Guideline:

Limits of acceptable change to groundwater dependent vegetation in the Western Davenport Water Control District

NORTHERN TERRITORY GOVERNMENT

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Acronym or term used	Full form
DBH	diameter at breast height
DENR or department	NT Department of Environment and Natural Resources
DGW	depth to groundwater
GDE	groundwater dependent ecosystem
GDV	groundwater dependent vegetation
NT	Northern Territory

Contents

1 Purpose

To provide guidance to applicants for water extraction licences in the Western Davenport Water Control District.

This Guideline takes effect from 13 February 2020.

2 Scope

This Guideline is intended to be read subject to the Western Davenport Water Allocation Plan 2018-2021.

3 Background

3.1 Water allocation plan

The Western Davenport Water Allocation Plan 2018-2021 (NT Government 2018) created a groundwater dependent ecosystem (GDE) protection area (Figure 1), where depth to groundwater is expected to be less than 20 m. The boundary was based on the information provided in a report (Cook and Eamus 2018) regarding the depth at which different plant species access groundwater in the arid zone.

The Western Davenport Water Allocation Plan (the Plan) has an objective that detrimental impacts on water dependent ecosystems as a consequence of consumptive use will be avoided as far as possible. More specifically, the Plan set limits for change in groundwater conditions within the GDE protection area as follows (refer section 8.2.1)

- Modelled extraction does not cause the maximum depth to water table to exceed 15 m below ground level
- Modelled extraction does not result in the maximum depth to water table declining by more than 50% below the levels that would be expected under a natural baseline scenario (no pumping scenario)
- Modelled extraction does not result in a rate of groundwater drawdown that exceeds 0.2 m/year.

Additionally, the Plan seeks to protect Aboriginal cultural values associated with water, including those related to GDEs.

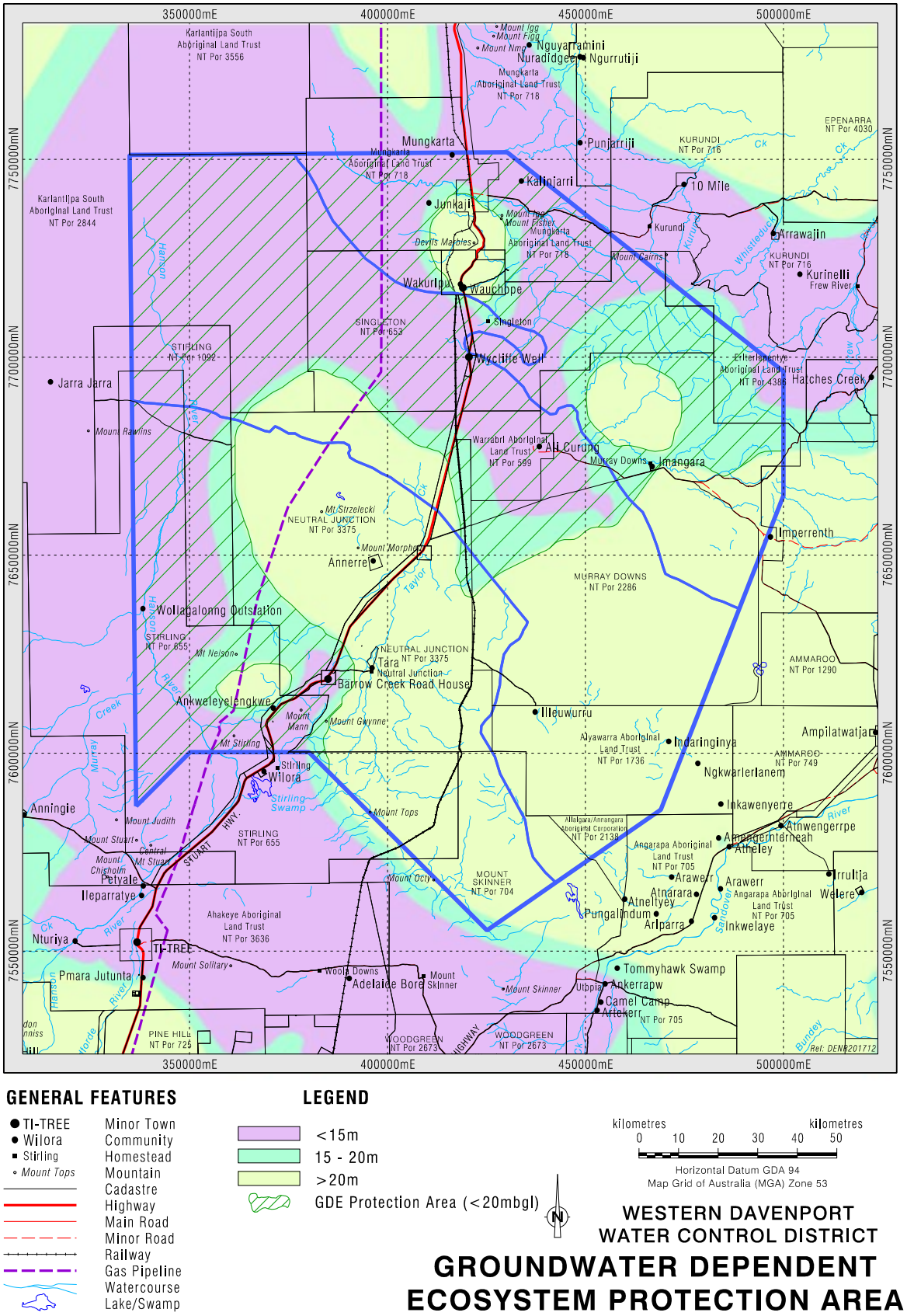

Figure 1. Groundwater Dependent Ecosystem Protection Area
from NT Government (2018)

3.2 Recent studies

Since the water allocation plan was declared in 2018, additional research in the Plan area has increase our understanding of aspects of GDEs, notably:

- the probability of groundwater dependent vegetation (GDV) occurring has been modelled across an extensive area of Central Plains, based on time-series of relevant "greenness" and "wetness" indices derived from Landsat 8 satellite imagery (Figure 2). This provides a basis for finer-scale mapping and field verification of GDEs at a property scale.
- The floristic composition of potential groundwater dependent vegetation has been investigated through on-ground sampling at sites stratified along a depth to groundwater (DGW) gradient and across two dominant landscapes. This indicated a distinct vegetation community composition associated with <10 m DGW in both aeolian sandplain and alluvial landscapes, with many of the distinctive species also being those with documented cultural significance for Alyawarr and Warlpiri peoples. This provides a basis for reliable recognition of GDEs during field survey and supports the significance of a 10 m DGW threshold in relation to the management of GDEs.
- Measurement of dominant overstorey trees along the same DGW gradient provides additional support for the importance of shallow groundwater for ecosystem productivity and complexity, with large and tall trees concentrated in areas of <10 m DGW. Within the 10-15 m DGW zone, large bloodwood and ghost gum (*Corymbia* spp) are likely to be accessing groundwater and are considered groundwater dependent vegetation. At groundwater depths greater than 15m, large trees may still occur but these are believed to not be accessing the deeper regional aquifer.

In combination, these studies indicate that the occurrence of vegetation demonstrating a "GDV-like response" can be modelled and mapped at a regional scale. There are readily identifiable groundwater dependent ecosystems occurring where DGW is less than 10 m, and these have high ecological and cultural values. In the 10-15 m DGW zone, groves of large trees are accessing groundwater and are also likely to have a significant ecological role and may have cultural values.

The additional recent information relating to GDEs in the Central Plains area has allowed DENR to update guidance in relation to the management of the potential impacts of extraction on these values in more detail, as outlined below. In doing this, it is also recognised that the purpose of the Plan is to provide for consumptive use of groundwater and that some impact on GDEs is unavoidable, but must remain within carefully managed levels.

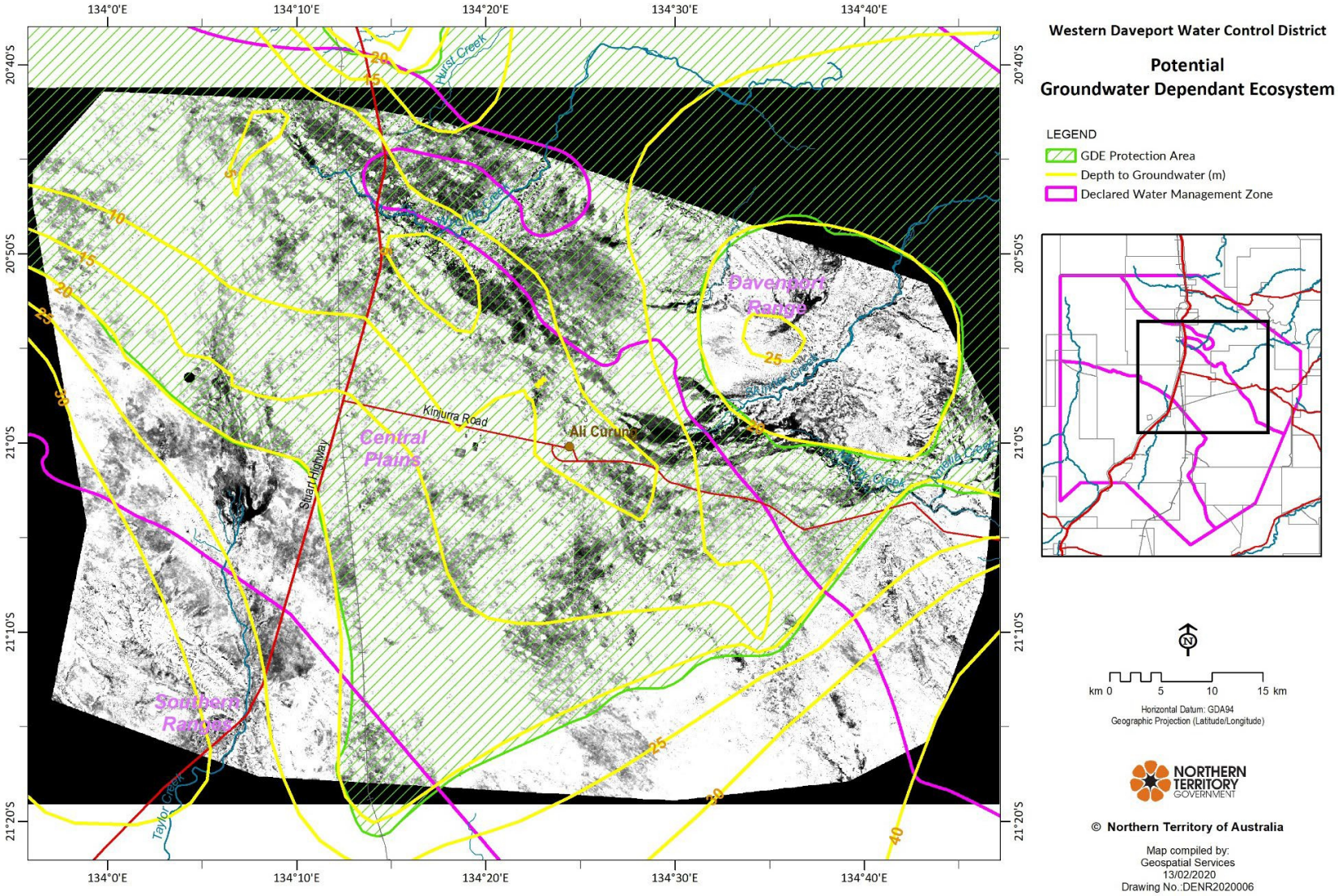

Figure 2. Modelled distribution of potential GDVs (darker pixels) in the Western Davenport region

4 Guidance

In order to inform development planning and water allocation and licensing decisions, it is necessary to set an overall threshold of acceptable change for GDEs in the Plan area. Impacts on GDEs should be limited to a level where medium- to long-term effects on regional biodiversity and ecosystem function are minimised. There is limited scientific evidence to confidently set this threshold for Australian arid-zone GDEs specifically. However, through reference to research in a broad range of environmental and developmental contexts nationally, and noting the relatively intact nature of the region and the Plan objectives, DENR has determined that **70% of the current extent of GDEs in the Western Davenport Water Control District should be protected from negative impact.** Negative impact is defined further below.

Within the context of this overall threshold, additional principles can be applied to enhance the protection of ecological values associated with GDEs, by seeking to minimise impact to GDEs that:

- are large in individual extent
- are in good condition (relative to the impacts of pressures such as grazing, fire, weeds)
- provide habitat for threatened or rare species
- have relatively high species richness
- have relatively complex vegetation structure
- represent the range of environmental variation in these ecosystems found in the region
- are important in maintaining connectivity between habitat patches across the landscape.

It is recognised that the ability to apply these principles may be limited by available data, and in some cases by practical constraints on the configuration of proposed developments. All GDEs which are known to support significant populations of threatened species should be included within areas protected from negative impact.

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In order that the principle of incorporating environmental variability is adequately applied, and in the absence of more comprehensive spatial data, **the 70% threshold applies**:

- within each of the two major landform classes (aeolian sandplain and alluvial plain)
- within each property occurring in the Water Control District.

Application of this threshold should result in protection of a high proportion of groundwater dependent ecosystems having high densities of plants of Aboriginal cultural value. However, it is noted that additional consideration may need to be given to minimising the impact of groundwater extraction on sites or areas specifically identified as having important cultural values.

4.1 Potential for negative impact

The approach for determining the potential for negative impact differs for groundwater dependent vegetation over shallow (<10 m) or deeper (10-15 m) groundwater. In both cases, modelled extraction should also consider the cumulative effects of any previously approved extraction in the region. Proponents are strongly encouraged to contact relevant DENR scientific staff to discuss appropriate methods for the mapping and field validation of potential GDEs, and the modelling approach for determining the potential for impact from proposed water extraction (and land clearing) on these values.

For GDEs occurring where the depth of groundwater is less than or equal to 10 m, potential for negative impact occurs if modelled extraction shows that one or more of the following may occur:

- the maximum depth to water table exceeds 10 m below ground level
- the maximum depth to water table declines by more than 50% below the levels that would be expected under a natural baseline (no pumping) scenario
- modelled extraction results in a rate of groundwater drawdown that exceeds 0.2 m/year.

Potential GDEs in this zone should be delineated based on the modelled distribution developed by DENR with additional field validation where groundwater dependent ecosystems can be recognised using the indicator plant species described by DENR.

For GDEs occurring where the depth of groundwater is between 10 and 15 m, potential for negative impact occurs if modelled extraction shows that one or more of the following may occur:

- the maximum depth to water table declines by more than 35% below the levels that would be expected under a natural baseline (no pumping) scenario
- modelled extraction results in a rate of groundwater drawdown that exceeds 0.2 m/year.

Potential GDEs in this zone should be delineated based on the modelled distribution developed by DENR with additional field validation, where groundwater dependent vegetation can be recognised by the presence of clusters of *Corymbia opaca* or *C. aparrerinja* with a height >= 10 m or DBH >= 30 cm. (DBH is a forestry measurement term referring to 'diameter at breast height').

It is noted that negative impacts to GDEs may also arise from land clearing associated with development proposals, and this should be included in calculations around the threshold of acceptable change. Land clearing approvals may also impose additional limits on clearing of particular vegetation communities, as described in the relevant Land Clearing Guidelines (NT Government 2020).

4.2 Monitoring and adaptive management

As there remains uncertainty around a number of factors relevant to the management of GDES in this region, including the predicted DGW contours and the response of GDEs to extraction-related changes in groundwater levels, it is important that robust monitoring is implemented where changes may occur. Monitoring the health of GDEs may allow for the adaptive management of water extraction regimes, provided such adaptive management accounts for the potential time lags before significant negative impacts are detectable.

4.3 Revision

This Guideline may be refined as understanding of groundwater, groundwater dependent ecosystems and the interaction between them improves with further studies in the Plan area.

5 References

Cook, P.G. and Eamus, D. (2018). *The Potential for Groundwater use by Vegetation in the Australian Arid Zone*. Department of Environment and Natural Resources, Environment, Northern Territory Government, Darwin.

Northern Territory Government (2020). Land clearing guidelines and management plans. https://denr.nt.gov.au/rangelands/guidelines-and-management-plans2/land-clearing-guidelines-and-management-plans

Northern Territory Government (2018). Western Davenport Water Allocation Plan 2018-2021. Department of Environment and Natural Resources: Northern Territory, Australia. Available online: denr.nt.gov.au/westerndavenportwaterplan