment lawyer and Professor Alex Gardner to review the Draft Water Plan documents and provide an analysis of the level of compliance with the *National Water Initiative* (NWI) and best practice water resource regulation. See enclosed letter from Professor Gardner.
55. The Draft Western Davenport WAP does not comply with the NTs commitments under the NWI to which the NT is a signatory.
    a. It does not truly provide for consumptive pool share entitlements as understood from the general NWI context because it provides only for a static volume in the Estimated Sustainable Yield;
    b. It does not provide adequately for secure environmental outcomes because it relies on the incorporation of an external document being the Guideline;
    c. It does not conform with the commitments to the format or content (including monitoring) of water planning.
        i. The new format of the Draft WAP with a separate Background Report and Implementation Actions Report does not conform to the NWI guidance in Schedule E and omits important information in relation to environmental water provisions.
56. The *Water Act* does not comply with the NT Government's NWI commitments.
    a. It does not provide for consumptive pool share entitlements as understood from the general NWI context because it does not provide a statutory basis for periodic allocations of water to share entitlements according to water availability,

[24] p.6.

b. It does not provide for making a plan allocation of water to non-consumptive cultural beneficial uses and does not authorise the form in which the acceptable limits of acceptable change on GDEs is defined,
c. It does not provide for adequately for the consultation procedures, content and legal effect making a water allocation plan.
    i. The Water Act does not conform with best practice water resource management. The Water Act is the only water resources management legislation in Australia that makes no statutory provision for the procedures of making and implementing a water allocation plan.
    ii. Monitoring, reporting and amendments of water allocation plans should be included in the gazetted Water Allocation Plan to ensure it is legally binding as per s 22(4)B of the *Water Act 1992* (NT) (Water Act). It is concerning there is no reference to monitoring in the Draft WAP and in fact monitoring has only been included in the Implementation Actions section.
    iii. The process for making water allocation plans should be prescribed in the Water Act. A water allocation plan should be legally binding on the Controller making water licensing decisions and on licensees exercising rights under their water extraction licences having regard to the NWI goals of water allocation plans providing for 'secure ecological outcomes' and 'resource security outcomes.'

57. The *Water Act* and Draft WAP fall short of best practice in water resources regulation.
    a. The NT Government rejects the NWI principle that water access entitlements may be granted for environmental water provisions and traded temporarily when the water is not needed for environmental purposes, but it is arguable that this institutional reform could assist the NT in protecting GDEs in the arid conditions of the Western Davenport Water Control District.
    b. The *Water Act* employs an outdated anthropocentric definition of 'environment', which may affect the credibility of the determination of the Estimated Sustainable Yield, and
    c. They do not conform with best practice in the legislative definition for the process, content and legal effect of a water allocation plan.

Concern 10: The GDE Guideline has no scientific basis

58. Through Freedom of Information it is known that the GDE Guideline has no scientific basis. The development of the document relies on land clearing guidelines for the Daly region in the Top-End savanna and land retention threshold in southeastern Australia.[25][26][27] None of these studies have any relevance to semi arid environments and groundwater dependent ecosystems.

[25] Smith, F.P., Prober, S.M., House, A.P. and McIntyre, S., 2013. Maximizing retention of native biodiversity in Australian agricultural landscapes—The 10: 20: 40: 30 guidelines. *Agriculture, ecosystems & environment*, *166*, pp.35-45.
[26] Adams, V.M. and Pressey, R.L., 2014. Uncertainties around the implementation of a clearing-control policy in a unique catchment in Northern Australia: exploring equity issues and balancing competing objectives. *PLoS One*, *9*(5), p.e96479.
[27] McAlpine, C.A., Fensham, R.J. and Temple-Smith, D.E., 2002. Biodiversity conservation and vegetation clearing in Queensland: principles and thresholds. *The Rangeland Journal*, *24*(1), pp.36-55.

59. The role groundwater dependent ecosystems play in arid and semi arid environments is critical and cannot be limited to just another vegetation type to be cleared and destroyed.
60. More information has constantly been demanded by the Ti Tree Western Davenport Water Advisory Committee on the scientific basis that this Guideline was developed and the impacts of groundwater drawdown upon dependent species and ecosystems. The Department has not been forthcoming with this information as it is extremely likely not known.
61. Despite the lack of scientific basis for the GDE Guideline, the Northern Territory Government has acknowledged the importance of GDEs in their own biodiversity assessment on the Western Davenport area (2022), that:
    a. GDEs are considered separate from 'significant vegetation communities' and to protect biodiversity values, GDEs, wetlands and significant vegetation communities all need to be protected.[28]
    b. 'Groundwater dependent ecosystems have intrinsic ecological values and are important for maintaining biodiversity and ecosystem function more widely. Groundwater dependent ecosystems provide important refugia for fauna within, or across, the landscape, particularly during periods of prolonged drought in arid and semi-arid regions. They also play an important role in maintaining land and water quality by holding onto soil and capturing run-off, and preventing development of dryland salinity (Eamus 2009).'[29]
    c. 'In the Western Davenport study area, GDEs support distinct vegetation communities with greater productivity and complexity than non-GDEs, which is likely important for a suite of fauna.'
62. The lack of scientific basis for the GDE is astounding as the impacts it promotes are nothing short of catastrophic.
63. It is widely understood that changes to the groundwater table have a significant impact in damaging or destroying groundwater dependent vegetation:

    Conceptually it is understood that the sustained lowering of the groundwater table in low precipitation areas will destroy the ecosystem and create new ecological communities.[30]

    The groundwater level, groundwater pressure, groundwater flux and groundwater quality all impact groundwater dependent vegetation.[31] These factors interact and compound the stress and ecological health of groundwater dependent vegetation.

    The Biodiversity Report emphasises this further that 'Terrestrial GDEs are highly sensitive to changes in water table depth (Wada et al. 2010), and current knowledge of critical drawdown thresholds for most GDEs is limited. GDE sensitivity to extractive drawdown is likely to manifest as a progressive and uni-directional change in plant abundance and composition (Sommer and Froend, 2011)'.[32]

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[28] P.2.
[29] p.20.
[30] Eamus, D., Froend, R., Loomes, R., Hose, G. and Murray, B., 2006. A functional methodology for determining the groundwater regime needed to maintain the health of groundwater-dependent vegetation. *Australian Journal of Botany*, *54*(2), pp.97-114.
[31] Ibid.
[32] P.61.

Noorduijn et al, (2019) have shown through simulated models that a reduction of 0.5m over 5 years for Terrestrial GDEs, can result in a reduction of evapotranspiration of up to 29%.[33] This is in a context where maximum abstraction rate was 40% of annual recharge. It is important to note that the Draft Plan's ESY is 230% of the annual change in groundwater storage.

Froend et al, (2004) completed a water-stress study in groundwater dependent vegetation in Western Australia, which concluded that a maximum acceptable rate of groundwater level decline of 0.2m / year, with a maximum total drawdown of 1.5m.[34]

Challis et al, (2016) highlighted that greater mortality may be observed in large trees which rely on more water to maintain physiological performance.[35]

64. Eamus et al, (2006) developed 'a summary of key questions to be addressed and methods that may be applied in the process of identifying and managing groundwater dependent ecosystems'.[36] Key questions included:
    a. 'Which populations or species of an ecosystem are groundwater dependent?
    b. If some populations or species of an ecosystems are groundwater dependent, what degree of dependency is expressed?
    c. What patterns in groundwater dependency are observed?
    d. What processes aer groundwater dependent?
    e. What attributes of groundwater (level, flux, hydraulic head, quality) are important to the dependent populations/ species?
    f. What are the safe limits to changes in the attributes of groundwater that are important?
    g. What is the response function of key species or the community to changes in groundwater regime (supply/ flux/ pressure/ quality or level?
    h. What values are assigned by all stakeholders, to the groundwater dependent vegetation of the ecosystem?
    i. What are the acceptable limits of change of groundwater (flux/ pressure/ level/ quality) that does not cause unacceptable change in ecosystem composition/ structure/ function or services?
    j. What are the environmental water requirements to maintain the values of the groundwater dependent vegetation of the ecosystem?'
65. The Northern Territory Government has only attempted to answer the first question. Whilst the Government may suggest that the GDE Guideline addresses further questions, as identified above, this document has zero scientific basis and thus ALEC disregards the Government's

[33] Noorduijn, S.L., Cook, P.G., Simmons, C.T. and Richardson, S.B., 2019. Protecting groundwater levels and ecosystems with simple management approaches. *Hydrogeology Journal*, *27*(1), pp.225-237.
[34] Froend, R., Loomes, R., Horwitz, P., Bertuch, M., Storey, A. and Bamford, M., 2004. Study of ecological water requirements on the Gnangara and Jandakot mounds under Section 46 of the Environmental Protection Act. *Edith Cowan University, Joondalup, Parameter identification and monitoring program review. A report to the Water and Rivers Commission*.
[35] Challis, A., Stevens, J.C., Mcgrath, G. and Miller, B.P., 2016. Plant and environmental factors associated with drought-induced mortality in two facultative phreatophytic trees. *Plant and Soil*, *404*, pp.157-172.
[36] Eamus, D., Froend, R., Loomes, R., Hose, G. and Murray, B., 2006. A functional methodology for determining the groundwater regime needed to maintain the health of groundwater-dependent vegetation. *Australian Journal of Botany*, *54*(2), pp.97-114.

attempt to answer questions in Section 65 (b-j). No evidence has been provided to support the GDE Guideline's 30% rule of destruction.

66. ALEC's position: The GDE Guideline and its 30% rate of destruction rule is removed from the Draft Water Plan.

Concern 11: The process to development of the GDE Guideline was unacceptable and in conflict with commitment arising from public consultation on the previous plan, which sought to preserved GDEs

67. Through Freedom of Information it is known that the development of the Guideline and its 30% rule:
    a. was largely developed in 1 week in February 2020 where no draft was produced.
    b. was based on a quick google scholar search;
    c. Was deliberately not put to the WAC for consideration by the Department, despite this group developing the previous water allocation plan;
    d. Was only scrutinised by one stakeholder, which was the industry representative (Fortune Agribusiness) who would benefit from the development of the GDE Guideline;
    e. When formally finalised by the Department, it was sent to Fortune Agribusiness the day the GDE Guideline was signed off by the Department CEO. This was five months before the GDE Guideline was made publicly available on the Department's website.
68. Further, there was no public consultation or engagement about the development of the Guideline, or any attempt to communicate its potential impacts to groundwater dependent vegetation and the semi-arid zone. This is significant as the GDE Guideline goes against public expectations that groundwater dependent ecosystems are protected.
69. As Eamus et al., (2006) state, in determining what are the safe limits to change in the groundwater regime 'implicit to this, of course, is that acceptable change has been defined by stakeholders (e.g. managers, the public, scientists and landowners'.[37]
70. This top-down approach to water resource management which actively excludes the public and key stakeholders lacks transparency. No opportunity was provided for engagement and scrutiny. This approach fuels a tense water resource management environment and undermines the wider public's confidence that the Northern Territory Government is making decisions that are in the public interest. The real or perceived conflicts of interest in this process, fuel scepticism further.
71. The lack of scientific basis makes it clear that there are other influences affecting Northern Territory Government decision making, where water resources are actively mismanaged.

Concern 12 The risk assessment in the implementation plan is highly problematic because:

- **It should be in the statutory WAP to ensure the adaptive management actions happen;**
- **The risk rating formulation has been reduced from the previous plan the risk assessment**
- **Management strategies were not worked through with the WAC and were retrofitted to a pre-existing strategy.**

[37] p.105

- **The individual risk assessment assessments are misleading by downplaying many high and very high risks and overstating the effectiveness of proposed mitigations.**

72. Each of these four concerns are discussed below.
73. The risk evaluation should be in the statutory WAP to ensure that the risks and mitigations are considered and that the appropriate adaptive management strategies are implemented.
74. We are concerned that the risks have been systematically downgraded from the 2018 plan, without the endorsement of the Water Advisory Committee. We compare the respective risk matrices in the figure below

Table: Risk matric from Western Davenport Water Allocation Plan 2021-22

3. Risk rating (Matrix)

Likelihood of occurrence	Consequence (impact)				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	M	H	E	E	E
Likely	M	H	H	E	E
Possible	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H

Legend:

Extreme (E): urgent intervention / correction required

High (H): matter requiring ongoing / systematic action to manage

Moderate (M): identify responsibility and actions to address

Low (L): manage by routine policy and procedures.

Table: Draft 2023 plan

Risk level

RISK LEVEL		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Rare	very low	very low	low	moderate	moderate
	Unlikely	very low	low	low	moderate	high
	Possible	low	low	moderate	high	high
	Likely	low	moderate	moderate	high	very high
	Almost certain	moderate	moderate	high	very high	very high

Risk response

The risk level will indicate the type of response that may be required to mitigate or avoid the risk.

Risk Level	Action	Timing
Very low – low	Continue routine approach to management – no specific actions required	Ongoing
Moderate – high	Manage by specific monitoring or response procedures	Within water plan period
Very high	Develop management or investigation plan, cease activities for which high risks may arise	Immediate

75. The Water Advisory Committee was not involved in this process. The Water Advisory Committee should have been involved in this discussion, which should have happened earlier in the process to guard against subjectivity in the analysis. There is no evidence to show that this analysis was not added retrospectively after the ESY was assigned and the draft plan had been largely written.
76. We are concerned with the evaluation of many event scenarios. While we will not go through the table line by line we highlight three highly significant risks and the consequences which have been unacceptably downplayed.
    a. **Excessive impact of groundwater extraction - 3.2.1 Local loss of GDE health more than acceptable levels**
        i. Describing the pre mitigation risk of lowering the water table by more than 5 m in less than 50 years over a 100 km stretch of country with substantial unknowns as "Moderate" is beyond the pale. That the guideline leads to the risks to GDEs being "moderate" points to the GDE guideline being completely out of tune with public expectations for the protection of the arid lands. Furthermore as the drawdown area includes sites of botanical significance, including Thring Swamp and the Numagalong dunes this classification is disputed. It is not possible to "wish away" these risks on the basis of the GDE guideline, so the residual risk should be classified as "very high".
        ii. Ultimately the only way to reduce this risk to "low" is reducing the estimated sustainable yield or excluding extraction from certain locations. As neither of these possibilities are included in the mitigations; and all as adaptive management strategies are outside the statutory WAP, the residual risk cannot be described as low. It is very high and unacceptable.
    b. **Excessive impact of groundwater extraction 3.2.2 Regional loss of key cultural sites due to reduced access to water -** After mitigations the risk to is described as "low". As damage to cultural sites is by definition of major consequence then this classification of risk level is impossible using the risk system described in schedule F. Furthermore as there are no protections in the statutory plan it is impossible to claim that the risk has been managed.
    c. **Water use increases groundwater salinity levels - 3.2.1 Local loss of GDE health to more than acceptable levels** It needs to be recognised that the risk described is pollution causing serious environmental harm. This appears to be an offence under Part 11 (1) 83 of the Waste Management and Pollution Control Act 1998. We are

opposed to the deliberate contamination of aquifers and dispute the characterisation of this risk as low.

Impact on the environment and culture

Concern 13: Terrestrial GDEs are not protected

77. In allocating too much water through an ESY that is too large, and embedding the GDV Guideline into the Draft Water Plan, it ensures a catastrophic approach to the management of GDEsthat rely on groundwater below the surface. These ecosystems often also carry significant cultural values. After 50 years, over a 100km of the groundwater table will be lowered by at least 5 metres, and across a 40 km stretch a 20 metre drop in the groundwater table will occur. Across over 100km stretch groundwater dependent trees, soaks, springs and wetlands will be damaged and destroyed. This is further than the distance from Mparntwe/ Alice Springs to Stuarts Well Roadhouse
78. The Draft Plan states that 'applicable limits of acceptable change for groundwater dependent ecosystems in the district are identified in guidelines published by the department from time to time'.[38] This easily missed sentence sees the Draft plan embedding the G*uideline:Limits of acceptable change to groundwater dependent vegetation in the Western Davenport Water Control District* (GDV Guideline). The GDV Guideline which ALEC deeply opposes allows the destruction of 30% of groundwater dependent trees in the region. This also allows the GDV Guideline to be updated at any time without consultation, highlighting a deep failing in placing key guidance outside of the statutory document..
79. This rule is fundamental to enabling too much water to be allocated. It is a key pillar for the Northern Territory Government attempting to justify the 81,500ML ESY as 'sustainable'.
80. The 30% rate of destruction has no scientific basis and will result in catastrophic regional environmental outcomes. Globally, trees, soaks, springs and swamps are recognised for their value as ecological refuges, specialised habitat and areas of high cultural importance. The overwhelming effects of evaporation in arid areas means surface water is rare and short-lived. Shallow groundwater is therefore one of the most reliable sources of water. These groundwater dependent trees and soaks in arid and semi-arid zones truly are rare and unique parts of the landscape.
81. Further, we know that the Singleton development will impact very close to the 30% of GDEs that are "allowed" to be impacted; this leaves little room for other development in the District, including development by Traditional Owners.
82. The proposed WAP seems to use the methodology of GDE mapping developed in Brim Box (2022).[39]The authors acknowledge that 'The model misclassified 28% of the GDE sites as non-GDE (false negatives)' while a smaller percentage is misclassified as false positives. Thus in addition to the 30% of mapped GDEs that are sanctioned for destruction by groundwater level reductions, there is a high potential for additional GDEs to be impacted that are not officially included in maps. These false positives may also suggest GDEs occur in areas of even greater depths to groundwater or reflect underlying uncertainty in depth to groundwater mapping.
83. We call on the approach of specifying "limits to change" and the GDE Protection Area that were in the previous plan to be retained.

[38] P.13.

[39] Brim Box et al (2022), 'Mapping terrestrial groundwater-dependent ecosystems in arid Australia using Landsat-8 time-series data and singular value decomposition', 8(4) *Remote Sensing in Ecology and Conservation ('Brim Box et al').*

84. ALEC's position: see Concern 10 on the removal of the GDE Guideline from the Draft Water Plan.

Concern 14: Aquatic GDEs will not be protected

85. According to the GDE Atlas (BoM) there are aquatic GDEs throughout the Western Davenport District.

    After a thorough study of 62 surface water bodies in and near the Water Allocation Plan (**WAP**) district, Davis et al. (2020) concluded that:[40]

    > 'Our project identified perennial groundwater-supported waterbodies in central Australia. These waterbodies... are likely to act as future evolutionary refugia because they are almost entirely de-coupled from local rainfall events. They do not rely on local rainfall to persist and so these sites are likely to **contain water through the most severe of droughts**. They are critically important for the survival of water-dependent species. These include **both aquatic and terrestrial species** (mammals and birds), the latter require water for drinking, cooling, and in some cases bathing (birds).' (emphasis added)

    This conclusion supports earlier work by Healy (2015) that similarly identified the critical role of GDEs in buffering the ecosystem, both hydrologically and thermally, through droughts and climate change.[41] It also concurs with the recent evaluation of Western Davenport GDEs by Nano et al. (2021) (p.20).[42] Yet, as explained by Bourke et al. (2022), such shallow, groundwater-fed aquatic systems are also the most vulnerable to water withdrawals.[43] As evidenced by Fortune's own maps of groundwater drawdown, there will be impacts on groundwater-fed systems in the WAP district (GHD, 2022).[44] These are the same systems that were described by both Davis (2020) and Healy (2015) as of the utmost importance to protect.[45]

86. According to Nano et al. (2021), the values of GDEs in the Western Davenport District include fire resilience, ecological refuges from both drought and fire, quality habitat for ground dwellers, and shade in a drying climate:[46]

    'Compared to surrounding vegetation, sandplain potential GDV (Groundwater Dependent Vegetation) supports high tree species richness, high productivity, and it is more structurally complex. Fire seems more frequent in potential GDV, but trees are taller, meaning that their

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[40] Davis et al., 2020, 'Identifying groundwater-fed climate refugia in remote arid regions with citizen science and isotope hydrology' 66(35) *Freshwater Biology* ('*Davis et al'*).
[41] Healy, 2015, 'It's Hot and Getting Hotter: Australian Rangelands and Climate Change – Reports of the Rangelands Cluster Project' *Ninti One Limited and CSIRO* ('*Healy et al').*
[42] Nano et al., 2021, 'Ecological characteristics of potential groundwater dependent vegetation in the Western Davenport Water Control District' *Mapping the Future Project ('Nano et al')*, p. 20.
[43] Bourke et al, 15 Feb 2023, 'A Hydrological Framework for Persistent Pools along Non-Perennial Rivers' 27 *Hydrology and Earth System Sciences* ('*Brouke et al').*
[44] GHD, 2022, 'Groundwater dependent ecosystem mapping and borefield design', *NT EPA Referral – Singleton Horticulture Project: Appendix R*.
[45] *Healy et al* (n 2); *Davis et al* (n 1).
[46] *Nano et al* (n 3).

upper branches and canopy can escape fire (e.g. see Clarke et al. 2015), which may help maintain important fauna habitat resources (roosting, nesting and feeding sites) in this fire-prone landscape (see Westerhuis et al. 2019). Even though cattle use of potential GDV is high, more litter is maintained through time, which may translate to improved habitat quality for a portion of the ground fauna (especially reptiles and insects). Potential GDV therefore may represent the 'biodiversity hotspots' as well as the 'productivity hotspots' of the sandplain landscape. Increased shade from higher tree and shrub cover also creates a cooler microclimate in potential GDV, and this may facilitate wildlife persistence during drought and under a warming climate. (p.20)

87. Duguid (2009) also says 'wetlands make an important contribution to the diversity of habitats and species in the district, even though they make up a small part of the area.'[47]
88. The background document acknowledges (wetlands) "may be more prominent in shallow groundwater areas. Smaller wetlands, such as swamps and claypans that are not connected by flood ways or channels, are generally filled intermittently via local rainfall, runoff from nearby rocky ranges, or from sheet-flow across the surrounding landscape (Figure 10 - p18 of the Background report)
89. The aquatic ecosystems are clearly crucial areas in an area with relatively little surface water and their locations and interactions with shallow groundwater are not well known. These areas are heavily referenced in artworks and cultural descriptions:
    a. *'Ali Curing is soakage Country. There are no waterholes, no rivers. Only rare weather events bring water to the dry grass plains that envelop the region. For the artists, this fact of life is a theme of many of the works on show. These paintings are inseparable from sacred underground water that sustains life in the bush: they speak to contemporary events as the much as the ancestral.*[48]
90. Yet the ESY demands a lowering of the water table of large areas where these could occur (e.g. near Thring Swamp and Wycliffe Creek, west of Singleton Station, dune systems on Kalantjipa ALT, Hanson River paleochanel and in areas where the Dulcie Sandstone outcrops.) It is absolutely inappropriate to lock in.
91. It is highly risky and not in the public interest to lock in an ESY which necessitates drawing down water tables, without a prior evaluation of what aquatic ecosystems occur or how they depend on groundwater.
92. We note there are clear examples of inconsistent, inaccurate data and inadequate data. Eg different depth to groundwater maps being used within the background report - Schedules F and G use different depth to groundwater contours and those in G which were used to evaluate the effects of drawdown are clearly wrong in the vicinity of the crucial Thring Swamp Area (they do not accord with data from RN018338) and understate how shallow groundwater is in this area.
93. Aquatic GDEs exist within the Draft Water Plan region and play a significant role ecologically. ALEC's concerns that aquatic GDEs will not be protected is justified. The Northern Territory Government does not have a good understanding of how these systems will be impacted, and the statutory WAP makes it clear that environmental values (including aquatic GDEs) will not be protected.

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[47] Duguid (2009), 'Wetlands of the Western Davenports Water Control District', *Northern Territory Government Department of Natural Resources, Environment, the Arts and Sport ('Duguid)*, p. ii.
[48] https://japingkaaboriginalart.com/collections/arlpwe-artists-off-beaten-track/

Concern 15: Stygofauna will not be protected

94. ALEC instructed the Environmental Defenders Office to brief freshwater ecologist Professor Jenny Davis to review the Project's referral documentation and provide an analysis of the Project's potential impacts on groundwater dependent ecosystems (GDEs). See enclosed letter from Professor Davis.
95. Professor Davis states:The impacts of a drop in the water table from 0 to 50 metres on subterranean ecosystems and stygofauna in this region are likely to be both major and irreversible. Species extinctions may occur, accompanied by a loss of ecosystem services, including a reduction in water.
96. We are concerned that the likelihood of impacts will be highest in shallow groundwater and irrigation risks changing water quality and yet the statutory plan does nothing to protect these areas
97. ALEC's position: The Draft Water Plan protects stygofauna

Concern 16: The role of groundwater dependent ecosystems in a changing climate has not been considered but must be

98. ALEC considers that GDEs:
    a. Will play an essential role as refugia during climate change driven droughts;
    b. Contain large amounts of stored carbon in woody vegetation. Loss of these ecosystems can be expected to result in atmospheric emissions if water tables are lowered.
99. We recommend
    a. GDEs must be fully preserved as climate change refugia;
    b. The atmospheric emissions associated with lowering the water table beneath GDEs must be quantified and this risk assessed.
100. We discuss each below:
    a. Role of GDEs as refugia - Terrestrial GDEs are self-evidently more resilient to drought as these do not depend upon year to year rainfall. We consider these will play a role as refugia during climate change enhanced droughts and could play a crucial role in sustained significant flora and fauna like bilby etc during droughts. We also note that large trees etc in open woodlands are likely to be key habitat for key species such as the grey falcon and that GDEs can be expected to have disproportionately high ecosystem values. We propose climate change adaption guidelines analogous for these for arid zone aquatic ecosystems be prepared for arid zone terrestrial GDES as a priority. [49]
    b. Atmospheric emissions - Nano et al[50] p 12 notes (for example in relation to sandplain vegetation): 'Increased structural complexity was associated with Group S2 over shallow groundwater – trees were taller, canopy- and mid-layer biomass was augmented and litter cover was higher in this vegetation type. By contrast, vegetation biomass was concentrated in the ground layer where groundwater was deepest.' This is clearly suggestive of significantly higher biomass, the emissions associated with

[49] https://nla.gov.au/nla.obj-1203503882/view)
[50] https://digitalntl.nt.gov.au/10070/868536/0

losing this needs to be urgently assessed. ALEC opposes any unnecessary carbon emissions such as this.

Concern 17: Salinity impacts have been misrepresented and ignored

101. According to first principles modelling of irrigation processes by Cooke and Keane (2021), irrigation return water will cause salinities across a wide swathe of the District to become brackish to saline.[51]

102. Under the best case scenario in Cook and Keane's report, modelled salinity in the shallow aquifer was predicted to rise to 8400 – 31000 uS/cm (note that the range represents spatial differences, not uncertainty) in the aquifer, compared to the current salinities of 1700 – 2100 uS/cm after only 30 years (p.63). The report notes that 'High [salinity] risk areas generally coincide with areas of shallow water tables.' (p.61) This suggests that GDEs across the region would be worst impacted, and that the land would not be suitable for future agricultural use either.

103. Cooke and Keane also highlight (p iv) that there is a lack of knowledge of the salinity of soil water within the unsaturated zone and that this is an even greater concern. There are no estimates of this parameter within theWestern Davenport Water Control District, but studies in Ti Tree Basin and at Rocky Hill show that some areas contain very large salt stores that could be a threat to the underlying groundwater system and to the sustainability of irrigated agriculture. It identifies that further work is needed to understand the reason for the large degree of variation in soil salinity. If the soil salinity is high, the salinity increases due to irrigated agriculture could be much greater than predicted in this report.

104. Increased salinity of irrigation water not only impacts crop yield and aquifer salinity, but also changes the permeability and structure of the soil itself: 'Moreover, soil sodicity often increases with increasing irrigation-water salinity and this can lead to **decreasing soil permeability and breakdown of soil structure** (Quirk and Schofield 1955).' (Source: Foster et al., 2018) (emphasis added)[52]

105. Australia has long ranked among the top countries globally for extent of area impacted by secondary salinisation, and the impacted area has risen significantly over the past decades (Niknam and McComb, 2000).[53] It is generally accepted that the cause for the greatest proportion of this secondary salinisation is the widespread removal of native vegetation for perennial crops. This process will be repeated in the Western Davenport region; it would be irresponsible to add more than 3500 ha by way of the Singleton development,[54] which receives a sizable allocation under this plan, to Australia's burgeoning area impacted by secondary salinisation.

106. There is relatively little literature on the salt tolerance of native species for Central Australia; in general, salt tolerance in native species has only been tested for some trees, and

[51] Cook and Keane (2021), 'The Risk of Salinity due to Irrigation Developments in the Western Davenport Basin, Northern Territory', *The National Centre for Groundwater Research and Training*.
[52] Foster et al (2018), 'Impact of irrigated agriculture on groundwater-recharge salinity: a major sustainability concern in semi-arid regions', 26 *Hydrogeology Journal ('Foster et al').*
[53] Niknam and McComb (1999), 'Salt tolerance screening of selected Australian woody species – a review', 139 *Forest Ecology and Management*.
[54] The development has been referred to the NT Environment Protection Authority for environmental impact assessment.

generally with regards to restoration of lands that have both secondary salinisation and waterlogging. Nano et al. (2021) review what is known of GDE vegetation in the Western Davenport District. They note 'Across the region, soil chemistry (pH) and texture gradients broadly correlate with vegetation types, however there remain knowledge gaps in relation to shifts in tree species dominance within land units (Burgess et al. 2016).' [55] Given the presence of these existing shifts, it is unlikely that the native GDE vegetation could survive a shift from marginal to brackish or brackish to saline groundwater.

107. ALEC's position: Extraction of over 80 GL/year inevitably will bring huge amounts of salt to the surface. These risks are poorly understood and the statutory WAP offers no commentary or guidelines, whatsoever that the Controller could take into consideration in assessing groundwater extraction licence applications. Salt contamination is a major risk to water resources for environment, public water supplies and long-term agricultural use. These risks are too large, poorly evaluated and with no management arrangements in place. These risks warrant a significantly lower ESY and management guidance within the statutory WAP.

[55] *Nano et al* (n 3).

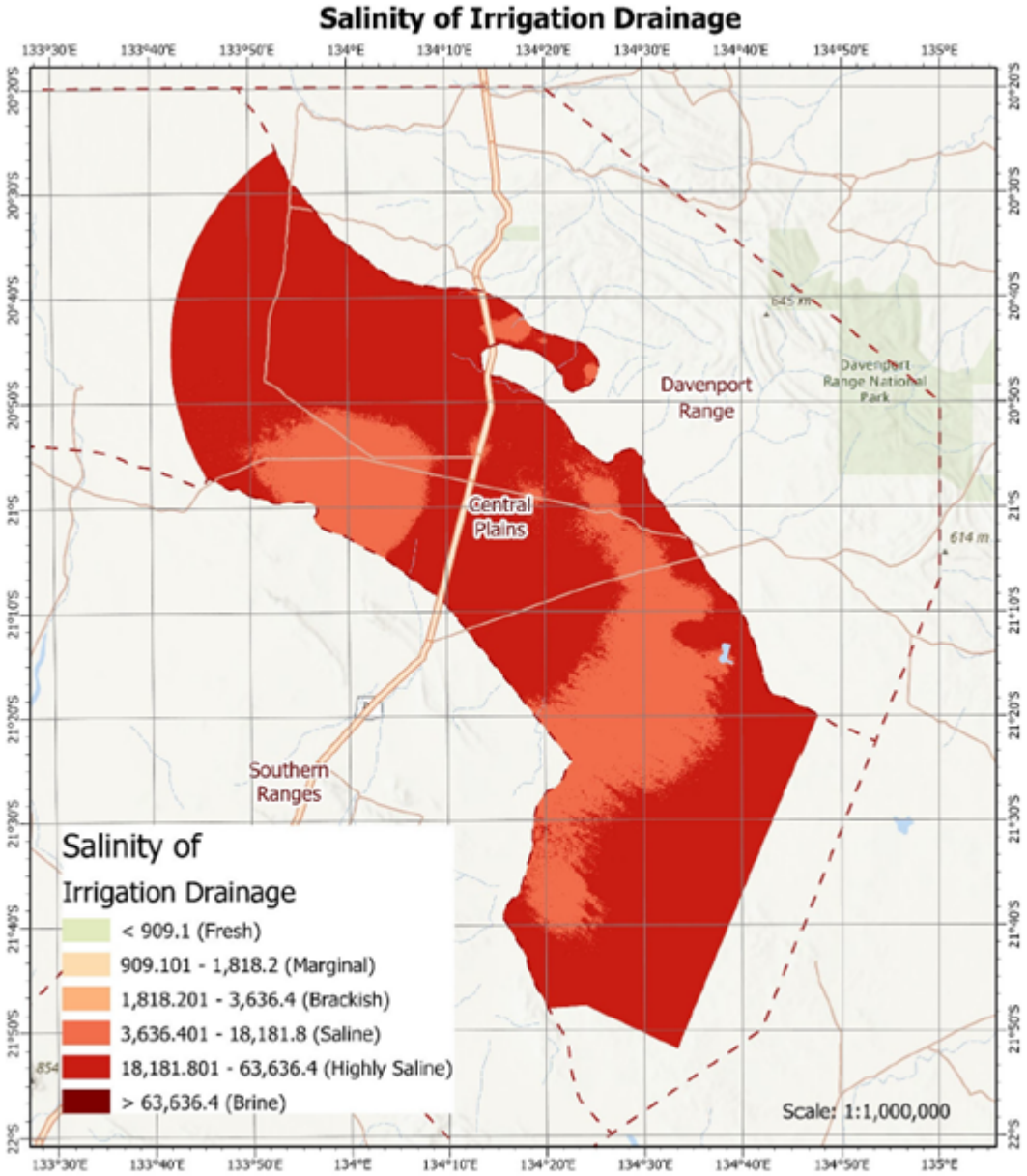


Figure 26. Modelled salinity (expressed as electrical conductivity, µS/cm) of the saline layer at the top of the aquifer (Scenario 1, No Recycling), assuming $c_0 = c_G$. It is estimated using Equation 12.

Concern 18: Cultural values are not protected

ALEC is recognises that cultural values and sacred sites are highly concentrated in areas accessing groundwater. For numerous examples refer Donaldson 2022[56]. We are concerned these have been placed under severe and unacceptable danger. The protection of these is paramount. It is unacceptable that the estimated sustainable yield threatens these and that Traditional Owners have had to endure this assault. We urge you to meet the requirements of the submissions of First Nations people and representative organisations in full.

[56] https://www.clc.org.au/files/20210901-Susan-Dale-Donaldson-lues-Assessment-public-report.pdf

Consultation and engagement

Concern 19: The Ti Tree Western Davenport Water Advisory Committee did not endorse the plan

108. This plan was not endorsed by the Western Davenport and Ti Tree Water Advisory Committee (WAC). The WAC has been explicit in their opposition to the plan in all its published minutes. The WAC has diverse membership representing Aboriginal, horticultural, environmental, remote community water supply, independent scientists and community interests and included, NT Farmers representative, the Central Land Council and ALEC. This may be the first WAC in NT history to explicitly not endorse a water plan.
109. Shockingly, the DEPWS consultation on this plan fails to mention that the entire WAC did not endorse the plan. This is despite the October minutes and leaked documents outlining the WACs opposition.
110. Furthermore as outlined in relation to concern 3 the department has failed to make clear that reducing aquifer storage by 3% involves exceeding GDE limits to change over a vast area
111. We are deeply concerned that the consultation is not meeting IAP2 code of ethics[57] by appearing to 'advocate for an interest, party or project outcome' and not failing the standard of "openness" which requires that all information relevant to the public's understanding and evaluation of a decision is disclosed.
112. We note that take all reasonable steps to ensure that information and knowledge relied upon to make decisions or take actions is evidence based, transparent, correct and current, also breaches 5.1.7 of the Code of Conduct for the Northern Territory Public Sector[58]

Concern 20: Traditional Owners and custodians do not support the plan

113. ALEC understands that Traditional Owners, custodians and representative institutions do not support the Draft Water Plan. ALEC urges the Northern Territory Government to meet the requirements of the submissions of First Nations people and representative organisations in full.

[57] https://iap2.org.au/about-us/about-iap2-australasia/code-of-ethics/
[58]https://ocpe.nt.gov.au/__data/assets/pdf_file/0006/379329/code-of-conduct-for-the-northern-territory-public-sector.pdf

Concern 21: The lack of consultation and engagement with the public

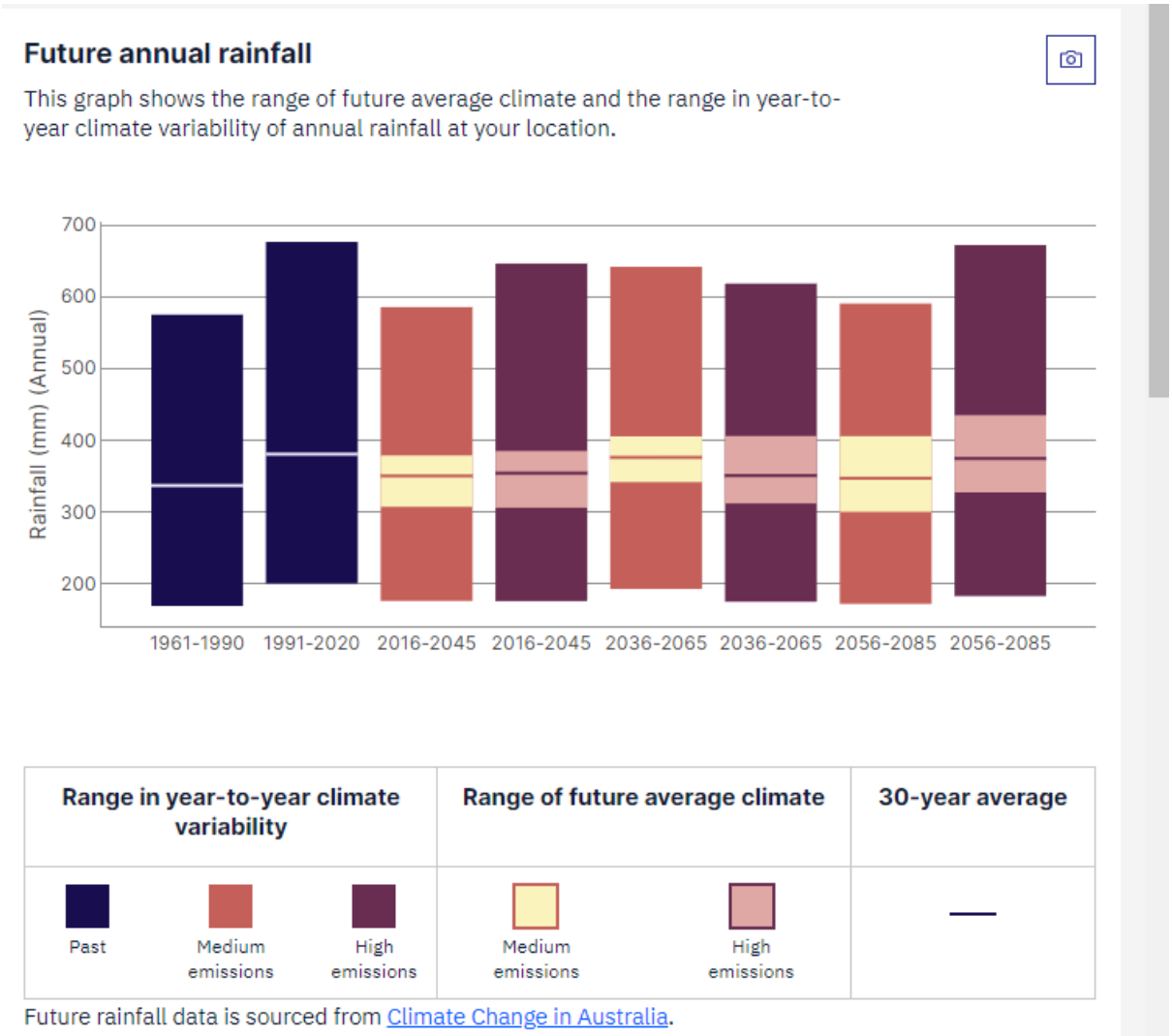
114. The Northern Territory Government did not attempt to consult or engage with public about the Draft Water Plan beyond through the Have Your Say portal. Further, ALEC is disappointed with the Have Your Say Survey which asks largely irrelevant questions that obfuscate from the catastrophic nature of the Draft Water Plan documents.

Kind Regards,

Alex Vaughan
Policy Officer

Adrian Tomlinson
Chief Executive Officer

Appendix A - Data from climate services for Agriculture medium emissions scenario (Ali Curung)[59]



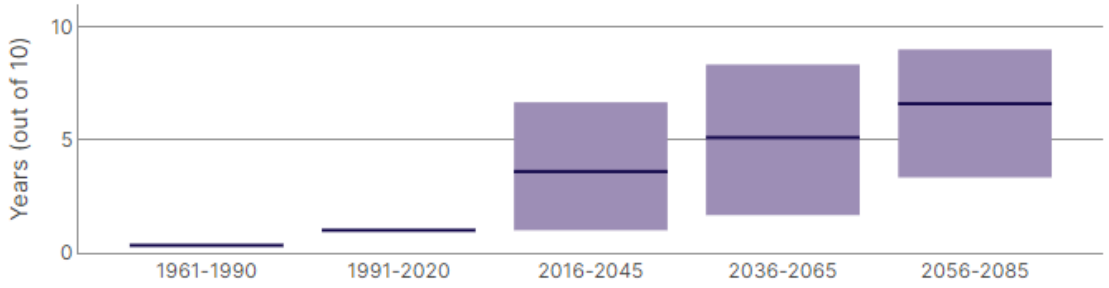
[59] https://climateservicesforag.indraweb.io/past-and-future-climate?commodity=General

Year Range	Number of years with annual rainfall below 200 (mm)	Number of years with annual rainfall above 676 (mm)
1961-1990	2.3 in 10 years	0.7 in 10 years
1991-2020	1 in 10 years	1 in 10 years
2016-2045	2 in 10 years	0.8 in 10 years
2036-2065	1.3 in 10 years	1 in 10 years
2056-2085	1.9 in 10 years	0.7 in 10 years

Upper extreme threshold (days Tmax ≥ 35°C)

177 − +

Reset default threshold



Year Range	Number of years with annual heat risk below 111 (days Tmax ≥ 35°C)	Number of years with annual heat risk above 177 (days Tmax ≥ 35°C)
1961-1990	1.3 in 10 years	0.3 in 10 years
1991-2020	1 in 10 years	1 in 10 years
2016-2045	0.4 in 10 years	3.6 in 10 years
2036-2065	0.2 in 10 years	5.1 in 10 years
2056-2085	0.1 in 10 years	6.6 in 10 years