City of Townsville

EPBC 2021/9133 Offset Area Weed Management Plan

Document Control

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Revision History

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1.0	Draft	18 September 2024
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Executive Summary

Kleinfelder was engaged by Townsville City Council to develop a Weed Management Plan for the Haughton Pipeline Stage 2 Project Offset Area, located 2.7km south-east of Lake Ross in southern Townsville in the Lake Ross Storage Area. Weed management will be undertaken in accordance with this plan, and any future revisions, over the life of the Haughton Pipeline Stage 2 project *Environment Protection and Biodiversity Conservation Act 1999* approval (EPBC ref 2021/9133).

There are a number of both declared and non-declared species occurring on site that will be subject to a form of management due to their interaction with the Offset Area Matters of National Environmental Significance species. Of particular consideration for the protection of habitat of Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*) on site is the control and removal of woody weeds which threaten the availability and recruitment of roost trees. Exotic weed cover is a key threatening process to habitat of Southern Black-throated Finch (*Poephila cincta cincta*) due to the outcompeting of foraging resources and nesting trees. Weed incursions in site also indirectly impact the Koala (*Phascolarctos cinereus*) due to changes in natural fire and hydrological regimes.

The implementation of this plan is to achieve ecological outcomes and completion criteria for the Matters of National Environmental Significance in the Offset Area. The ecological outcomes outlined in Table ES 1.1 of the Offset Area Management Plan include a reduction in woody weeds and grassy weed densities.

A baseline survey has been conducted as part of Year 2 in the Offset Area. The weed management approach provided in this plan has been guided by key local, state and federal weed management plans and strategies, with prioritisation for management and weed control methodologies designated according to current habitat for the three Matters of National Environmental Significance species in the Offset Area. This plan designates monitoring events, weed species specific monitoring and containment requirements, and key avoidance and minimisation measures.

Implementation of this plan will integrate with the implementation of the Bushfire Management Plan and Revegetation and Rehabilitation Management Plan developed for the Offset Area for successful outcomes in weed management. The plan allows for monitoring of emerging threats and designates performance indictors for Years 2 to 4 to allow succession planning for the 5- yearly compliance reporting.

Plan review and monitoring reporting is required for this plan and by this plan as detailed in Section 7 which aligns with the requirements of the Offset Area Management Plan, as well as in line with the Commonwealth Approval (EPBC ref 2021/9133).

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Acronyms/ Abbreviations

Term	Meaning
BMP	EPBC 2021/9133 Offset Area Bushfire Management Plan
BRSB	Bare-rumped Sheathtail Bat
BO Act	*Biosecurity Act 2014*
DAF	Department of Agriculture and Fisheries
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GBO	General Biosecurity Obligation
Grassy Weed	Refer Species Growth Form in Table 4 and Table 5
HPS2	Haughton Pipeline Stage 2
LRSA	Lake Ross Storage Area
MNES	Matters of National Environmental Signifcance
OAMP	Offset Area Management Plan
Offset Area	HPS2 Offset Area
Priority Weeds	Declared and Non-declared Species (Species in Table 4 and Table 5)
SBTF	Southern Black-throated Finch
Shrubby Weed	Refer Species Growth Form in Table 4 and Table 5
TCC	Townsville City Council
WMP	Weed Management Plan
WoNS	Weeds of National Significance

1. Introduction

1.1. Purpose Statement and Objectives

The purpose of this Weed Management Plan (WMP) is to meet the weed management action for the Haughton Pipeline Stage 2 Offset Area (Offset Area), as part of the implementation of the approved Offset Area Management Plan (OAMP). Weed management is a key measure for meeting the ecological outcomes and completion criteria under the OAMP. The OAMP is conditioned and monitored for implementation under the Haughton Pipeline Stage 2 (HPS2) Project *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval (2021/9133). This requirement is included under condition 7 and condition 9 of the HPS2 EPBC Act Approval as follows:

> *Condition 7: To compensate for residual significant impacts to protected matters, up to the limits specified in condition 2, the approval holder must commence implementing the Offset Area Management Plan (OAMP) prior to the commencement of the action and continue to implement it for the remainder of the life of the approval. The approval holder must notify the department in writing of the date of commencing the OAMP implementation within 20 business days of the date of commencing OAMP implementation.*
>
> *Condition 9 (excerpt): Within 60 business days following each 5-year anniversary of the date of commencing OAMP implementation, until the expiry of this approval, the approval holder must submit to the department and publish on the website for the remainder of the period of the approval, an OAMP Report which assesses progress towards achieving and maintaining each of the completion criteria.*
> *Cont.… Once the completion criteria are achieved, the approval holder must ensure the completion criteria for the offset area are maintained for the remainder of the life of the approval.*

This plan will align with Local, State and Federal legislated , plans and strategies relevant to weed management in the Offset Area.

The program for weed management and active control set out in Section 4 of this WMP is a 20-year plan, that sets out a schedule for targeted intensive control efforts for the first four years to utilize the high capacity for available resourcing and ensure weed management remains on track to meet the performance indicators detailed in Table 7.5 of the OAMP, summarized in Table 1 below. Following the initial four years of intensive efforts, the program will move to a monitoring and reactive management approach, provided the previous years of control efforts are successful in achieving the performance indicators recommended in Section 6 of this Plan and in the OAMP.

The zoning for active control has aligned with current and future MNES habitat areas in the site, as well as the known larger infestations, to clearly demonstrate ongoing improvements or issues with management in the each of the habitat areas. This will allow future revisions to consider if the current efforts recommended in this WMP are suitable for the areas and weed species on site and ensure any evolving or innovative methods are able to be integrated that will demonstrate better and potentially more rapid improvement of the MNES habitat areas.

The entire Offset Area is mapped as either current or future MNES habitat for the SBTF, BRSB and the Koala. The ecological outcomes for the SBTF and Koala require a 70% reduction in key shrubby weed densities and extent below baseline within 20 years, with the BRSB requiring a 90% reduction in key shrubby weed densities below baseline within 20 years (Table 1). The ecological outcome for the SBTF also details a requirement to reduce density and extent of key grassy weeds by 70% within 20 years (Table 1). Thus a 90% reduction in shrubby weeds across the entire Offset Area is required to occur by completion of the 20-year weed management program, alongside 70% reduction across the Offset Area as per Table 1.

The objectives of this plan are to achieve ecological outcomes and meet the completion criteria relevant to weeds under the OAMP, which are detailed in Table 1. The ecological outcomes can be found in the Executive Summary of the OAMP, with the performance indicators detailed in Section 7.3 of the OAMP.

Table 1: Plan Objectives Relevant to OAMP

OAMP Reference	Objectives relevant to this Plan
Table ES 1.1: Ecological Outcomes for the relevant MNES	Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus*)*:* Reduction in key shrubby weed densities by 90% of baseline level within 20 years.
	Southern Black-throated Finch (*Poephila cincta cincta*): Reduce the density and extent of shrubby weeds and grassy weeds within the offset area by 70% of baseline within 20 years.
	Koala (*Phascolarctos cinereus*)*:* Reduction in key shrubby densities by 70% of baseline level within 20 years.
Table 7.5: Interim milestones, completion criteria and corrective actions	Performance indicators • Year 1: Program for weed management has been developed and commenced to reduce the presence of weeds • Year 5: Weed management has reduced the density and extent of existing weed infestations. No new weed infestations have established. • Year 10: No net increase in weed cover is recorded. • Year 15: No net increase in weed cover is recorded. • Completion criteria: Density and extent of shrubby weeds and grassy weeds within the offset area reduced to 70% of baseline level. • Corrective actions: Review and update the weed management program and implement necessary actions.

1.2. Consultation and Collaboration

Weed management in the Offset Area has historically been undertaken as part of management of the wider Lake Ross Storage Area (LRSA) and Townville Local Government Area (LGA). Weed management has been collaborated across various internal Townsville City Council (TCC) teams as well as with external land managers/holders where appropriate. Townsville City Council participate annually in Regional Biosecurity Management Group forums to allow consultation and collaboration of weed management initiatives which will benefit the Offset Area weed management.

The TCC land management team dedicated to weed management and control for this Offset Area will be responsible for consulting and collaborating with the key stakeholders included in Table 2. Active control efforts occurring adjacent stakeholder easements within the Offset Area would benefit from collaboration with stakeholders detailed in Table 2, to allow potential additional resources towards control efforts for the benefit of the Offset Area and the easements. Consultation with stakeholders detailed in Table 2 would allow review of designated management and control efforts in this Plan, against differing methodologies presented by stakeholders that are finding success in management and control efforts in their jurisdictions.

Table 2: Offset Area Consultation and Collaboration for Weed Management

Consultation	Collaboration
Biosecurity Queensland	Townsville City Council Dams and Catchments team
Burdekin Shire Council	Townsville City Council Environment team
Charters Towers Regional Council	Townsville City Council Environmental Restoration Biosecurity Team, Construction Maintenance and Operations section.
Queensland Parks and Wildlife Service	Townsville City Council Sustainability Team

Queensland Department of Transport and Main Roads	Townsville City Council Land Tenure
Queensland Rail	Department of Resources
North Queensland Dry Tropics	All adjoining private landholder/s to Offset Area
Ergon and/or Powerlink	High Pressure Gas Pipeline Easement (Enertrade (NQ) Pipeline No.1 and No.2)

2. Guiding Legislation, Plans and Strategies

2.1. Key Legislation

2.1.1. Commonwealth

- *Biosecurity Act 2015*
- *Environment Protection and Biodiversity Conservation Act 1999*

2.1.2. State

- *Biosecurity Act 2014*
- *Biosecurity Regulation 2021*
- *Nature Conservation Act 1992*

2.1.3. Local

- Townsville City Biosecurity Plan 2020-2024

2.2. Relevant Plans and Strategies

The Table 3 below details the keys plans and strategies relevant to weed management in the HPS2 Offset Area.

Table 3: Summary of Relevant Plans and Strategies for Offset Area Weed Management

Plan/Strategy	Jurisdiction	Relevant Weed Management Information	Relationship to this Plan
Townsville City Biosecurity Plan 2020-2024	Local	Weed species were prioritised using a scoring system aligned with other regional and local plans in the area. Each species was scored using eight attributes within 3 themes (status, potential impacts and management capacity). Management for each risk category is as follows: • **Critical Risk**: For species where eradication is possible, or species pose significant risk to community. • **High Risk**: Species are likely to be well established in Townsville region. Eradication is no longer possible, however these species pose significant impacts to community and are prioritised for local eradication, intensive control or asset protection. • **Medium Risk**: Species are well established in Townsville region with widespread and abundant distribution or species have not been identified as significant threat at state level. Management is focused on asset protection, impact reduction and maintenance of infrastructure/ public assets.	The priorities for each species detailed in the Townsville City Biosecurity Plan 2020-2024 have been considered for the species listed in Table 4 and Table 5 of this Plan, when designating them under either management methodologies or active control as detailed in Section 4 of this Plan. Weed Species listed in the Townsville City Biosecurity Plan have been included in Appendix B.

Plan/Strategy	Jurisdiction	Relevant Weed Management Information	Relationship to this Plan
		• **Low Risk**: Common garden plants and not consider having severe impacts to Townsville LGA. Management focuses on impact reduction.	
Lake Ross Storage Area Management Plan 2023	Local	Plan identifies significant risks to raw water quality and mitigations/ management of risks, including but not limited to exotic species. Pesticide and herbicide use is controlled and specific to weed species present in LRSA. Prioritisation of weed control is based on species, status, risk to LRSA values, achievability of management options and cost-effectiveness of clearance process.	The timeframe and control commitments for species detailed in the LRSA Management Plan are consistent with the management methodologies or active control recommended for each species listed in Table 4 and 5 of this Plan as detailed in Section 4.
Management Plan for Black-throated Finch at Lake Ross Storage Area, Townsville	Local	This plan details threatening process to the threatened Southern Black-throated Finch (SBTF) include weed assemblages currently present in the LRSA that are out-competing or displacing native plant species favoured by the SBTF. The main groups threatening the species' habitat was categorised into woody weeds, exotic forbs and exotic grasses.	The non-declared species that threaten SBTF habitat are listed as priority species in this Plan for management and/or control.
Queensland Invasive Plants and Animals Strategy 2019-2024	State	The strategy sets out stages and scope of management actions which are utilised in Local and Federal plans include prevention, eradication, containment and protection of assets. The strategy also sets out six key themes with related objectives and strategic actions that help to achieve the vision of cooperatively managing invasives plants to reduce their impacts on environment, the economy, human health and social amenity.	This Plan utilises the broad management actions detailed in the QLD Invasive Plants and Animals Strategy 2019-2024.
Australian Weeds Strategy 2017-2027	Federal	The strategy provides national guidance on best practice weed management with the aim on coordination across all jurisdictions and informing plans or actions developed by governments and stakeholders. The strategy supports three national goals including: • Prevention, detection and early intervention, • Minimising impact of established weeds, and • Enhancing Australia's capacity and commitment to weed management. The strategy provides a list of Weeds of National Significance (WoNS).	This Plan builds on the broad national goals detailed in the Australian Weeds Strategy 2017-2027 and is referred to for the WoNS list.

3. Weed Species within LRSA and Offset Area

3.1. Declared Species

The declared species detailed in Table 4 are all present within the LRSA, with several also present within the Offset Area in varying degrees of density.

Table 4: Declared Invasive Plants Management within LRSA and Presence within Offset Area

Common Name	*Species Name*	Growth Form	Status		Management Requirements in Key Local Plans and Strategies	Presence and Existing Management Practises in Offset Area
			State	Federal		
Chinee Apple	*Ziziphus mauritiana*	Shrubby Weed	Category 3 Restricted	Not listed	• High priority in Townsville City Biosecurity Plan. • Strategic reduction management goal with 3–5 year priority in LRSA Management Plan. • Listed as most common woody weed impacting SBTF in Management Plan for SBTF in LRSA.	Comprises largest density and extent of woody weeds in Offset Area. Most dominant in eastern portions of site. Mechanical clearing commenced late 2023 in eastern extent of site.
Hymenachne	*Hymenachne amplexicaulis*	Grass	Category 3 Restricted	WoNS	• High priority in Townsville City Biosecurity Plan. • Strategic reduction management goal with immediate priority in LRSA Management Plan.	Present in two main locations being a watercourse (Landsdowne Creek) and a several small waterholes across the Offset Area. Some herbicide control to maintain current density and extents.
Lantana	*Lantana camara*	Shrubby Weed	Category 3 Restricted	WoNS	• High priority in Townsville City Biosecurity Plan. • Containment management goal with 3–5 year priority in LRSA Management Plan. • Listed as a common woody weed impacting SBTF in Management Plan for SBTF in LRSA.	In various areas of Offset Area.. Many of the patches of lantana in the south-western extent were observed to be under attack potentially from a biological control, as evidenced by the discolouration/ attack of leaves (which are a common sign of insects used in biological control of Lantana). No active control, only monitoring.
Parkinsonia	*Parkinsonia aculeata*	Shrubby Weed	Category 3 Restricted	WoNS	• High priority in Townsville City Biosecurity Plan.	Only single trees have been identified over previous years of land management which

Common Name	*Species Name*	Growth Form	Status		Management Requirements in Key Local Plans and Strategies	Presence and Existing Management Practises in Offset Area
			State	Federal		
					• Strategic reduction management goal with 1-2 year priority in LRSA Management Plan.	are promptly mechanically or chemically removed. No infestations.
Prickly Acacia	*Vachellia nilotica*	Shrubby Weed	Category 3 Restricted	WoNS	• High priority in Townsville City Biosecurity Plan. • Strategic reduction management goal with 1-2 year priority in LRSA Management Plan. • Listed as a woody weed impacting SBTF in Management Plan for SBTF in LRSA.	Only single trees have been identified over previous years of land management which are promptly chemically treated. No infestations.
Rat's Tail Grass	*Sporobolus sp.*	Grass	Category 3 Restricted	Not listed	• High priority in Townsville City Biosecurity Plan. • Containment management goal with 3-5 year priority in LRSA Management Plan. • Listed as an exotic grass impacting SBTF in Management Plan for SBTF in LRSA.	This species is present in various locations across the Offset Area.
Rubber Vine	*Cryptostegia grandiflora*	Shrubby Weed (vine)	Category 3 Restricted	WoNS	• High priority in Townsville City Biosecurity Plan. • Strategic reduction management goal with 3-5 year priority in LRSA Management Plan. • Listed as a woody weed impacting SBTF in Management Plan for SBTF in LRSA.	This species is widespread across the site in varying densities. Currently a reactive control approach where plants are removed or basal barked when time and resourcing permits.
Siam Weed	*Chromolaena odorata*	Shrubby Weed	Category 3 Restricted	Not listed	• High priority in Townsville City Biosecurity Plan. • Strategic reduction management goal with long-term monitoring and preventative approach priority in LRSA Management Plan. • Listed as a woody weed impacting SBTF in Management Plan for SBTF in LRSA.	This species is widespread across the site in varying densities.

3.2. Non-declared Species

The Table 5 below includes the species that are detailed in either or both of the following two plans due to existing management priorities and known impacts on the SBTF in the LRSA:

- Lake Ross Storage Area Management Plan 2023
- Management Plan for Black-throated Finch at Lake Ross Storage Area, Townsville

Table 5: Non-declared Invasive Plants Management within LRSA and Presence within Offset Area

Common Name	*Species Name*	Growth Form	Management Requirements in Key Local Plans and Strategies	Presence and Existing Management Practises in Offset Area
Grader Grass	*Themeda quadrivalvis*	Grass	• Strategic reduction management goal with 1-2 year priority in LRSA Management Plan. • Listed as an exotic grass impacting SBTF in Management Plan for SBTF in LRSA.	• Isolated infestations in several areas in the eastern and western portion of the Offset Area. Currently slashed as a level of control prior to seeding. Infestations are large in Eastern portion of site as a result of Chinee Apple removal. • Minor patches are appearing in western locations of offset area that are being monitored for any spread.
Horehound	*Mesosphaerum (syn. Hyptis) suaveolens*	Forb (Grassy weed group)	• Listed as an exotic forb impacting SBTF in Management Plan for SBTF in LRSA.	• Known to occur widely throughout Offset Area. • Currently monitored however not actively controlled due to the low priority for management and widespread occurrence.
Round-leaf Cassia	*Chamaecrista rotundifolia*	Forb (Grassy weed group)	• Medium priority in Townsville City Biosecurity Plan. • Listed as an exotic forb impacting SBTF in Management Plan for SBTF in LRSA.	• Known to occur widely throughout Offset Area. • Currently being monitored for spread, no active control.
Sida spp.	Sida sp.	Forb (Grassy weed group)	• Listed as an exotic forb impacting SBTF in Management Plan for SBTF in LRSA.	• Known to occur widely throughout Offset Area. • Currently monitored however not actively controlled due to the low priority for management and widespread occurrence.
Snakeweed	*Stachytarpheta jamaicensis*	Forb (Grassy weed group)	• Monitor management goal with 3-5 year priority in LRSA Management Plan. • Listed as an exotic forb impacting SBTF in Management Plan for SBTF in LRSA.	• Known to occur widely throughout Offset Area. • Currently monitored however not actively controlled due to the low priority for management and widespread occurrence.
Stylo	*Stylosanthes sp*	Forb (Grassy weed group)	• Listed as an exotic forb impacting SBTF in Management Plan for SBTF in LRSA.	• Known to occur widely throughout Offset Area. • Currently monitored however not actively controlled due to the low priority for management and widespread occurrence.

Common Name	*Species Name*	Growth Form	Management Requirements in Key Local Plans and Strategies	Presence and Existing Management Practises in Offset Area
Thatch Grass	*Hyparrhenia rufa*	Grass	• Listed as an exotic grass impacting SBTF in Management Plan for SBTF in LRSA.	• Infestations in several areas in the eastern and western portion of the Offset Area. Currently being monitored for spread, no active current control.

3.3. Impacts of Weeds on MNES in Offset Area

Invasion of habitat by exotic weed species is a key threatening process for the SBTF and Bare-rumped Sheathtail Bat (BRSB). Woody and shrubby weed incursion into BRSB habitat areas impact the availability, recruitment, longevity and growth of roost trees (Recovery Plan). Ingress of invasive grasses, forbs and woody weeds impact on SBTF habitat via the direct displacement of foraging grasses and nesting trees (NRA, 2018). Weed incursions into the habitats for all three MNES species' habitats on site also alter ecological processes such as fire and hydrological regimes which can indirectly impact the species' (NRA, 2018).

The priority weed species all have direct or indirect impacts on the habitat of the three MNES species on site and as such are considered the priority weed species for management under this Plan.

Infestations of priority woody/shrubby weeds and priority invasive grasses/forbs listed in Table 4 and Table 5 are within the Offset Area are illustrated in Figure 2 and Figure 3.

4. Weed Management Approach

Weed management in the Offset Area will involve three key measures occurring simultaneously over a 20-year program as detailed in the below sections, with prioritisation of measures according to the weed management zoning.

The three approaches include:

1. **Identification and Monitoring** (refer to Section 4.1).
   Aligning with the performance indicators in Table 7.5 of the OAMP, this approach ensures priority weeds are:
   a. Identified, if not previously occurring on site, to allow prioritisation for management.
   b. Consistently monitored for potential increases in density and extent of existing infestations, and/or for new infestations elsewhere in the Offset Area, triggering corrective actions.
2. **Avoidance and Minimisation** (refer to Section 4.2).
   Provides supplementary measures to prevent spread or introduction of new invasive plant species into and across the Offset Area.
3. **Control** (refer to Section 4.3).
   Details zoning of the Offset Area with prioritisation of weed management aligned with current MNES habitat areas. Control methodologies are recommended according to known weed species present within the Offset Area. A schedule has been detailed for control efforts to allow succession planning towards the recommended Year 2 to 4 performance indicators detailed in Section 6 below, performance indicators detailed in Table 7.5 of the OAMP, as well as the overall ecological outcomes detailed in Table ES 1.1 of the OAMP.

4.1. Identify and Monitor

4.1.1. Baseline Survey

For accurate measuring of success against ecological outcomes detailed in Table ES 1.1 of the OAMP and in Table 1 of this Plan, a comprehensive baseline survey of the priority weed species detailed in Table 4 and 5 of this Plan was undertaken with data collected on locality, density and extent. The baseline survey, attached in Appendix C was conducted as part of a Year 2 Performance Indicator action as detailed in Section 6 of this Plan.

The baseline survey comprehensively surveyed for all declared weed species through random meandering and transect surveys at locations detailed in Figure 4 within the Offset Area to ensure TCC's General Biosecurity Obligation (GBO), required by the BO Act, is being met through management of all declared species on site.

The non-declared species detailed in Table 5 was surveyed at each location detailed in Figure 4 with density and extent averaged for the entire area of each zone via transects within each zone.

4.1.2. Monitoring

Monitoring of all priority weed species will involve surveys revisiting all weed plot locations surveyed as part of the baseline survey, with monitoring scheduled in line with the monitoring commitments detailed in Table 7.7 of the OAMP and are detailed in Table 6. Monitoring will also be conducted on density and extent of existing weed infestations subject to active control. The amount of survey effort will be determined by the suitably qualified person conducting the monitoring, ensuring frequency and collection of parameters detailed in Table 5 are adequately followed. Resource limitations may hinder the ability to undertake quarterly monitoring in the first year (and 6-monthly monitoring in years 2 and 3) for instance, however it is recommended that the OAMP Monitoring Frequency is followed where practicable.

Table 6: Monitoring Frequency and Parameters for Zones subject to Active Control (Section 4.3)

Year (from initial baseline)	Monitoring Frequency	Undertake Monitoring	Monitoring Time	Monitoring Parameters
0 (Start)	HP2 Offset Area Baseline Weeds Survey Undertaken 22-26 September 2024 (Appendix C)			
1	Quarterly	Suitably Qualified Person	1. December-January 2025 2. March-April 2025 3. June-July 2025 4. September-October 2025	• Undertake follow up assessment of weed species and associated weed densities at all Weed Survey Plots (30x) (Figure 4 and Appendix C). • Undertake follow up assessment of weed species and associated densities through random meanders within areas subject to targeted weed control since the last weed monitoring assessment.
2 -3	Bi-annually (6- monthly)	1. Suitably Qualified Person 2. Suitably Qualified Person 3. Suitably Qualified Person 4. Suitably Qualified Person	1. March-April 2026 2. September-October 2026 3. March-April 2027 4. September-October 2027	
4- 20 (Finish)	Annually	Years 5, 10, 15 and 20 to be assessed by an Independent Consultant. All other assessments to be undertaken by Suitably Qualified Person.	Undertake annually in September-October each year.	

4.1.3. Specific Weed Species Monitoring

As detailed in Table 5, priority grassy weeds excluding Rat's Tail Grasses, Grader Grass and Hymenachne are actively monitored within the Offset Area. These species are well established in the LRSA and wider Townsville LGA and are not considered a significant threat at State level, however they can form monospecific stands which are an impact to the SBTF due to the outcompeting of foraging grasses/areas. Strategic reduction or containment of these species has not been considered as a first response due to it being cost-prohibitive and ineffective measure when considering the overall ecological outcomes for the site for all MNES. However, given these species are widespread across the site and are listed as a threat to SBTF habitat, Table 7 details the treatment methodologies suitable for these species if their densities increase in each zone above the acceptable range listed in Table 8. Specific herbicide treatments were mostly selected for foliar spray application only and selective for the species, to minimise potential non-selective treatment of native groundcover species. Rat's Tail Grass species have been included in this monitoring program as they are not currently widespread across the site. Treatments were provided by the Weeds of Central and Northern Queensland guide, produced by the Weed Society of Queensland in 2019, excluding Round-Leaf Cassia. There is very little known on management or treatment of Round-leaf Cassia; however it is listed to be susceptible to 2,4-D (Tropical Forages, 2020).

Table 7: Recommended Management and/or Treatment for Weed Species

Species	Management	Herbicide Treatment			
		Active Ingredient	Recommended Products	Application Method	Application Rate
Giant Rat's Tail Grasses, *Sporobolus pyramidalis, S. natalensis*	Hand remove individual plants. Refer to EPBC 2021/9133 Offset Area Bushfire Management Plan prescribed burn plans, and monitor areas with species post-burn for effectiveness.	Flupropanate	Tussock™	Foliar Spray	200mL/100L (apply during active growth)
Parramatta Grass, *Sporobolus fertilis, S. africanus*					
Sida spp.	Physical or mechanical control such as slashing may help control however this has only been noted for pasture situations (Rojas-sandoval, P., Acevedo-Rodriguez, P., 2013).	2,4-D + Picloram	Tordon® 75-D	Foliar Spray	150mL/100L
		Fluroxypr	Comet® 400	Foliar Spray	250mL/100L (up until flowering)
Horehound, *Mesosphaerum*	Chemical control is listed as the most efficetive, priori to flowering (Centre for Invasive Species Solutions, 2021).	2,4-D	Amicide® 625	Foliar Spray	320mL/100L

(syn. Hyptis) suaveolens					
Blue Snakeweed, *Stachytarpheta jamaicensis*	Potential manual removal of small infestaions prior to seed formation (Centre for Invasive Species Solutions, 2021). Removal of stock from the site and slashing prior to setting seed is recommended with follow up chemical control at seedling stage. As this species is already established and has set seed, chemical control is likely to be most suitable (DAF,2020).	2,4-D	Amicide® 625	Foliar Spray	*Summer Application* 160mL/100L
		Fluroxypr	Comet® 400	Foliar Spray	*Summer Application* 250mL/100L
Stylo sp.	Chemical control.	Aminopyralid + fluroxypr	Hoshot®	Foliar Spray	500mL/100L

For the purposes of this Plan, several species listed in Table 5 have been prioritised for continual monitoring with corrective actions if they pose significant impacts through an increase in average density within a weed management zone within the Offset Area, as detailed in Table 8. These species will also be subject to integrated environmental management detailed under other Offset Area management plans such as the EPBC 2021/9133 Offset Area Bushfire Management Plan and EPBC 2021/9133 Offset Area Revegetation and Rehabilitation Management Plan.

Table 8: Species Subject to Monitoring only unless Non-compliant with Acceptable Range

Species	Acceptable Range	Corrective Actions
Rat's Tail Grasses *Sporobolus sp.*	No new occurrences on site.	Targeted weed management and/or treatment as detailed in Table 7 and monitor after prescribed burns for response.
Sida *Sida sp.*	Average density and extent of each species in each individual zone has not increased by >20%.	Targeted weed management and/or treatment as detailed in Table 7 in their corresponding zone.
Horehound *Mesosphaerum (syn. Hyptis) suaveolens*		
Snakeweed *Stachytarpheta sp.*		

Stylo and Cassia spp. are widespread throughout the site and are known to pose threats and limitations to Black-Throated Finch habitat restoration. Management of these species is complicated by their small size and that they grow interspersed among other plants. Application of herbicide to reduce Stylo and Cassia spp. would supress native broadleaf emergence as overspray would be impossible to control. This reality in combination with the cost associated with the application of herbicide at this scale (the entire offset area) make herbicide use impractical outside of areas in which these plants form monospecific stands. Stylosanthes is noted in the OAMP as being susceptible to fire, and as such it is recommended these species be monitored following prescribed burns undertaken as part of the scheduling in the EPBC 2021/9133 Offset Area Bushfire Management Plan. Outcomes of monitoring following prescribed burns in areas of higher density Stylo and Round-leaf Cassia will guide potential control efforts and priorities for these species during future revisions of this Plan.

4.2. Avoidance and/or Minimisation

Supplementary measures have been detailed to avoid and/or minimise spread of existing weed species across the Offset Area, in line with the recommendations detailed in the Vehicle and Machinery Cleandown Procedures guideline developed by DAF in 2019. These measures are detailed below:

- Designation of zones on site and ensuring no travel occurs between zones unless travel is on designated roads/ tracks.
  As per Figure 5, no travel will occur between the *restricted western travel zone* and *restricted eastern travel zone* unless on formed roads and if vehicles have utilised the clean-down bays in each zone location. If travel is occurring within either of these zones, a vehicle must complete a clean down at the corresponding bay location before travelling into any other areas within the Offset Area.
- Addition of a rock pad for a 'clean-down' bay in locations shown in Figure 5 across the site to allow inspection and cleaning of vehicles that are travelling between zones. Clean down bays are located more than 50m from a watercourse to reduce potential spread of reproductive materials via watercourses and will be designed similar to a Construction Entry/Exit Rock Pad as per the International Erosion Control Association standard design (Catchments & Creeks, 2017) (Figure 1). A weed wash down facility would not be a feasible design for the Offset Area as there is no supply of water and power to operate and maintain the facility. Ensure all vehicles carry an air compressor for removing of dry material to be captured within the clean down bay and complete the basic cleaning checklist detailed in the Vehicle and Machinery Cleandown Procedures (DAF, 2019) included in Appendix D. These pads would only be utilised if travel has not occurred on formed roads/ tracks. The intention of these pads is to separate the areas of better quality MNES habitat, in the West of the Project site, that are still offering a mosaic of native groundcover species from the East which has larger monospecific infestations of invasive groundcover. However travel occurs between these zones weekly and sometimes daily, introducing a higher risk of continued spread of invasive groundcover into the Western portion of the site, without some form of mitigation. These pads will also be inspected during monitoring events detailed in Table 5, with non-selective chemical treatment applied to the bay.

Rock pad

Rock pads

- Suitable for all soil types.
- The critical design parameter is the total void spacing (volume) between the rocks.
- Minimum 10 m length for single dwelling building sites, and 15 m for construction sites.
- Generally perform better than *Vibration Grids* during wet weather.
- Drainage controls (e.g. a cross bank) may need to be incorporated into the rock pad to direct sediment-laden runoff to an appropriate sediment trap.

Figure 1: Rock Pad Clean Down Bay Indicative Design

4.3. Active Control

4.3.1. Control Zoning

As shown in Figure 6, the zoning of active control on site has been prioritised in areas of current MNES habitat present as illustrated in Figure 3-2, Figure 3-4 and Figure 3-6 of the OAMP, which have been designated as individual zones within 'Current MNES Habitat Management Areas' and 'Future MNES Habitat Management Areas'. Within these zones are areas of differing priority designated due to the broad knowledge on extents and densities of each weed group (shrubby or grassey) occurring. Zones have been designated by priority and according to the areas they occur within as noted in Table 9, with definitions noted in Table 10.

Table 9: Zoning designation and Prioritisation of Weed Management in Offset Area

	Current MNES Habitat Management Area		Future MNES Habitat Management Area	
Priority	**Very High**	**High**	**High**	**Low to Moderate**
Label	CH-VH	CH-H	FH-H	FH-M

Table 10: Definitions for Zoning designation and Prioritisation

Label	Definition
CH-VH	**Current Habitat - Very High Priority** Within current MNES habitat and has high densities of priority weeds (includes woody and grassy weeds)
CH-H	**Current Habitat - High Priority** Within current MNES habitat and has low to moderate densities of priority weeds (includes woody and grassy weeds)
FH-H	**Future Habitat -High Priority** Within future MNES habitat and has high densities of priority weeds (includes woody and grassy weeds)

FH-M	**Future Habitat – Low to Moderate Priority** Within future MNES habitat and has low to moderate densities of priority weeds (includes woody and grassy weeds)

4.3.2. Control Scheduling

A higher frequency of weed control has been designated for 2024 to 2026 within the Current MNES Habitat Management Areas, to significantly reduce the weed abundance in the current MNES habitat as well as to reduce the cost and effort of longer-term management in these areas.
After these two to three years of aggressive control, the schedule of control will be reduced to allow for time and cost efficiencies in weed management while still achieving the overall ecological outcomes. The monitoring frequency detailed in Table 6 will allow a high-level review of weed control successes and failures annually to guide ongoing weed control efforts and an evaluation of priorities for each of the zones. It is expected that after intensive weed control efforts in each zone, control effort will then move to reactive follow-up control following monitoring events.

The scheduling for control in priority zones in Current and Future MNES Habitat Management Areas will occur as per Table 11.

Table 11: Weed Control Methodology and Scheduling According to Zone

Zones	Year* / Control Method				
	Year 2	Year 3	Year 4	Year 5	Year 6 to Year 20
CH-VH	Targeted mechanical removal and spraying of priority weeds. Aim for a reduction of at least 25% in priority weed species compared to their baseline at the end of 2025.		Targeted mechanical removal and spraying of priority weeds to at least 50% reduction on their baseline densities.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 70% reduction on their baseline densities.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 90% reduction on their baseline densities.
CH-H	Targeted spraying of priority weeds. Aim for a reduction of at least 25% in priority weed species compared to their baseline at the end of 2025.		Targeted spraying of priority weeds to at least 50% reduction on their baseline densities.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 70% reduction on their baseline densities. To prioritise any targeted spraying required in Zones listed above (CH-VH) before commencing within this Zone.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 90% reduction on their baseline densities. To prioritise any targeted spraying required in Zones listed above (CH-VH) before commencing within this Zone.
FH-H	Monitor, if priority weed species are progressing towards a CH-H level of their weed densities (refer Appendix C Baseline Weed Survey Report for zone densities), undertake targeted spraying as required.		Targeted mechanical removal and targeted spraying of priority weeds to at least 50% reduction on their baseline densities.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 70% reduction on their baseline densities for each year (2027 and 2028). To prioritise any targeted spraying required in Zones listed above (CH-VH and CH-H) before commencing within this Zone.	

FH-M	Monitor, if priority weed species are progressing towards a FH-H level of their weed densities (refer Appendix C Baseline Weed Survey Report for zone densities) and priority weeds in each of the Zones listed above (Zones CH-VH to FH-H) have been suppressed by >50% from their baseline levels for each year (2027 and 2028), undertake targeted spraying as required.	Targeted mechanical removal and targeted spraying of priority woody weeds to at least 50% reduction on their baseline densities.	Reactive non-mechanical follow up (eg targeted spraying of weed outbreaks) to at least 50% reduction of their baseline densities for each year (2028 onwards). To prioritise any targeted spraying required in the Zones listed above (CH-VH to FH-H) before commencing within this Zone.

*Note, the yearly timeframes are considered from OAMP implementation commencement which is the period from 17 July to 17 July.

Schedule deviations or contingencies:

- Current MNES Habitat Management Area zones yearly control efforts may change pending resourcing availability.

4.3.3. Methods of Control

Weed control will vary annually dependent on weather conditions and site accesses. Maintenance of site access to active control areas will be key to allow ongoing efforts following the wet season where access remains limited due to poor access conditions. Control methods will require integrated approaches.

Shrubby Weeds

Mechanical

Mechanical weed control in the Offset Area has previously being undertaken in the Chinee Apple infestation areas. Specialised attachments for machinery including bobcats and larger skid-steers are utilised to allow removal and stockpiling of woody weeds. The attachments include a speciality saw, proven to be very effective in the eradication of woody weeds. The attachment is capable of cutting and poisoning simultaneously, the saw can also target weeds without affecting the surrounding flora and fauna. The saw spins without relying on force to cut allowing it to remove anything from a 1cm to 30cm+ diameter.

Stick-raking is utilised to remove all vegetation from the ground into stockpiles for decomposition.

These methods of mechanical control are recommended for all ongoing mechanical control of woody weeds.

For single plants, hand pulling/removal methods may be applied where practicable.

Non-mechanical

Non-mechanical control of woody weeds including herbicide control and application shall be conducted in line with the species-specific Department of Agriculture and Fisheries (DAF) factsheets for Restricted and Prohibited invasive plants. Selection of herbicide shall be in line with the DAF recommendations, as well as herbicide application method which may include but is not limited to:

- Foliar spray (only suitable for woody weeds below 1.7m).
- Basal barking.
- Stem injection.
- Cut stump.

Grassy Weeds

Control of grassy weeds including herbicide control and application shall be conducted in line with the species-specific DAF factsheets for Restricted and Prohibited invasive plants. Control of priority grassy weeds will follow DAF recommendations and TCC Best Practice methodologies. In line with the DAF recommendations, herbicide application may include but is not limited to:

- Foliar spray.
- Wick applications.

4.3.4. Integrated Environmental Management

As noted in Table 6 in Section 4.1.3, fire may be useful in management tool of priority grassy weed species and Lantana in the Offset Area. Prescribed burn scheduling within the Offset Area as per the approved BMP will be monitored for success in control of these species. Two grassy species in particular that will be subject to monitoring of densities at Weed Plot locations occurring in a prescribed burn area are:

- Round-leaf Cassia, *Chamaecrista rotundifolia.*
- Stylo, *Stylosanthes sp.*

Stylo is detailed in the OAMP as susceptible to fire and as such this management method is likely to be the most suitable for the species on site due to its widespread occurrence. Round-leaf Cassia has very little recorded information on management and as such shall be monitored post-burns to record its susceptibility to fire as a possible main management measure. If either or both species flourish after prescribed burns, with an increase in density at Weed Plot locations recorded, a future revision of this management plan will include an amended plan for monitoring and control of these species.

The integration of this Plan alongside the implementation of the EPBC 2021/9133 Offset Area Revegetation and Rehabilitation Management Plan will provide an additional layer of longer-term management of weed species within the Offset Area.

5. Emerging Threats

The Offset Area is currently publicly accessible which creates a risk of uncontrolled spread into the Offset Area.

Monitoring and reactive management of 'vectors of spread' entries into the Offset Area including waterways and formed roads will be undertaken during monitoring events. Reactive management includes immediate control such as selective herbicide or hand removal of any new isolated plants or small patches and notification/consultation with neighbouring landholders for management of new infestations introduced by vectors of spread when appropriate.

Restricted weeds such as Bellyache Bush, *Jatropha gossypiifolia*, are within the surrounding areas and as such have a high-risk of emerging and establishing in the Offset Area.

If any Prohibited weed species are identified on site during monitoring events, reporting the sighting to Biosecurity Queensland by calling 13 25 23 will occur within 24 hours of identification. As per TCC's GBO n all reasonable and practical measures will be undertaken to minimise the biosecurity risk of the plant spreading until they receive advice from an authorised officer.

6. Performance Indicators

To ensure the implementation of this Plan aligns with the performance measures and completion criteria of the OAMP, the priority is on weed management in existing MNES habitat to improve the quality and availability of the habitat resources.

As part of this Plan, the performance indicators in Table 11 have been recommended to guide reporting of successes against the OAMP 5-yearly performance indicators. The weed management approach detailed in Section 4 of this Plan have been detailed with consideration of the performance indicators and have included a suite of corrective actions and review processes to ensure performance indicators not being met are being appropriately remediated.

Table 12: Recommended Year 2 to Year 4 Performance Indicators

Ecological Outcome	Year 2 (2024-2025)	Year 3 (2025-2026)	Year 4 (2026-2027)
Reduce weed density	• Conduct comprehensive baseline weed survey in Offset Area. • Continue control efforts in Zone CH-VH (detailed in Table 9). • Commence control efforts in Zone CH-H (detailed in Table 9).	• Continue control efforts in Zone CH-VH (detailed in Table 9), aim for reduction of at least 25% of priority weeds. • Continue control efforts in Zone CH-H (detailed in Table 9), aim for reduction of at least 25% of priority weeds.	• Continue control efforts in Zone CH-VH (detailed in Table 9), aim for reduction of at least 50% of priority weeds. • Continue control efforts in Zone CH-H (detailed in Table 9), aim for reduction of at least 50% of priority weeds. • Commence control efforts in Zone FH-H (detailed in Table 9), aim for reduction of at least 25% of priority weeds. • Commence control efforts in Zone FH-M if control in Zones CH-VH and CH-H achieve >50% reduction in woody weed cover (detailed in Table 9).

7. Review, Monitoring and Reporting

7.1. Plan Review

This plan will be scheduled for review at the monitoring events detailed in Table 12, to assess performance against the objectives outlined in Table 1 of this plan and performance indicators detailed in Table 7.5 of the OAMP. The objectives are also subject to compliance auditing and review against conditions 7 to 11 under the *Environmental Offset Requirements* in the HPS2 Project EPBC Approval (ref 2021/9133).

Table 13: Weed Management Plan Review

Timing	Approval Requirement	Management Plan Review Trigger
Year 3	Condition 8 of the HPS2 Project EPBC Approval (ref 2021/9133) requires a report to be produced and provided to the department within 20 business days of the 3-year anniversary of the date of implementing the OAMP (17 July 2026) detailing: • A detailed description of survey method, timing and effort undertaken to detect the SBTF in the Offset Area, • An assessment of likelihood of SBTF being present in the Offset Area, including analysis of likely cause(s) for failure to detect species, and • Additional action approval holder to undertake to increase likelihood of detecting SBTF in Offset Area.	In Section 7.6.1 of the OAMP, a commitment to the review of the OAMP is made and scheduled to occur following the reporting event required by Condition 8 of the EPBC Approval. This review will include the review of the implementation and success of this plan.

Year 5, 10 and 15	Condition 9 of the HPS2 Project EPBC Approval (ref 2021/9133) requires a report to be produced and provided to the department within 60 business days of each 5-year anniversary of the date of implementing the OAMP, assessing progress towards achieving and maintaining the completion criteria. The report must also detail if the SBTF have not been detected in the Offset Area in 5 years. Details to be included are: • Detail performance achieved against all interim performance indicators in the period since approval decision with more detail in respect of the period since the previous OAMP report, • Describe results and effectiveness of all management actions implemented during period subject of current OAMP report, • Include monitoring results including all confirmed sightings of protected matters, and • Detail any interim performance indicators not met and describe all corrective actions taken and evaluate their effectiveness.	The corrective action for weeds detailed in Table 7.5 of the OAMP and Condition 9 of the HPS2 project EPBC Approval trigger a review of this plan, which will be undertaken at each 5-year anniversary of the implementation of the OAMP.

7.2. Monitoring and Reporting

Monitoring of zones subject to active control to assess weed infestations will occur as per Table 6of this Plan, which aligns with the monitoring frequency and method detailed in Table 7.7 of the OAMP, alongside monitoring of the Weed Survey Plots (Figure 4) across the entire Offset Site in line with the schedule in Table 6. Monitoring and the development of the monitoring report will be conducted and produced by a Suitably Qualified Person.

A monitoring report will be produced following the monitoring events required in each year. The monitoring report shall include:

- Consolidation of all data collected during monitoring events. Comparison against baseline data and previous years of data.
- Details on existing density and extent of isolated plants/patches and infestations. If additional controls were actioned due to an increase in density and extent.
- Changes in prioritization zones for weed control efforts due to identification of new declared species in new zones.
- Success of each control methodology for the weed species or location, including if any natural regeneration of the area is occurring as a result of weed management. Any other change in weed density/ extent due to other integrated environmental management.
- Any emerging threats identified.
- Yearly brief assessment of progress against objectives detailed in Table 1 of this plan, recommended performance indicators detailed in Section 6 of this plan and performance indicators in Table 7.5 of the OAMP.

Monitoring reports will be provided as part of the annual compliance reporting for the HPS2 Project EPBC Approval.

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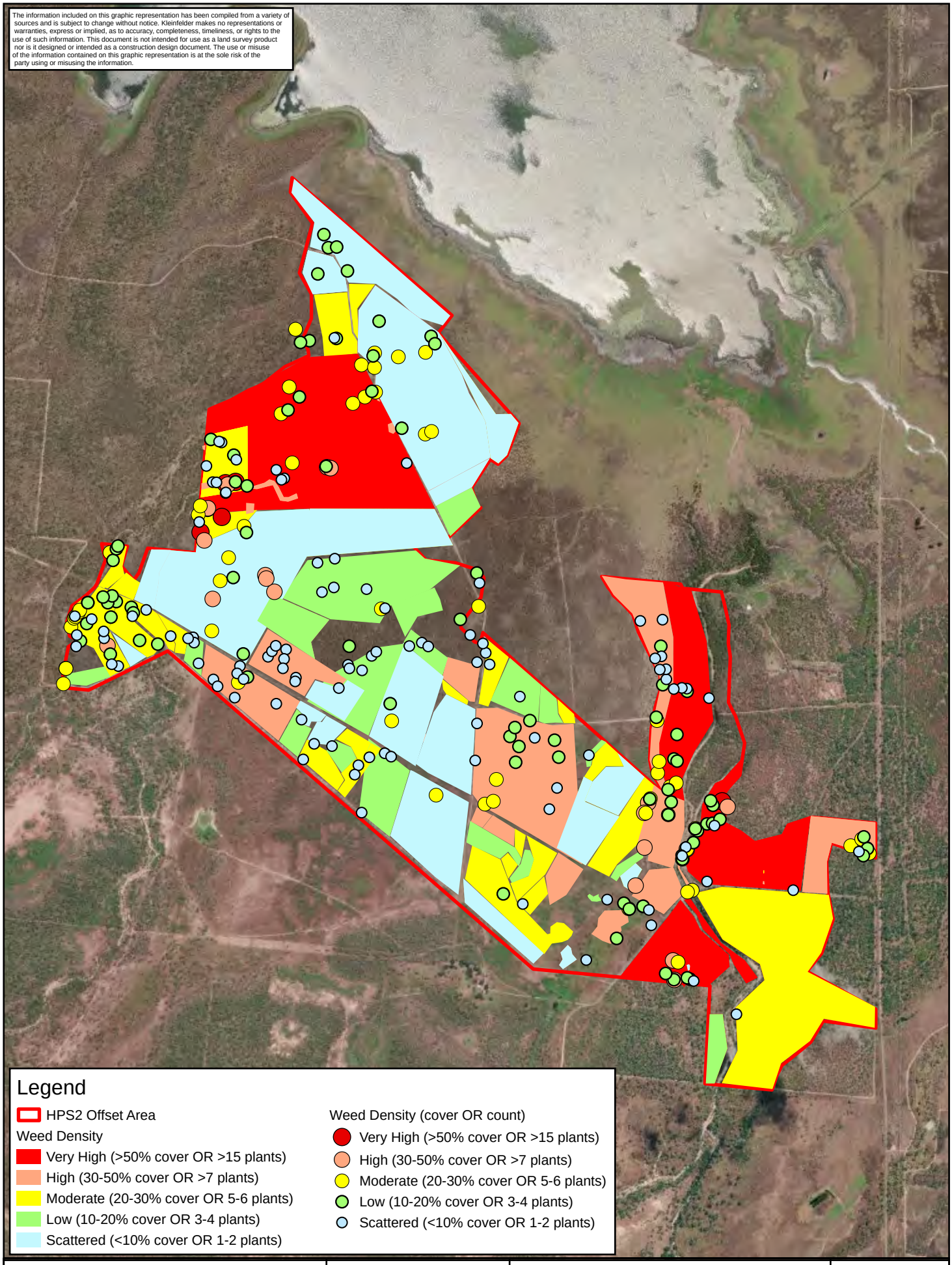
Appendix A: Figures



Legend

- HPS2 Offset Area

Weed Density

- Very High (>50% cover OR >15 plants)
- High (30-50% cover OR >7 plants)
- Moderate (20-30% cover OR 5-6 plants)
- Low (10-20% cover OR 3-4 plants)
- Scattered (<10% cover OR 1-2 plants)

Weed Density (cover OR count)

- Very High (>50% cover OR >15 plants)
- High (30-50% cover OR >7 plants)
- Moderate (20-30% cover OR 5-6 plants)
- Low (10-20% cover OR 3-4 plants)
- Scattered (<10% cover OR 1-2 plants)

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Scale @ A4 1:24,685 Metres

GDA 1994 MGA Zone 55

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OCCURRENCE OF PRIORITY **SHRUBB**Y WEEDS ON SITE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2

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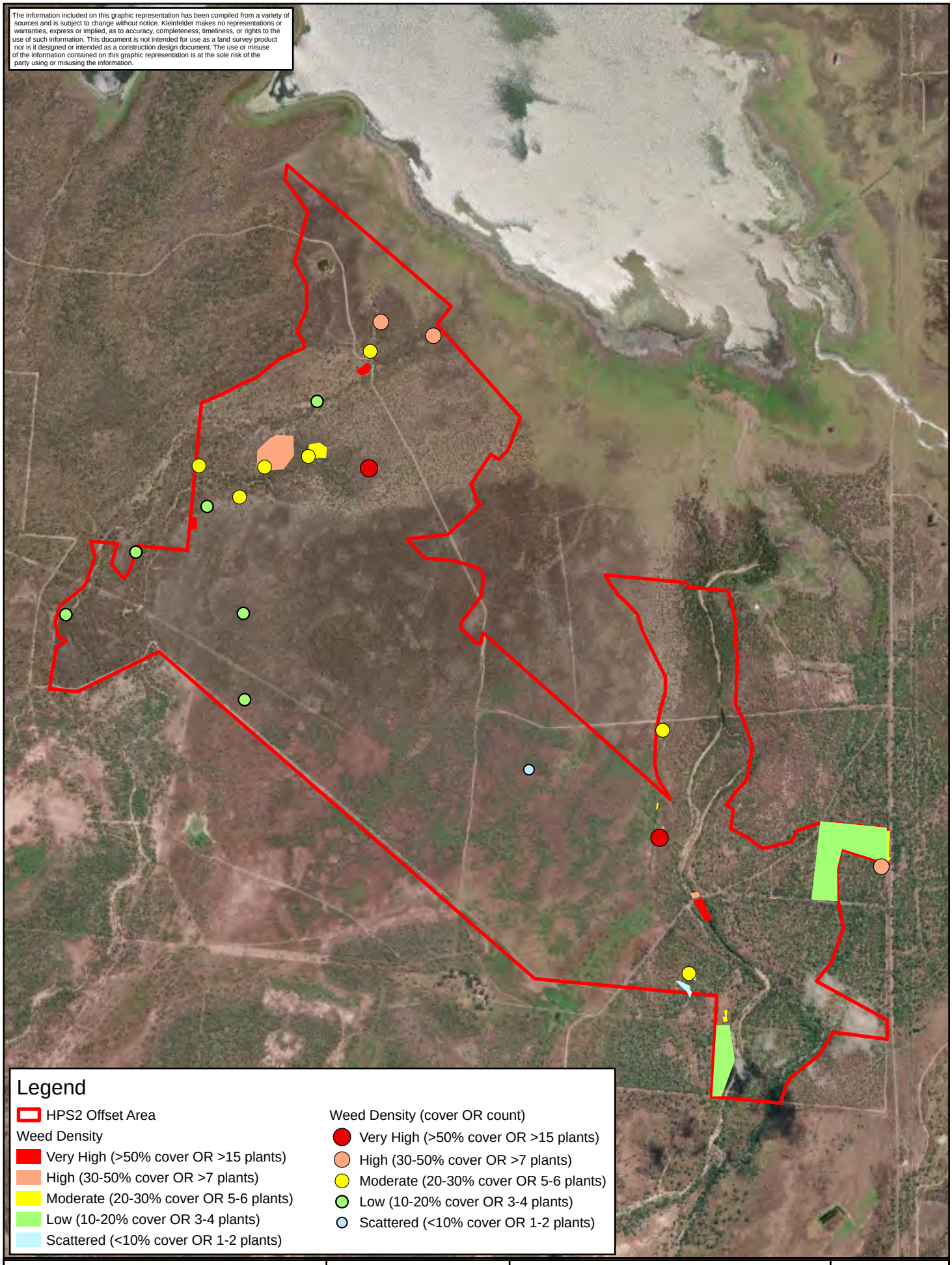

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OCCURRENCE OF PRIORITY **GRASSY WEEDS** SITE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3

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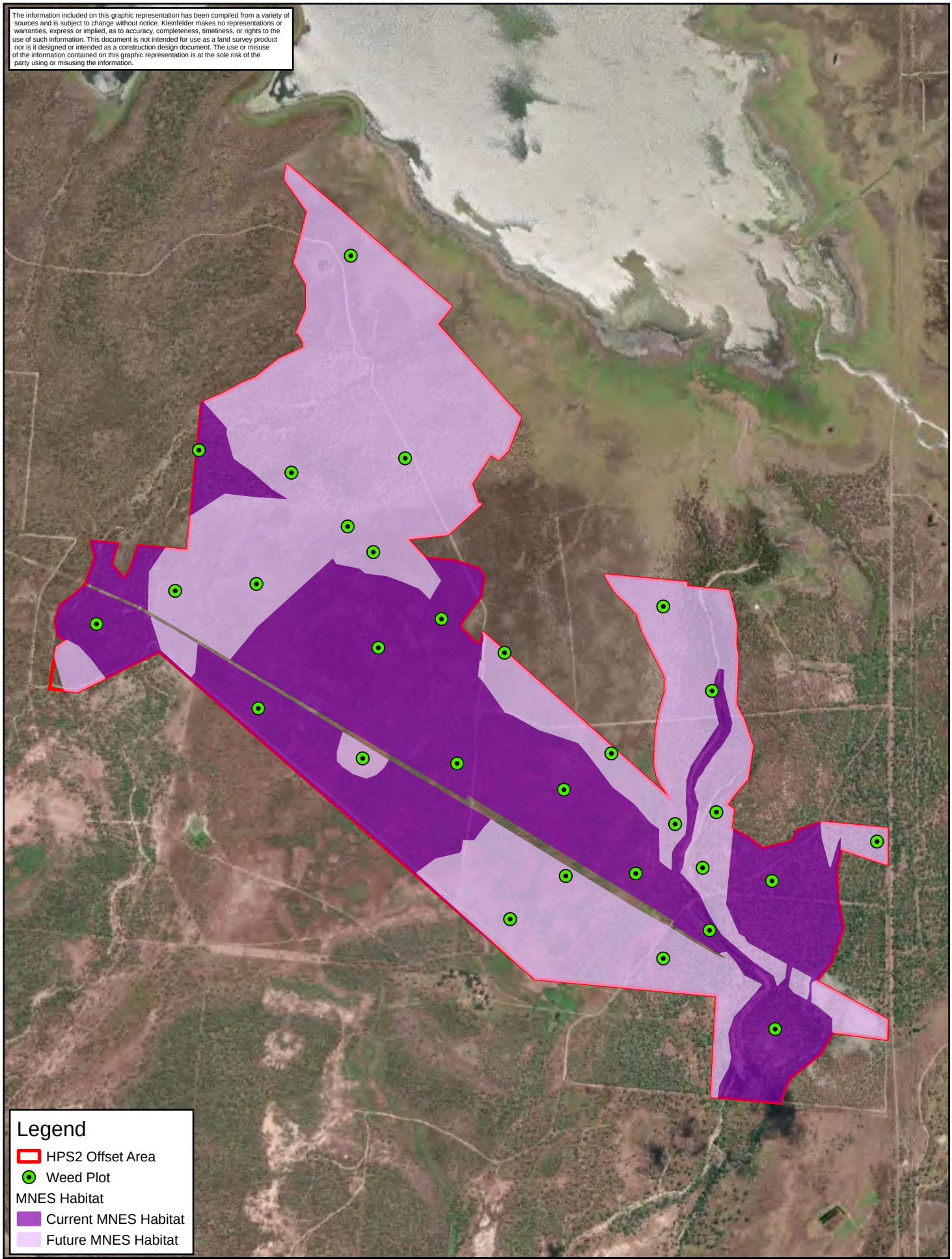

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WEED PLOT SURVEY LOCATIONS

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4

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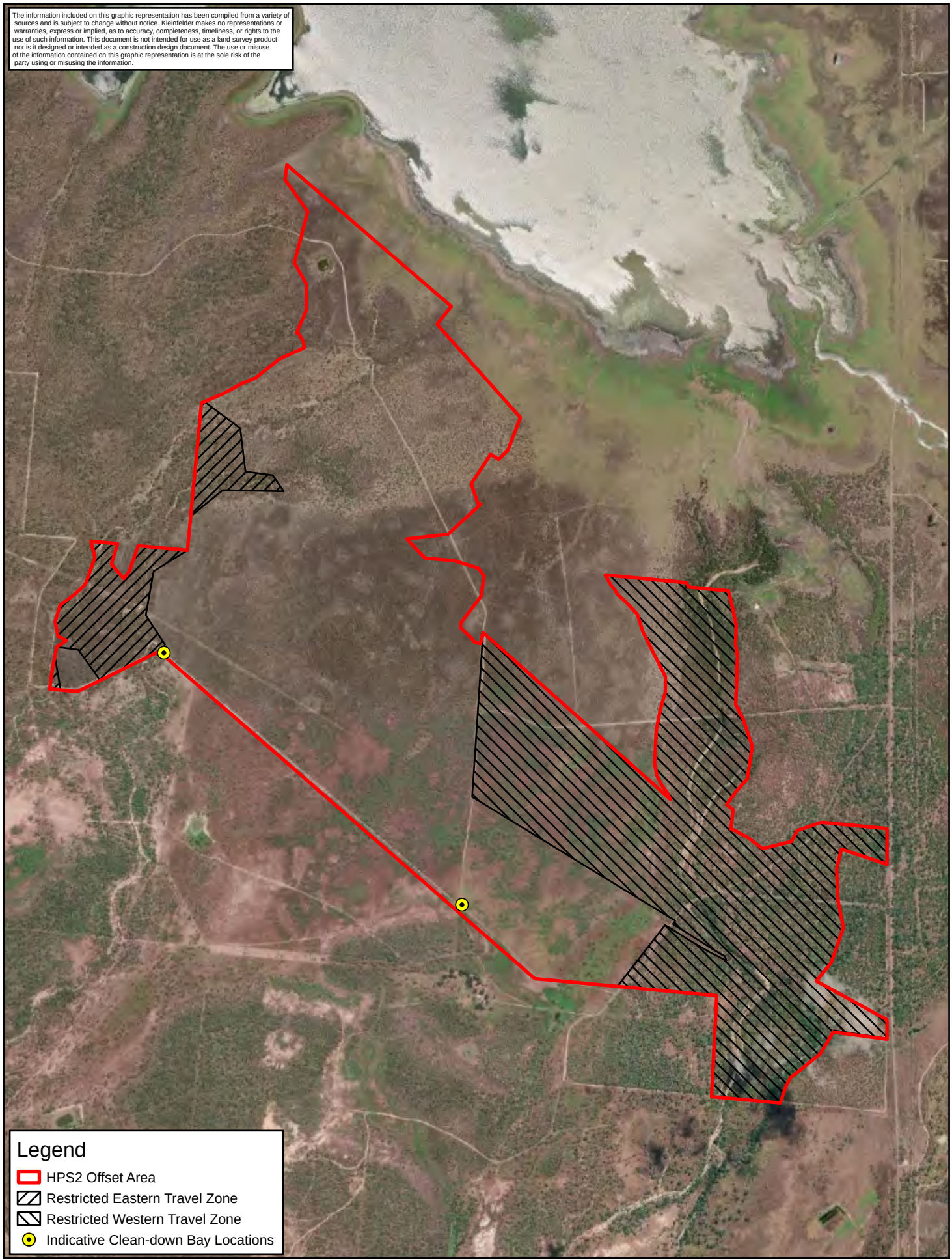

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AVOIDANCE AND/OR MINIMISATION MEASURE LOCATIONS

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

5

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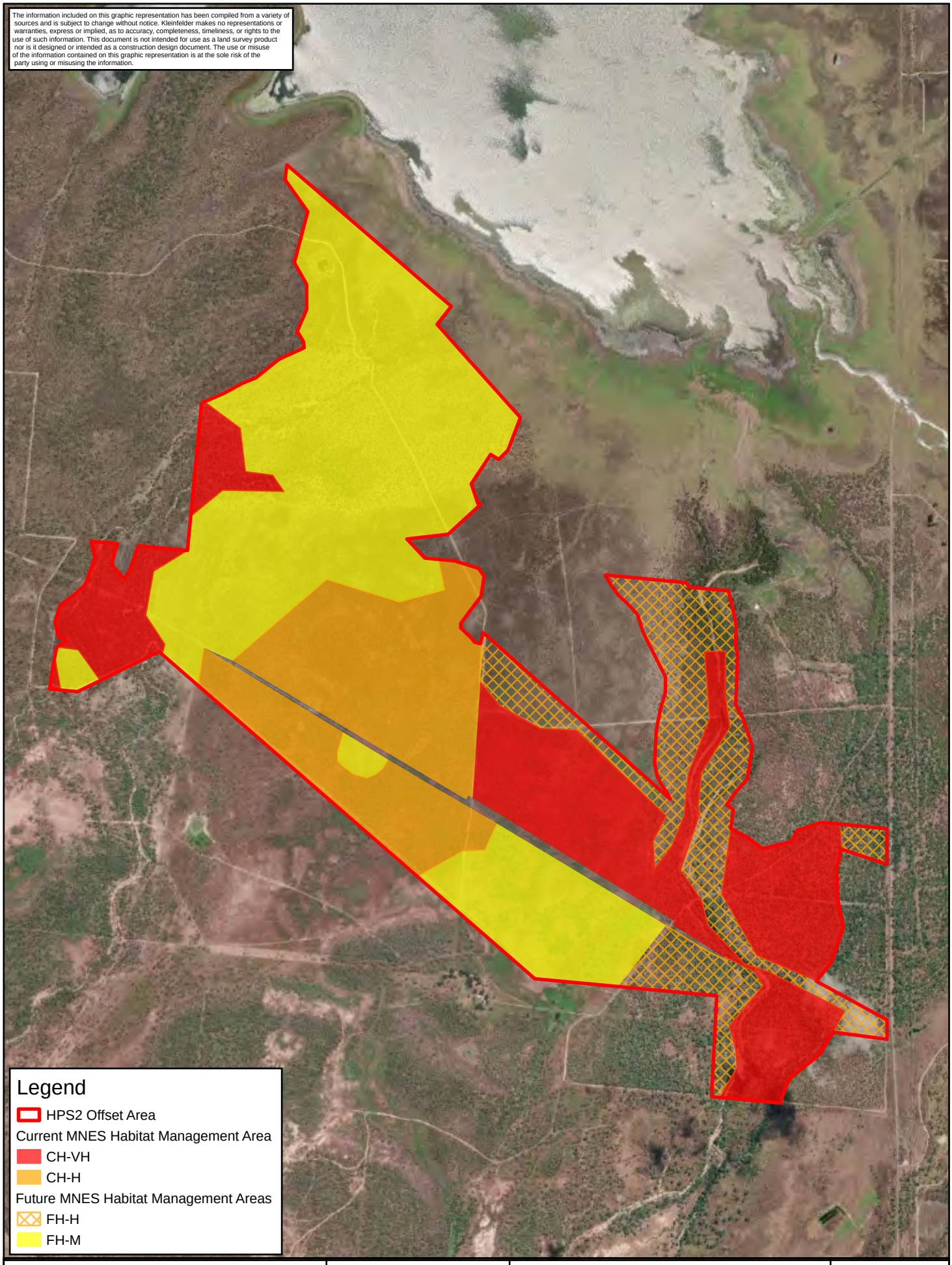

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MANAGEMENT AREAS AND CONTROL ZONING

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

6

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Appendix B: Townsville City Biosecurity Plan 2020-2024 Invasive Plants Tables

Table 2 - Pest Prioritisation Scoring System used in Townsville LGA

Attribute	Score			
	3	2	1	0
Pest Status				
National status.	National alert list or national eradication program.	Weed of National Significance (WoNS) or national feral animal list.	Not scored.	Not scored.
State or local declaration.	Invasive prohibited matter.	Invasive restricted matter.	Priority species in neighbouring Pest Management Plan, Biosecurity Plan, or regional pest strategy.	Not scored.
Potential impact				
Environmental impact.	Major impact on biodiversity and major impact on riparian areas.	Major impact on biodiversity and minor/no impact on riparian areas.	Minor impact on biodiversity.	No impact.
Social impact.	Major risk to public health or safety (e.g. fatality).	Moderate risk to public health, safety or amenity.	Minor annoyance.	No impact.
Economic impact.	Major threat to primary production, industry or transport.	Moderate threat.	Minor threat.	No impact.
Capacity to manage				
Current or potential distribution.	Localised with high potential to spread further in or beyond LGA.	Widespread with moderate potential to spread further.	Widespread with little risk of further spread.	Not scored.
Invasiveness.	Rapid dispersal mechanisms and high population growth rate.	Moderate dispersal and population growth rate.	Slow dispersal and population growth rate.	Not scored.
Achievability.	Population small and can be effectively contained or eradicated.	Population large but can be effectively contained/reduced OR population small but no effective control.	Population large and difficult to contain with current controls.	Not scored.

Scores for each attribute were combined to provide a total prioritisation score, which was used to categorise each pest species as High, Medium or Low priority as shown in Table 3. A high priority pest species was upgraded to critical priority if:

- it is the target of an active eradication program in the Townsville LGA; or
- it poses significant risk to human health if unmanaged.

Table 3 - Prioritisation Categories

Priority	Score
Low	0-9
Medium	10-14
High	15+
Critical	15+ and either: • species with active eradication program in Townsville LGA; or • species that pose significant risk to human health if unmanaged.

The risk categorisation tables below outline the inherent risk posed by each species listed in the Townsville LGA.

The tables below also identify the category for each species so that the statutory responses in addition to the GBO can be identified in table 1 above.

Table 4 - Prioritisation of Pest Plants

Common name	Scientific name	Priority	Status*	Category
Arrowhead	*Sagittaria platyphylla*	Critical	R	3
Gamba grass	*Andropogon gayanus*	Critical	R	3
Grey-hair acacia	*Vachellia gerrardii* (syn. *Acacia g.*)	Critical	P	
Pond apple	*Annona glabra*	Critical	R	3
White ball acacia	*Acaciella angustissima* (syn. *Acacia a.*)	Critical	P	
Yellow burr head	*Limnocharis flava*	Critical	R	2, 3, 4, 5
Amazon sword	*Echinodorus grisebachii* (syn. *E. amazonicus*)	High	R	3
Athel pine	*Tamarix aphylla*	High	R	3
Bellyache bush	*Jatropha gossypiifolia*	High	R	3
Blue thunbergia / laurel clock vine	*Thunbergia grandiflora* (syn. *T. laurifolia)*	High	R	3
Cabomba / fanwort	*Cabomba caroliniana*	High	R	3
Cat's claw creeper	*Dolichandra unguis-cati* (syn. *Macfadyena u.)*	High	R	3
Chinee apple	*Ziziphus mauritiana*	High	R	3
Chinese lantern	*Dichrostachys cinerea* subsp. *malesiana*	High	R	3
Giant Paramatta grass	*Sporobolus fertilis*	High	R	3
Giant rat's tail grass	*Sporobolus pyramidalis* and *S. natalensis*	High	R	3
Hairy cassia	*Senna hirsuta*	High	R	3
Hymenachne	*Hymenachne amplexicaulis*	High	R	3
Lantana	*Lantana camara*	High	R	3
Mesquite	*Prosopis* spp.	High	R	3
Parkinsonia	*Parkinsonia aculeata*	High	R	3
Parthenium	*Parthenium hysterophorus*	High	R	3
Prickly acacia	*Vachellia nilotica* (syn. *Acacia n.*)	High	R	3
Purple / ornamental rubber vine	*Cryptostegia madagascariensis*	High	R	3
Rubber vine	*Cryptostegia grandiflora*	High	R	3
Salvinia	*Salvinia molesta*	High	R	3
Siam weed	*Chromolaena odorata*	High	R	3
Sicklepod	*Senna obtusifolia*	High	R	3
Water hyacinth	*Eichhornia crassipes*	High	R	3
African fountain grass	*Cenchrus setaceus* (syn. *Pennisetum setaceum*)	Medium	R	3
African tulip tree	*Spathodea campanulata*	Medium	R	3
American rat's tail grass	*Sporobolus jacquemontii*	Medium	R	3
Basket asparagus fern	*Asparagus aethiopicus*	Medium	R	3
Brazilian pepper tree	*Schinus terebinthifolius*	Medium	R	3
Camphor laurel	*Cinnamomum camphora*	Medium	R	3

Common name	Scientific name	Priority	Status*	Category
Dutchman's pipe	*Aristolochia elegans*	Medium	R	3
Gaping Dutchman's pipe	*Aristolochia ringens*	Medium	R	3
Harungana	*Harungana madagascariensis*	Medium	R	3
Mother of millions	*Bryophyllum* spp.	Medium	R	3
Prickly pear	*Opuntia* spp, *Cylindropuntia* spp.	Medium	R	3
Round leaf cassia	*Chamaecrista rotundifolia*	Medium	N	
Setaria / pale pigeon grass	*Setaria pumila* subsp. *subtesselata*	Medium	N	
Singapore daisy	*Sphagneticola trilobata*	Medium	R	3
Water lettuce	*Pistia stratiotes*	Medium	R	3
Yellow oleander / Captain Cook tree	*Cascabela thevetia* (syn. *Thevetia peruviana*)	Medium	R	3
Yellow bells	*Tecoma stans*	Low	R	3

* Status under the *Queensland Biosecurity Act 2014*: P = invasive prohibited matter; R = invasive restricted matter; N = not listed.

Table 5 - Prioritisation of Pest Animals

Common name	Scientific Name	Priority	Status*	Category
Feral horse	*Equus caballus*	Critical	N	
Wild dog (other than domestic dog)	*Canis* spp.	Critical	R	3, 4, 6
Yellow crazy ant	*Anoplolepis gracilipes*	Critical	R	3
Cat (other than domestic cat)	*Felis catus*	High	R	3, 4, 6
European fox	*Vulpes vulpes*	High	R	3, 4, 5, 6
European rabbit (domestic and wild breeds)	*Oryctolagus cuniculus*	High	R	3, 4, 5, 6
Feral chital deer	*Axis axis*	High	R	3, 4, 6
Feral pig	*Sus scrofa*	High	R	3, 4, 6
Rusa deer	*Cervus timorensis* (syn. *Rusa t.*)	High	R	3, 4, 6
Cane toad	*Rhinella marina*	Medium	N	
Gambusia / mosquitofish	*Gambusia holbrooki*	Medium	R	3, 5, 6, 7
Tilapia	*Oreochromis*, *Sarotherodon* and *Tilapia* spp.	Medium	R	3, 5, 6, 7
Apple snail	*Pomacea bridgesii*	Low	N	
Peafowl	*Pavo cristatus*	Low	N	
Indian Myna^	*Acridotheres tristis*	Low	N	
Domestic Pigeon	*Columba livia domestica*	Low	N	

* Status under the *Queensland Biosecurity Act 2014*: P = invasive prohibited matter; R = invasive restricted matter; N = not listed.

^ High priority on Magnetic Island

The following table provides weed species which have been identified in the Townsville region but are not listed in the Biosecurity act.

Table 6 – Other weed species in the Townsville region.

Common name	Scientific Name
African mahogany	*Khaya senegalensis*
Amazon sword	*Echinodorus grisebachii (syn. E. amazonicus)*
Bamboo	*Phyllostachys and Bambusa (exotic spp.)*
Bauhinia / butterfly tree	*Bauhinia variegata (syn. B. alba)*
Buffel grass	*Cenchrus ciliaris (syn. Pennisetum c.)*
Butterfly pea	*Clitoria ternatea*
Castor oil plant	*Ricinus communis*
Centro / butterfly pea	*Centrosema molle*
Cherry guava	Psidium cattleianum
Chinese burr	*Triumfetta rhomboidea*
Chinese lantern	*Dichrostachys cinerea subsp. malesiana*
Chinese violet	Asystasia gangetica
Coffee senna	*Senna occidentalis*
Easter cassia	*Senna pendula*
Elephant grass	*Cenchrus purpureus (syn. Pennisetum purpureum)*
Florida beggar weed	*Desmodium tortuosum*
Giant reed	*Arundo donax*
Giant rubber bush	*Calotropis spp.*
Gliricidia	*Gliricidia sepium*
Golden cassia	*Cassia fistula*
Grader grass	*Themeda quadrivalvis*
Grewia	*Grewia asiatica*
Guinea grass	*Megathyrsus maximus*
Hiptage	*Hiptage benghalensis*
Hop-headed barleria	*Barleria lupulina*
Hygrophila	*Hygrophila triflora*
Indian siris	*Albizia lebbeck*
Itch grass	*Rottboellia cochinchinensis*
Ivy gourd	*Coccinea grandis*
Japanese sunflower	*Tithonia diversifolia*
Johnson grass	*Sorghum halepense*
Kalanchoe	*Bryophyllum pinnatum*

Common name	Scientific Name
Knobweed	*Hyptis capitata*
Kyasuma grass / deenanth grass	*Cenchrus pedicellatus subsp. unispiculus*
Leucaena	*Leucaena leucocephala*
Mango	*Mangifera indica*
Mexican poppy	*Argemone mexicana*
Mimosa	*Vachellia farnesiana (syn. Acacia f.)*
Mintweed / hyptis	*Mesosphaerum suaveolens (syn. Hyptis s.)*
Mock orange	*Murraya paniculata cv. Exotica*
Molasses grass	*Melinis minutiflora*
Morning glory	*Ipomoea cairica, I. carnea subsp. fistulosa, I. indica*
Mother-in-law's tongue	*Sansevieria trifasciata*
Navua sedge	*Cyperus aromaticus*
Neem tree	*Azadirachta indica*
Noogoora burr	*Xanthium occidentale*
Orange buddleja	*Buddleja madagascariensis*
Para grass	*Urochloa mutica*
Poinciana	*Delonix regia*
Porcupine flower	*Barleria prionitis*
Praxellis	*Praxellis clematidea*
Sisal hemp	*Agave sisalana*
Snake weed	*Stachytarpheta spp.*
Stinking passionfruit	*Passiflora foetida*
Stylo, Townsville lucerne	*Stylosanthes spp.*
Swamp foxtail / marsh foxtail	*Alopecurus geniculatus (syn. Pennisetum alopecuroides)*
Tamarind	*Tamarindus indica*
Thatch grass	*Hyparrhenia rufa subsp. rufa*
Umbrella sedge	*Cyperus involucratus*
White thunbergia	*Thunbergia fragrans*
Yellow guava	*Psidium guajava*

3.4 Local Alert Species

Local alert species are not currently known from the Townsville LGA but could cause significant impacts if introduced. An Invasive Plants and Animals Surveillance and Control Program (emergency response plan) will be developed to respond to the discovery of any local alert species within the Townsville LGA.

Table 11 – Local alert species in the Townsville LGA

Common name	Scientific Name	Status*
Acacias (non-indigenous spp. Other than listed priority spp.)	Non-indigenous *Acacia, Acaciella* and *Vachellia* spp. (other than listed priority spp.	P
African boxthorn	*Lycium ferocissimum*	R
Alligator weed	*Alternanthera philoxeroides*	R
Anchored water hyacinth	*Eichhornia azurea*	P
Annual ragweed	*Ambrosia artemisiifolia*	R
Badhara bush	*Gmelina elliptica*	R
Balloon vine	*Cardiospermum grandiflorum*	R
Brillantasia	*Brillantaisia lamium*	N
Christ's thorn	*Ziziphus spina-christi*	P
Eurasian water milfoil	*Myriophyllum spicatum*	P
Fireweed	*Senecio madagascariensis*	R
Giant mimosa	*Mimosa pigra*	R
Giant sensitive plant	*Mimosa diplotricha* var. *diplotricha*	R
Glush weed / hygrophila	*Hygrophila costata*	R
Harrisia cactus	*Harrisia* spp.	P or R
Kochia	*Kochia scoparia* (syn. *Bassia scoparia*)	P
Kosters curse	*Clidemia hirta*	R
Kudzu	*Pueraria montana var. lobata* (syn. *P. lobata, P. triloba*)	R
Lagarosiphon	*Lagarosiphon major*	P
Lions tail	*Leonotis nepetifolia*	N
Madras thorn	*Pithecellobium dulce*	R
Mesquite	*Prosopis* spp.	P or R
Mexican bean tree	*Cecropia peltata*	P or R
Miconia	*Miconia* spp.	P or R
Mikania vine	*Mikania micrantha*	P or R
Mist flower	*Ageratina riparia*	N
Mysore thorn	*Biancaea decapetala*(syn. *Caesalpinia d.*)	N
Parramatta grass	*Sporobolus africanus*	N
Peruvian primrose bush	*Ludwigia peruviana*	P
Prickly pears	*Opuntia spp.* (excluding *O. ficus-indica, O. stricta, O. aurantiaca, O. monacantha. O. tomentosa* and *O. streptacantha*	P or R
Red sesbania	*Sesbania punicea*	P
Red witch weed	*Striga asiatica*	R
Salvinia	*Salvinia* spp. (other than *S. molesta*)	P
Senegal tea	*Gymnocoronis spilanthoides*	R
Sicklepod	*Senna tora*	R
Spiked pepper	*Piper aduncum*	P
Triplaris / mulato tree	*Triplaris surinamensis*	N
Venezuelan pokeweed	*Phytolacca rivinoides*	N
Water mimosa	*Neptunia oleracea and N. plena*	R
Willow	*Salix* spp.	R

* Status under the *Queensland Biosecurity Act 2014*: P = invasive prohibited matter; R = invasive restricted matter; N = not listed.

Appendix C: Baseline Weed Survey Report

Baseline Weed Survey Report

Haughton Pipeline Stage 2 Offset Area

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02 October 2024

KLEINFELDER

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CONTENTS

TABLES

FIGURES

ACRONYMS/ ABBREVIATIONS

Term	Meaning
BRSB	Bare-rumped Sheathtail Bat
BO Act	*Biosecurity Act 2014*
BR	*Biosecurity Regulation 2016*
DAFF	Department of Agriculture, Fisheries and Forestry
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GBO	General Biosecurity Obligation
HPS2	Haughton Pipeline Stage 2
LRSA	Lake Ross Storage Area
MNES	Matters of National Environmental Significance
OAMP	Offset Area Management Plan
Offset Area	Offset Area
Priority Weeds	Declared and Non-declared Species (listed in Table 7.3 of Section 7.2 of OAMP)
RE	Regional Ecosystem
SBTF	Southern Black-throated Finch
WMP	Weed Management Plan
WoNS	Weeds of National Significance

1 INTRODUCTION

1.1 PROJECT UNDERSTANDING

Kleinfelder will undertake Weed Plots and comprehensive random meanders of the Haughton Pipeline Stage 2 (HPS2) Project Offset Area (Offset Area) to record all declared weed species and densities for weed species listed in Table 7.3 of Section 7.2 in the Haughton Pipeline Stage 2 (HPS2) Project Offset Area Management Plan (OAMP). This includes any additional *Biosecurity Act 2014* (BO Act) listed and/or Weeds of National Significance Weeds (WoNS) that occur within the Offset Area. All weed species recorded during the Weed Plots and comprehensive random meanders will be provided for use in ongoing management and monitoring of the Offset Area.

1.2 SITE DESCRIPTION

The Offset Area is located south of Ross River Dam in the Lake Ross Storage Area (LRSA), the primary reservoir for Townsville.

The Offset Area comprises a mix of open eucalypt woodlands and forests, shrublands or low woodlands of *Melaleuca viridiflora* (Broad-leaf Tea-tree) and/or *Petalostigma spp*. (Quinine Bush) and/or *Ziziphus mauritiana* (Chinee Apple), riparian forests and open grasslands dominated by exotic grass species (NRA 2018). The vegetation communities in the Offset Area represent a mix of remnant and regrowth regional ecosystems (RE) and non-remnant areas that are mapped as preclear woodland Res (Queensland Herbarium 2024). These woodlands would have supported suitable habitat for Southern Black-throated Finch (SBTF) and the Bare-rumped Sheathtail Bat (BRSB). Areas of remnant RE represent existing habitat values for the Matters of National Environmental Significance (MNES), whilst areas of non-remnant and regrowth REs have limited value, but good future potential habitat values that will be actively managed to enhance the habitat values of the offset (OAMP, 2022).

The Offset Area is subject to extensive weed infestation, with invasive shrubby weeds, particularly Chinee Apple and climber species *Cryptostegia grandiflora* (Rubber Vine) occurring in high local densities. Exotic herbs including *Stylosanthes scabra* (Stylo), *Chamaecrista rotundifolia* (Round-leaf Cassia) and *Sida spp*.

The majority of the Offset Area has been historically used for cattle grazing on freehold land. Sustained cattle grazing has caused a reduction in the abundance of native perennial and annual grasses and relatively high abundance of exotic plant species in the LRSA.

1.3 RELEVANT LEGISLATION AND PLANS

This project was undertaken in accordance with, and/or consideration of, the following Acts and Policies:

Commonwealth:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Reg).

State of Queensland:

- *Biosecurity Act 2014* (BO Act);
- *Biosecurity Regulation 2016* (BR)
- *Nature Conservation Act 1992* (NCA);
- *Nature Conservation (Wildlife) Regulation 2006* (NC(W)R);
- *Nature Conservation (Plants) Regulation 2020* (NC(P)R);
- *Vegetation Management Act 1999* (VMA) and
- *Vegetation Management Regulation 2012* (VMR).

While all Acts and Regulations listed above were considered for this project, largely to identify possible environmental values present, onsite weeds and pests are primarily controlled and regulated under the BO Act and BR within Queensland. Under this Act, the approach is based on a 'General Biosecurity Obligation' (GBO). As stated in the Act, a GBO is the obligation a person has to take all reasonable and practical measures to prevent or minimise a biosecurity risk. It is assumed by the Act that a person will know their business and the biosecurity risks inherent in their business. In the case of land managers, it could be reasonably assumed that they will be

aware of the necessary management of undeveloped land under their control, including which weeds and pests are present on that land and control measures that should be used based on the species present. One of the main focuses of the Act is prevention of further spread of weeds and pests.

The OAMP is the leading document guiding land management within the Offset Area. In Table 7.3 of the OAMP, management of weeds in the Offset Area is detailed under Management Action 3, which requires:

- Ongoing weed control program, detailing methods for weed control that are site-specific and specific to weed species as well as in regard to best practice.
- Alternative treatment options involving an integrated approach including physical, chemical or biological methods. Mechanical clearing requires pre-clearance surveys to mark out desirable vegetation.

Table 7.5 of the OAMP details performance measures at Year 1, Year 5, Year 10 and Year 15 for achieving the overall completion criteria which is a reduction of density and extent of shrubby and grassy weeds by 70% below baseline.

Table 7.7 of the OAMP details monitoring commitments for the density and extent of weed infestations, that requires monitoring quarterly in first year after initial treatment, then every six months in years two and three. Monitoring in year four onwards is annual.

2 SUVERY METHODOLOGY

2.1 SUMMARY

Baseline surveys for recording introduced weed species and weed densities throughout the Offset Area have been designed to be easily repeatable in the future for future weed monitoring surveys to monitor the effectiveness of the management measures being implemented at the time. Kleinfelder has used the location of the previously assessed BioCondition plots (See Figure 4-3 in Section 4.4.1 of the OAMP) to enable data from future BioCondition assessments to also be used for monitoring the effectiveness of weed control measures being implemented at the time. Recording weed species as part of the future BioCondition assessments is recommended to be included in the ongoing Weed Plot monitoring at these sites to enable more effective and timely management to occur.

Weed densities were measured in density classes which correspond with the percent cover OR the number of plants of a given weed species as outlined in **Table 1** below. The survey methodology for recording species densities was derived from Appendix 1 of the Spatial Pest Attribute (SPA) Standard (Department of Agriculture, Fisheries and Forestry, 2017). This document was utilised with a slight deviation for the woody weeds to gain a percentage density (utilising the stem counts along with woody weed crown size to calculate percentages in each plot).

Table 1: Weed Density Classes

Density Class	Percent cover (%)	No. of Plants
Scattered	0-10	1-2
Low	10-20	3-4
Moderate	20-30	5-6
High	30-50	7-14
Very High	>50	>15

Figure 4.2 in Section 4.4.1 of the OAMP was referred to for plot sizing (50m x 10m) to ensure consistency in data collection for weeds during subsequent BioCondition surveys. Smaller plots would increase the likelihood of local variability skewing the data.

2.2 Weed Plot Surveys

Weed plot transects were undertaken at all previously assessed BioCondition plots (22x) (refer to Figure 4-3 in Section 4.4.1 of the OAMP) and at seven additional locations (**Figure 1**). The additional Weed Plot locations were chosen to get more datapoints within current MNES habitat for the BRSB, koala and SBTF and within areas that were representative of the site including areas of known priority weed infestations. This was undertaken to ensure rigid and robust ongoing Weed Plot sampling can occur over time to enable timely and cost-effective management of the Offset Area targeting priority areas where required.

The middle point (25m) of all Weed Plots aligned with the centre point of the corresponding BioCndition plots, with the start point located in the most representative vegetation surrounding the BioCondition centre point. This was undertaken due to no data provided for the start or end point for the 100m BioCondition plots or associated bearing. Weed plots were undertaken over 0-50m with 10 quadrats surveyed along the 50m tape in quadrats 10m long (along the tape) and 5m wide (extending out from the tape). This resulted in 5x quadrats (end to end) on each side of the tape from 0-10m, 10-20m, 20-30m, 30-40m and 40-50m. Pink flagging tape was placed in the corners of the end plots 5m out from the tape at the start and end of the 0-50 transect to ensure accurate quadrat sizes. Refer to **Plate 1** for the Weed Plot setup. An image was taken at the start point of each Weed Plot facing towards the 50m length of tape measure, as seen in **Attachment 3,** it is recommended photos be taken in landscape view to capture a larger width of vegetation however during this baseline survey portrait view was captured.

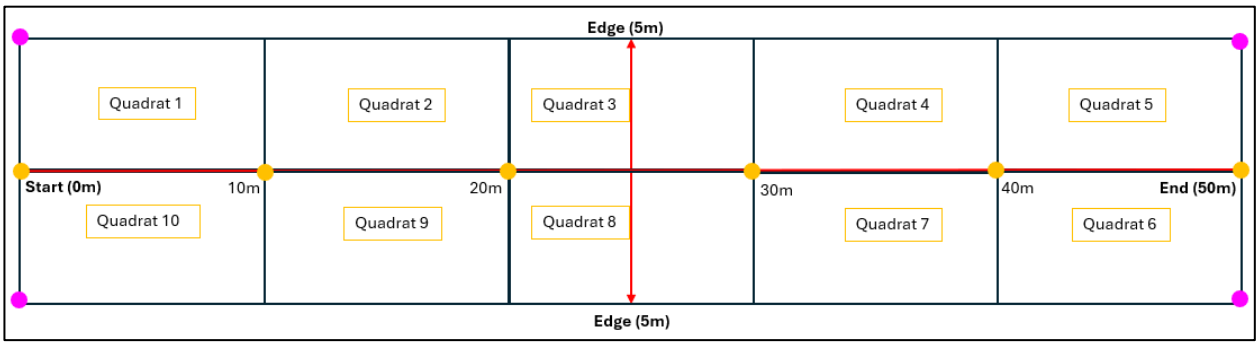

Plate 1 Weed Plot Setup

Only the declared and non-declared weed species, as listed in Table 7.3 of Section 7.2 of the OAMP, were identified and associated species densities recorded for all Weed Plots. Any additional BO Act listed and/or Weeds of National Significance Weeds were also recorded, as well as non-declared weeds that were occurring within high abundances at each Weed Plot locations.

Densities were decided as per **Table 1** above, in line with Appendix 1 of the SPA Standard developed by Department of Agriculture, Fisheries and Forestry in 2017 (**Attachment 1**).

2.3 Random Meander Surveys

Random meander surveys on foot were undertaken throughout the entirety of the Offset Area (where accessible) to record only declared weed species and associated species densities. This was undertaken in addition to the Weed Plots due to it being a GBO. Only declared weeds weed were assessed during random meanders due to the high density of non-declared weed species present throughout the entire Offset Area including Round-leaf Cassia (*Chamaecrista rotundifolia*), Stylo (*Stylosanthes scabra*), Horehound (*Mesosphaerum (syn. Hyptis) suaveolens*), Snakeweed (*Stachytarpheta jamaicensis*) and *Sida* sp.

Random meandering was also undertaken to ground-truth infestations that have been mapped via aerial imagery. All areas unable to be accessed on foot for random meandering to accurately record weed species and associated species densities were mapped in the field from the perimeter where possible and updated using Google Earth aerial imagery to ensure accurate weed polygons and densities for high density weed areas was recorded.

2.4 Data Analysis

2.4.1 Non-declared Weeds

2.4.1.1 Collection

These species are only surveyed for as part of the Weed Plot surveys, as they are all species that are widespread in occurrence, and it is not feasible to survey and collect data on these for the entire Offset Area during the random meandering. To note however, data was collected on the monospecific stands of the Thatch and Grader Grasses seen on site (not within survey plots) during random meandering.

2.4.1.2 Interpretation

Density will be averaged for plot data of all weeds occurring in each management zone to get an average density of each species per zone. The raw weed species density scores are tabulated at species level to allow comparison year on year ensuring management actions are having the desired effect and the offset is on track to reach completion criteria.

Extent of occurrence for non-declared species are mapped across the entire Offset Area according to the Weed Plots each species occurs within. The extents will also be separated into each individual species to allow delineation of management measures for each zone.

2.4.2 Declared Weeds

2.4.2.1 Collection

Data collected during the survey illustrates all locations of every declared species (either in the form of a single data points or polygons to signify a patch/infestation (>10m x 10m)) identified during the random meandering. The spatial files include metadata on percentage cover and maturity.

For Weed Plots, data is collected on occurrence at the location and density that can be surveyed for and analysed each year.

2.4.2.2 Interpretation

The densities of each species recorded in the Weed Plots are considered during future analysis post-monitoring separate to total densities for the Offset Area as all 30 plots only encompass a negligible amount of the total Offset Area. The random meanders and mapping of infestation will provide a total density (hectares and percentage) for each individual declared species infestations in the Offset Area.

The survey methodologies provide spatial data that illustrates an 'extent of occurrence' within the Offset Area. By separating extent into each individual declared species, it allows coordination of different management efforts dependent on extent.

3 RESULTS

3.1 SUMMARY

A summary of all priority weed species (declared and non-declared) recorded throughout the Offset Area is listed below in **Table 2**, as well as several additional non-declared species that are not a priority for management in the Offset Area but were widespread in occurrence including Joyweed, Hoary Basil and Stinking Passionflower. Other non-priority non-declared species recorded on occasion at weed plots are Guinea Grass, Leucaena, Para Grass and Phasey Bean.

Of the 30 Weed Plots assessed within the Offset Area, the most commonly recorded weed species were Chinee Apple - *Ziziphus mauritiana* (27 Weed Plots), Stinking Passionflower - *Passiflora foetida* (21 Weed Plots) and Shrubby Stylo - *Stylosanthes scabra* (20 Weed Plots). The most commonly recorded BO Act listed weed species within the Offset Area were Chinee Apple, Rats Tail Grasses – *Sporobolus* sp. (7 Weed Plots) and Siam Weed - *Chromolaena odorata* (4 Weed Plots). The most commonly recorded WoNS within the Offset Area were Rubber Vine - *Cryptostegia grandiflora* (13 Weed Plots) and Lantana - *Lantana camara* (2 Weed Plots).

Extent of occurrence and density of priority declared weed species in the Offset Area are discussed and illustrated in **Attachment 2** as follows:

- Chinee Apple was most prevalent across the Offset Area noted in both Weed Plots and random meanders, as shown in **Figure 2a.**
- Rubbervine was the next most commonly encountered in Weed Plots and random meanders as evident in **Figure 2c** and **Figure 3a.**
- Lantana, Siam Weed and Sicklepod were occasionally identified at Weed Plots however all three species were identified at varying densities across the Offset Area, at times forming infestations.

- Lantana occurrence and density is illustrated in **Figure 2b** and **Figure 3b**,
- Siam Weed occurrence and density is shown in **Figure 2d** and **Figure 3c**,
- Sicklepod tended to associate occurrence and infestations with areas adjacent waterways or within waterways, as shown in **Figure 2f** and **Figure 3d**.

- Sporobolus species were identified at seven plots but were also identified during random meanders as shown in **Figure 2e**.
- Hymenachne did not occur at any Weed Plots but was identified in three locations on site connected to or within a waterway (**Figure 3e**).

Table 2: Summary of Priority Weed Species Recorded within the Offset Area

Common Name	Scientific Name	Status		Weed Form	Weed Plots	Random Meanders	
		BA	WoNS		Number	No. of Weed Data Points Collected	Total Infestations Area (ha)
Chinee Apple	*Ziziphus mauritiana*	Cat 3	Nil	Woody/Shrubby	27	33	571.02
Grader Grass	*Themeda quadrivalvis*	Nil	Nil	Grass	5	18	19.16
Guinea Grass	*Megathyrsus maximus*	Nil	Nil	Grass	1	Nil	
Hoary Basil	*Ocimum americanum*	Nil	Nil	Forb	4	Nil	
Horehound	*Mesosphaerum (syn. Hyptis) suaveolens*	Nil	Nil	Forb	10	Nil	
Hymenachne	*Hymenachne amplexicaulis*	Cat 3	WoNS	Grass	-	1	0.89
Joyweed	*Alternanthera sp.*	Nil	Nil	Forb	17	Nil	
Lantana	*Lantana camara*	Cat 3	WoNS	Woody/Shrubby	2	64	17.94
Leucaena	*Leucaena leucocephala*	Nil	Nil	Woody/Shrubby	2	Nil	
Para Grass	*Urochloa mutica*	Nil	Nil	Grass	1	Nil	
Phasey Bean	*Macroptilium lathyroides*	Nil	Nil	Woody/Shrubby	1	Nil	
Prickly Acacia	*Vachellia nilotica*	Cat 3	WoNS	Woody/Shrubby	-	3*	Nil
Rats-Tail Grasses	*Sporobolus sp.*	Cat 3	Nil	Grass	7	Nil	3.76
Round-leaf Cassia	*Chamaecrista rotundifolia*	Nil	Nil	Forb	10	Nil	
Rubber Vine	*Cryptostegia grandiflora*	Cat 3	WoNS	Woody/Shrubby	13	193	185.71
Shrubby Stylo	*Stylosanthes scabra*	Nil	Nil	Woody/Shrubby	20	Nil	
Siam Weed	*Chromolaena odorata*	Cat 3	Nil	Woody/Shrubby	4	41	3.81
Sicklepod	*Senna obtusifolia*	Cat 3	Nil	Woody/Shrubby	3	Nil	36.53
Sida sp.	*Sida* sp.	Nil	Nil	Woody/Shrubby	15	Nil	
Snakeweed	*Stachytarpheta sp.*	Nil	Nil	Forb	10	Nil	
Stinking Passionflower	*Passiflora foetida*	Nil	Nil	Woody/Shrubby	21	Nil	
Thatch Grass	*Hyparrhenia rufa*	Nil	Nil	Grass	0	3	7.50

* Only isolated plants identified.

3.2 WEED PLOT SURVEYS

Thirty Weed Plots were undertaken within the Offset Area, comprising of 21 pre-existing BioCondition plot locations and nine additional ones predominantly located in either current or future MNES habitat. The location of the Weed Plots assessed for pest flora species are listed below in **Table 3**.

Table 3: Summary of Weed Plot Location Data

Plot_ID	Corresponding BioCondition plot	Start (0m)		Middle (25m)	
		Easting	Northing	Easting	Northing
W1	BioCondition 68	16342839.77	-2212697.75	16342818	-2212710
W2	BioCondition 2	16342007.6	-2213715.881	16342030	-2213721
W3	-	*	*	16342509	-2213836
W4	BioCondition 65	16343118.83	-2213777.98	16343097	-2213764
W5	-	16341526.99	-2214614.731	16341502	-2214624
W6	-	16341900.1	-2214424.551	16341906	-2214450
W7	BioCondition 56	16342328.44	-2214443.267	16342328	-2214416
W8	-	16342825.25	-2214101.445	16342802	-2214117
W9	BioCondition 29	16342931.65	-2214275.876	16342933	-2214251
W10	BioCondition 47	16342363.11	-2215073.275	16342339	-2215062
W11	BioCondition 15	16342971.78	-2214727.855	16342958	-2214748
W12	BioCondition 26	16343277	-2214622.267	16343286	-2214598
W13	BioCondition 50	16343586.9	-2214759.502	16343611	-2214774
W14	-	16344428.83	-2214509.148	16344434	-2214536
W15	BioCondition 43	16342853.66	-2215307.972	16342878	-2215325
W16	BioCondition 4	16343370.49	-2215327.015	16343366	-2215351
W17	-	16343898.19	-2215470.932	16343918	-2215489
W18	BioCondition 32	16344147.92	-2215318.3	16344166	-2215300
W19	BioCondition 11	*	*	16344686	-2214975
W20	BioCondition 34	16344491.18	-2215690.92	16344492	-2215666
W21	BioCondition 38	*	*	16344707	-2215605
W22	BioCondition 20	16343620.29	-2216144.355	16343641	-2216160
W23	BioCondition 17	16343935.49	-2215913.893	16343927	-2215937
W24	BioCondition 53	16344316.16	-2215912.05	16344291	-2215923
W25	BioCondition 41	16344650.92	-2215890.01	16344687	-2214976

Plot_ID	Corresponding BioCondition plot	Start (0m)		Middle (25m)	
		Easting	Northing	Easting	Northing
W26	-	16344993.73	-2215935.99	16344996	-2215965
W27	BioCondition 72	16345538.1	-2215785.141	16345536.60	-2215759
W28	-	16344368.26	-2216335.608	16344385	-2216355
W29	BioCondition 7	16344663.1	-2216211.2	16344670	-2216221
W30	-	16345077.72	-2216670.506	16345078	-2216697

Note: Corresponding BioCondition Plot – Centre point of BioCondition Plot (50m), corresponds with the centre point of the Weed Plot (25m). * Denotes Weed Plots where there was no access to the Start (0m) to record exact coordinates.

3.2.1 Weed Species Records

A summary of all weed species including average density and their average occurrence within Weed Plots they were identified within are provided in **Table 4**. Density percentages were given a score to allow for ease of data interpretation as follows:

- Score 1: Less than 10%
- Score 2: 10% to 20%
- Score 3: 20% to 30%
- Score 4: 30% to 50%
- Score 5: More than 50%

Table 4: Summary of All Weed Species Recorded within Weed Plots

Common Name	Scientific Name	Summary			
		No. of Plots	Occurrence Across All Sites (%)	Average Density (Class)*	Average Density (%) *
Chinee Apple	*Ziziphus mauritiana*	27	90.0	2.7	20-30
Grader Grass	*Themeda quadrivalvis*	5	16.7	2.6	20-30
Guinea Grass	*Megathyrsus maximus*	1	3.3	2	20-30
Hoary Basil	*Ocimum americanum*	4	13.3	1	10-20
Horehound	*Mesosphaerum (syn. Hyptis) suaveolens*	10	33.3	3	30-40
Joyweed	*Alternanthera* sp.	17	56.7	1.7	10-20
Lantana	*Lantana camara*	2	6.7	1	20-30
Leucaena	*Leucaena leucocephala*	2	6.7	2	20-30
Para Grass	*Urochloa mutica*	1	3.3	4	40-50
Rats Tail Grass	*Sporobolus* sp.	7	23.3	1.4	10-20
Round-leaf Cassia	*Chamaecrista rotundifolia*	10	33.3	3.8	30-40
Rubber Vine	*Cryptostegia grandiflora*	13	43.3	1.2	10-20
Shrubby Stylo	*Stylosanthes scabra*	20	66.7	3.6	30-40
Siam Weed	*Chromolaena odorata*	4	13.3	1	10-20
Sicklepod	*Senna obtusifolia*	3	10.0	2	20-30
Sida sp.	*Sida* sp.	15	50.0	1.7	10-20
Snakeweed	*Stachytarpheta* sp.	10	33.3	1.2	10-20
Stinking Passionflower	*Passiflora foetida*	21	70.0	1.1	10-20

Note: *Average Density (class and %) is for the average density of the weeds recorded across all quadrats within a Weed Plot.

Species recorded in each Weed Plot were given a density percentage and associated scoring, with data for each Weed Plot in **Table 5** to **Table 7** for all 30 plot locations, detailing:

- Average density of each priority weed species at each individual plot.
- Total number of priority weeds at each Weed Plot.
- Total average density (percentage and scoring) of all priority weeds at each individual plot.

Table 5: Summary of All Weed Species and Density Averages Recorded within Weed Plots (W1 to W10)

Common Name	Scientific Name	Weed Plot ID									
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Chinee Apple	*Ziziphus mauritiana*	1	4	5	2	2	2	2	3		2
Grader Grass	*Themeda quadrivalvis*		4	1	5						
Guinea Grass	*Megathyrsus maximus*			2							
Hoary Basil	*Ocimum americanum*				1		1				
Horehound	*Mesosphaerum (*syn*. Hyptis) suaveolens*		2			2				3	
Joyweed	*Alternanthera* sp.		1		2	1			2		1
Lantana	*Lantana camara*		1								
Leucaena	*Leucaena leucocephala*				1						
Para Grass	*Urochloa mutica*	4									
Rats Tail Grass	*Sporobolus* sp.					2		1	1	2	
Round-leaf Cassia	*Chamaecrista rotundifolia*		3			5				3	
Rubber Vine	*Cryptostegia grandiflora*		1		1	1		1	1		
Shrubby Stylo	*Stylosanthes scabra*	3			1	4	5	4	4	4	5
Siam Weed	*Chromolaena odorata*				1	1					
Sicklepod	*Senna obtusifolia*	1		1							
Sida sp.	*Sida* sp.		1	5		1	1				1
Snakeweed	*Stachytarpheta* sp.				1	1		2	1	1	
Stinking Passionflower	*Passiflora foetida*	1	1		2	1		2	1		1
Summary	No. of Weed Sp. (per site)	5	9	5	10	11	4	6	7	5	5
	Average Density (class)*	2	2	2.8	1.7	1.9	2.25	2	1.9	2.6	2
	Average Density (%) *	20-30	20-30	20-30	10-20	10-20	20-30	20-30	10-20	20-30	20-30

Table 6: Summary of All Weed Species and Density Averages Recorded within Weed Plots (W11 to W20)

Common Name	Scientific Name	Weed Plot ID									
		W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
Chinee Apple	*Ziziphus mauritiana*	2		4	4	3	1	2	2	5	3
Grader Grass	*Themeda quadrivalvis*										
Guinea Grass	*Megathyrsus maximus*										
Hoary Basil	*Ocimum americanum*										1
Horehound	*Mesosphaerum* (syn. *Hyptis) suaveolens*	2						3			
Joyweed	*Alternanthera* sp.			1	4	1		1		1	1
Lantana	*Lantana camara*										
Leucaena	*Leucaena leucocephala*										
Para Grass	*Urochloa mutica*										
Rats Tail Grass	*Sporobolus* sp.		1								
Round-leaf Cassia	*Chamaecrista rotundifolia*	5	4				5		5		2
Rubber Vine	*Cryptostegia grandiflora*					1					1
Shrubby Stylo	*Stylosanthes scabra*	3	4	5		5	5	4	1		2
Siam Weed	*Chromolaena odorata*										
Sicklepod	*Senna obtusifolia*				4						
Sida sp.	*Sida* sp.	1	1				1	2	2	5	1
Snakeweed	*Stachytarpheta sp.*		1	1					2		
Stinking Passionflower	*Passiflora foetida*	1	1	1		1	1	1	1		1
Summary	No. of Weed Sp.	6	6	5	3	5	5	6	6	3	8
	Average Density (class)*	2.3	2	2.4	4	2.2	2.6	2.2	2.2	3.7	1.5
	Average Density (%)*	20-30	20-30	20-30	40-50	20-30	20-30	20-30	20-30	30-40	10-20

Table 7: Summary of All Weed Species and Density Averages Recorded within Weed Plots (W21 to W30)

Common Name	Scientific Name	Weed Plot ID									
		W21	W22	W23	W24	W25	W26	W27	W28	W29	W30
Chinee Apple	*Ziziphus mauritiana*	5	3		2	4	3	1	1	3	3
Grader Grass	*Themeda quadrivalvis*							2			1
Guinea Grass	*Megathyrsus maximus*										
Hoary Basil	*Ocimum americanum*				1						
Horehound	*Mesosphaerum* (syn. *Hyptis) suaveolens*	5				3	4			3	2
Joyweed	*Alternanthera* sp.	5			2		2	2	1	1	
Lantana	*Lantana camara*										1
Leucaena	*Leucaena leucocephala*									3	
Para Grass	*Urochloa mutica*										
Rats Tail Grass	*Sporobolus* sp.						2	1			
Round-leaf Cassia	*Chamaecrista rotundifolia*		5		1						
Rubber Vine	*Cryptostegia grandiflora*	1			2		1	3		1	1
Shrubby Stylo	*Stylosanthes scabra*		3	5	3				2		
Siam Weed	*Chromolaena odorata*				1		1				
Sicklepod	*Senna obtusifolia*										
Sida sp.	*Sida* sp.			1	1			1			
Snakeweed	*Stachytarpheta* sp.				1			1			
Stinking Passionflower	*Passiflora foetida*		1	1	1			1	1		1
Summary	No. of Weed Sp.	4	4	3	10	2	6	8	4	5	6
	Average Density (class)*	4	3	2.3	1.5	3.5	2.2	1.5	1.25	2.2	1.5
	Average Density (%)*	40-50	30-40	20-30	10-20	30-40	20-30	10-20	10-20	20-30	10-20

Note: *Average Density (class and %) is for the average density of the weeds recorded across all quadrats within a Weed Plot.

3.2.2 Non-declared Weeds

The extent of occurrence and average densities for each of the weed species identified at Weed Plots across the Offset Area detailed in **Table 8,** are displayed in **Figure 4a** to **Figure 4l** (**Attachment 2**).

Several species in **Table 8** are not listed as priority in Table 7.3 of Section 7.2 of OAMP, however they were noted during data collection and reported due to their widespread occurrence across the Offset Area, and/or due to their known ability to develop into monospecific infestations if not subject to management. These species include:

- Hoary Basil
- Joyweed
- Leucaena
- Stinking Passionflower.

Guinea Grass and Para Grass are listed in Table 7.3 of Section 7.2 of OAMP as a priority for control due to their potential impact on MNES habitat, however their occurrence at Weed Plots was rare. As shown in **Table 8**, both Guinea Grass and Para Grass were separately recorded at a single Weed Plot in the FH-M management Zone.

Table 8: Average Density of Non-declared Weeds from Weed Plot Data within the Management Zones

Common Name	CH-VH			CH-H			FH-H			FH-M		
	No. of Plots	Occurrence Across Sites (%)	Average Density (%) *	No. of Plots	Occurrence Across Sites (%)	Average Density (%) *	No. of Plots	Occurrence Across Sites (%)	Average Density (%) *	No. of Plots	Occurrence Across Sites (%)	Average Density (%) *
Grader Grass	2	29	20-30	0	0	-	1	11	20-30	2	20	30-40
Guinea Grass	0	0	-	0	0	-		0	-	1	10	20-30
Hoary Basil	1	14	10-20	0	0	-	1	11	10-20	2	20	10-20
Horehound	6	86	20-30	1	25	20-30	2	22	40-50	1	10	30-40
Joyweed	6	86	10-20	1	25	10-20	6	67	20-30	3	30	10-20
Leucaena	1	14	30-40	0	0	-	0	0	-	1	10	10-20
Para Grass	0	0	-	0	0	-	0	0	-	1	10	40-50
Round-leaf Cassia	3	43	30-40	3	75	40-50	2	22	30-40	2	20	40-50
Shrubby Stylo	3	43	30-40	4	100	40-50	3	33	10-20	9	90	30-40
Sida sp.	4	57	10-20	4	100	10-20	4	44	20-30	3	30	20-30
Snakeweed	2	29	10-20	1	25	10-20	2	22	10-20	4	40	10-20
Stinking Passionflower	5	71	10-20	4	100	10-20	4	44	10-20	7	70	10-20
Total sites (per zone)	**7**			**4**			**9**			**10**		

Note: *Average Density (%) is for the average density of the weeds recorded across all quadrats within a Weed Plot.

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3.3 RANDOM MEANDERS

Random meanders to record densities of all priority declared weeds and non-declared Thatch Grass and Grader Grass, and map if they were occurring in infestations were undertaken throughout the Offset Area. Due to the heavy infestations of some shrubby weed species including Chinee Apple these areas were sometimes inaccessible to traverse on foot. The perimeter extent of these weed infestations was mapped out, however additional weed species that may occur within these infestations were not able to be included in the results. Refer to **Table 9** and **Table 10** for a summary of all declared weed species and Thatch Grass and Grader Grass recorded within random meanders throughout the Offset Area.

Grader Grass and Thatch Grass were individually mapped across the Offset Area as they are prevalent in small infestations on the site however were rarely seen in the Weed Plots, as shown in **Figure 3f** and **Figure 3g**, respectively.

The total density of shrubby weeds within the Offset Area and associated weed management zones is shown below in **Table 9** and **Table 10**. The total area of the Offset Site is approximately 625ha, with the total area for each of the management zones described in the Weed Management Plan making up the following:

- CH-VH: 154.20 ha
- CH-H: 120.73 ha
- FH-H: 95.81 ha
- FH-M: 259.12 ha

Table 9: Priority Weed Species and Estimated Area Densities Recorded in Random Meander Surveys

Common Name	Growth Form	Total Density in Offset Area (ha)*					Total Extent in Offset Area (ha)
		Scattered	Low	Moderate	High	Very High	
Chinee Apple	Shrubby	47.64	114.68	87.71	104.31	216.68	571.02
Grader Grass	Grass	0.25	14.45	0.998	2.62	0.85	19.16
Hymenachne	Grass	0.01	-	0.025	0.11	0.74	0.89
Lantana	Shrubby	-	1.59	11.854	4.50	-	17.94
Rats Tail Grasses	Grass	3.52	-	0.01	0.05	0.184	3.76
Rubber Vine	Shrubby	116.19	8.10	53.195	8.30	-	185.71
Siam Weed	Shrubby	2.55	-	-	1.26	-	3.81
Sicklepod	Shrubby	-	-	-	-	36.53	36.53
Thatch Grass	Grass	3.24	4.25	-	0.01	-	7.50

*Note: Prickly acacia (*Vachellia nilotica*) was also recorded on site, with only 3 isolated records.

Table 10: Priority Weed Species and Percentage Densities Recorded in Random Meander Surveys

Common Name	Growth Form	Percentage Density in Offset Area (%) *					Total Extent of Offset Area (%)
		Scattered	Low	Moderate	High	Very High	
Chinee Apple	Shrubby	7.6	18.35	14.03	16.69	34.67	91.34
Grader Grass	Grass	0.04	2.3	0.16	0.42	0.14	3.06^
Hymenachne	Grass	<0	-	<0	0.02	0.12	0.14
Lantana	Shrubby	-	0.25	1.9	0.72	-	2.87
Rats Tail Grasses	Grass	0.56	-	<0	0.01	0.03	0.6
Rubber Vine	Shrubby	18.6	1.3	8.51	1.33	-	29.74
Siam Weed	Shrubby	0.4	-	-	0.2	-	0.6
Sicklepod	Shrubby	-	-	-	-	5.84	5.84
Thatch Grass	Grass	0.52	0.68	-	<0	-	1.2

*Note: Prickly acacia (*Vachellia nilotica*) was also recorded on site, with only 3 isolated records. ^ Final Grader Grass density and extent in Offset Area is also considered under data reported in Table 8 for Weed Plots in each zone.

Table 11: Priority Weed Species and Estimated Densities Recorded in Random Meander Surveys Within Weed Management Zones

Common Name	Growth Form	Total Density in each Weed Management Zone (ha)*					Percentage Density in Zone (%) *
		Scattered	Low	Moderate	High	Very High	
Zone CH-VH							
Chinee Apple	Shrubby	0.92	2.79	32.17	50.30	67.55	99.7
Grader Grass	Grass	<0.01	4.26	<0.01	0.02	-	2.8^
Hymenachne	Grass	-	-	<0.01	0.09	0.29	0.3
Lantana	Shrubby	-	1.59	11.56	4.27	-	11.3
Prickly Acacia	Grass	-					0
Rats Tail Grasses	Shrubby	-	-	<0.01	0.01	-	0.01
Rubber Vine	Shrubby	14.41	<0.01	43.22	4.63		40.4
Siam Weed	Shrubby	2.55	-	-	1.03	-	0.02
Sicklepod	Grass	-	-	-	-	3.81	2.5
Thatch Grass	Shrubby	-					0
Zone CH-H							
Chinee Apple	Shrubby	27.02	31.76	4.35	23.62	-	71.9

Common Name	Growth Form	Total Density in each Weed Management Zone (ha)*					Percentage Density in Zone (%) *
		Scattered	Low	Moderate	High	Very High	
Grader Grass	Grass	<0.01	4.257	-	-	-	3.5^
Hymenachne	Grass	-					0
Lantana	Shrubby	-					0
Prickly Acacia	Grass	-					0
Rats Tail Grasses	Shrubby	-					0
Rubber Vine	Shrubby	0.20	3.44	0.09	-	-	3.1
Siam Weed	Shrubby						0
Sicklepod	Grass	-	-	-	-	6.38	5.3
Thatch Grass	Shrubby	<0.01	4.25	-	-	-	3.5
Zone FH-H							
Chinee Apple	Shrubby	-	6.32	6.87	17.91	56.07	90.9
Grader Grass	Grass	0.22	5.92	0.40	0.13	0.64	7.6^
Hymenachne	Grass	-	-	0.02	0.02	0.18	0.2
Lantana	Shrubby	-					0
Prickly Acacia	Grass	-					0
Rats Tail Grasses	Shrubby	-	-	-	0.04	0.18	0.2
Rubber Vine	Shrubby	0.97	2.69	9.34	3.23	-	16.9
Siam Weed	Shrubby	-					0
Sicklepod	Grass	-	-	-	-	26.33	27.5
Thatch Grass	Shrubby	3.23	-	-	-	-	3.4
Zone FH-M							
Chinee Apple	Shrubby	19.70	73.81	44.32	12.47	93.07	93.9
Grader Grass	Grass	<0.01	<0.01	0.59	2.48	0.21	1.3^
Hymenachne	Grass	<0.01	-	-	-	0.27	0.1
Lantana	Shrubby	-	-	0.30	0.23	--	0.2
Prickly Acacia	Grass	-					0
Rats Tail Grasses	Shrubby	3.52	-	-	-	-	1.4
Rubber Vine	Shrubby	100.53	1.95	0.55	0.44	-	39.9
Siam Weed	Shrubby	-	-	-	0.23	-	0.09
Sicklepod	Grass	-					0
Thatch Grass	Shrubby	-	-	-	<0.01	-	<0

*Note: Prickly acacia (*Vachellia nilotica*) was also recorded on site, with only 3 isolated records. ^ Final Grader Grass density and extent in Offset Area is also considered under data reported in Table 8 for Weed Plots in each zone.

4 RECOMMENDATIONS

It is recommended that ongoing monitoring of priority weeds occurs throughout the life of the Offset Area Weed Management Plan to enable timely adaptive management to occur, to ensure the best ecological outcomes can be achieved.

It is recommended that surveying of Weed Plots is monitored by a one Suitably Qualified Person per monitoring event to ensure consistency of results are achieved across the monitoring survey – which can be accurately compared with previous monitoring surveys.

Sincerely,

Kleinfelder Australia Pty Ltd

George Bradey

Senior Ecologist
BBioSc (Hons)
gbradey@kleinfelder.com
Mobile: 0498475256

Attachments

Attachment 1 SPA Standard
Attachment 2 Figures
Attachment 3 Weed Plot Location and Images

ATTACHMENT 1 SPA STANDARD

6 APPENDIX 1: Density values

6.1 Density values for ground cover species

This group includes grasses and herbs, vines, aquatic weeds and cacti.

Table 12: Percentage ground covers and equivalent look-up categorical value.

Percentage ground cover	Lookup value
< 10	Scattered
10 – 20	Low
20 – 30	Moderate
> 30	High

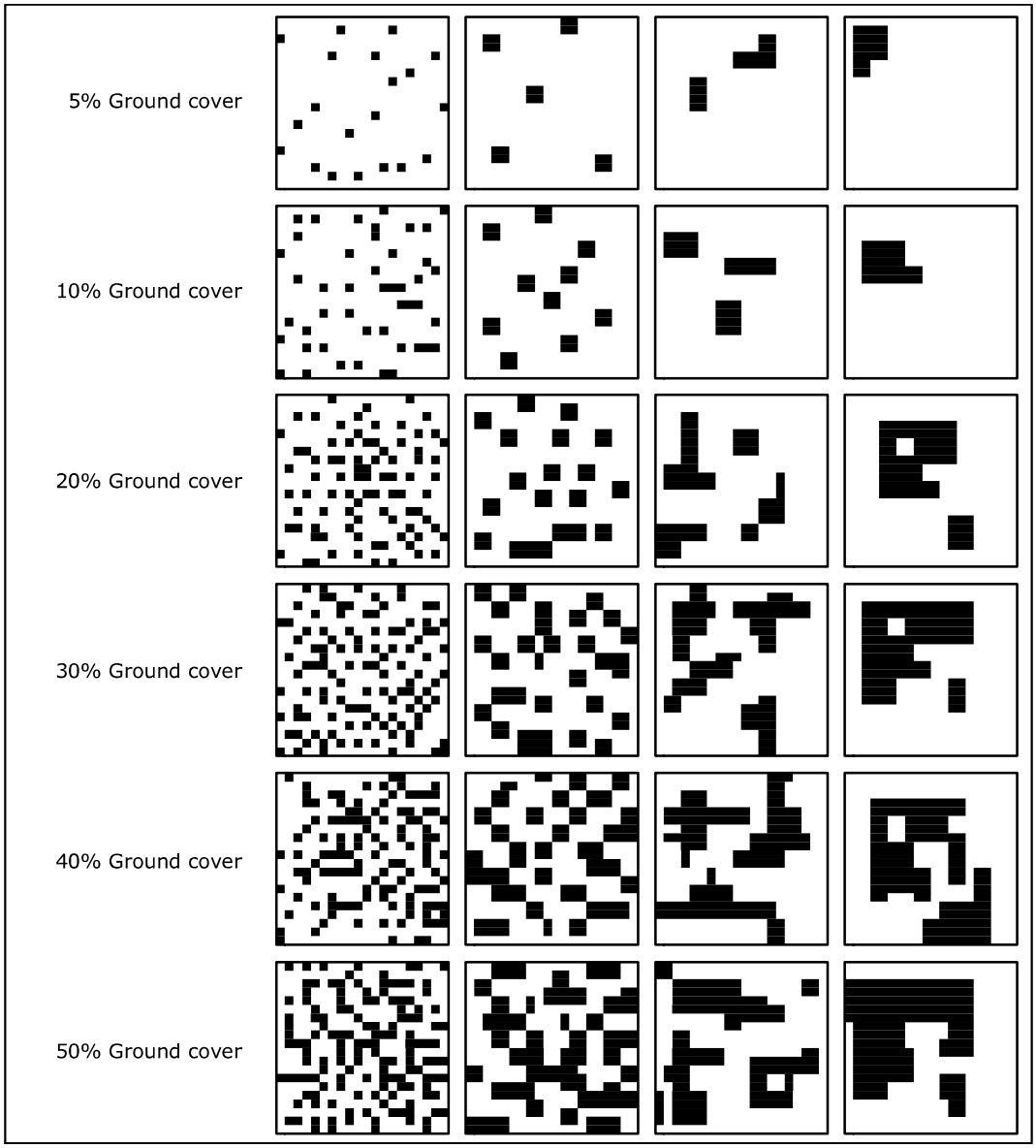


Figure 3: Distribution of ground cover visual aid for helping to assess percentage cover (Source: Bayley, 2001).

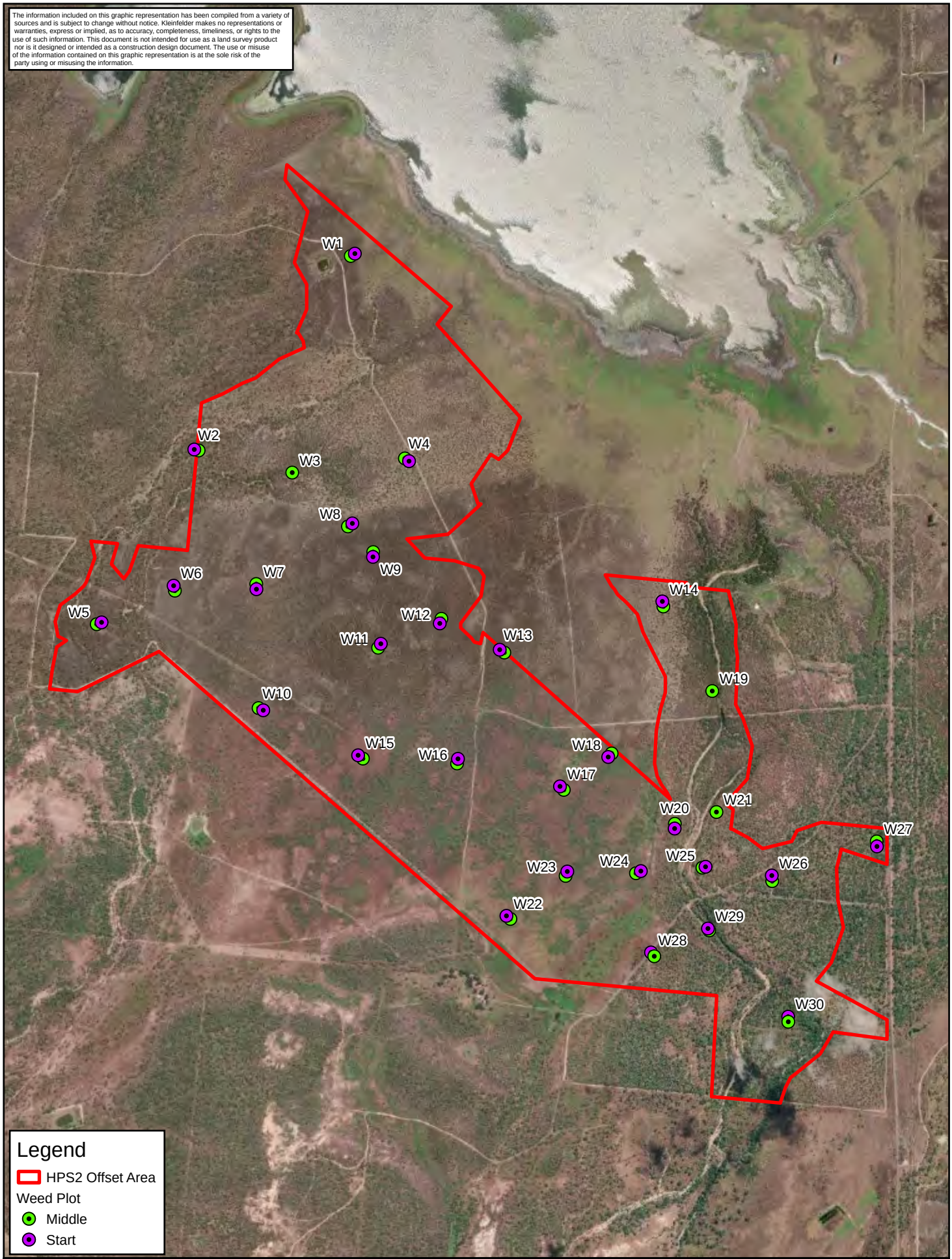
6.2 Density values for shrubs and woody species

This group includes shrubs and woody vegetation.

Table 13: Average number of stems per 10 square metres (10m x 10m). (Source: PestInfo Geographic Information System).

No. stems /10m^2	Lookup value
1 to 2	Scattered
3 to 4	Low
5 to 6	Moderate
> 7	High

ATTACHMENT 2 FIGURES



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

GDA 1994 MGA Zone 55

N

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PROJECT REFERENCE:	24005427
DATE DRAWN: 2/10/2024	Version 1
DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

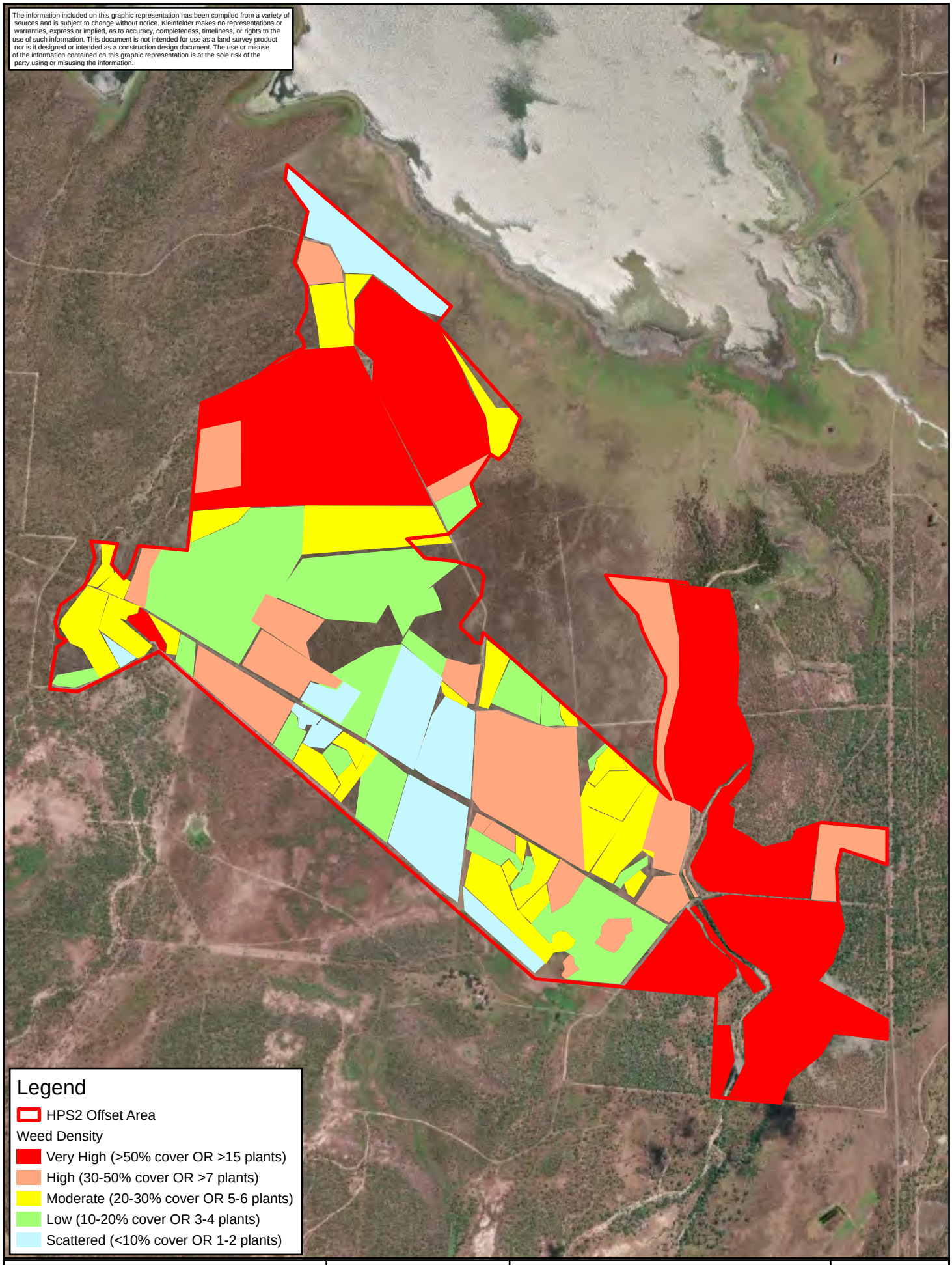
SURVEY EFFORT - WEED PLOTS

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

1a

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (1a)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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DATE DRAWN: 2/10/2024	Version 1
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DATA SOURCE: Esri - 2024	

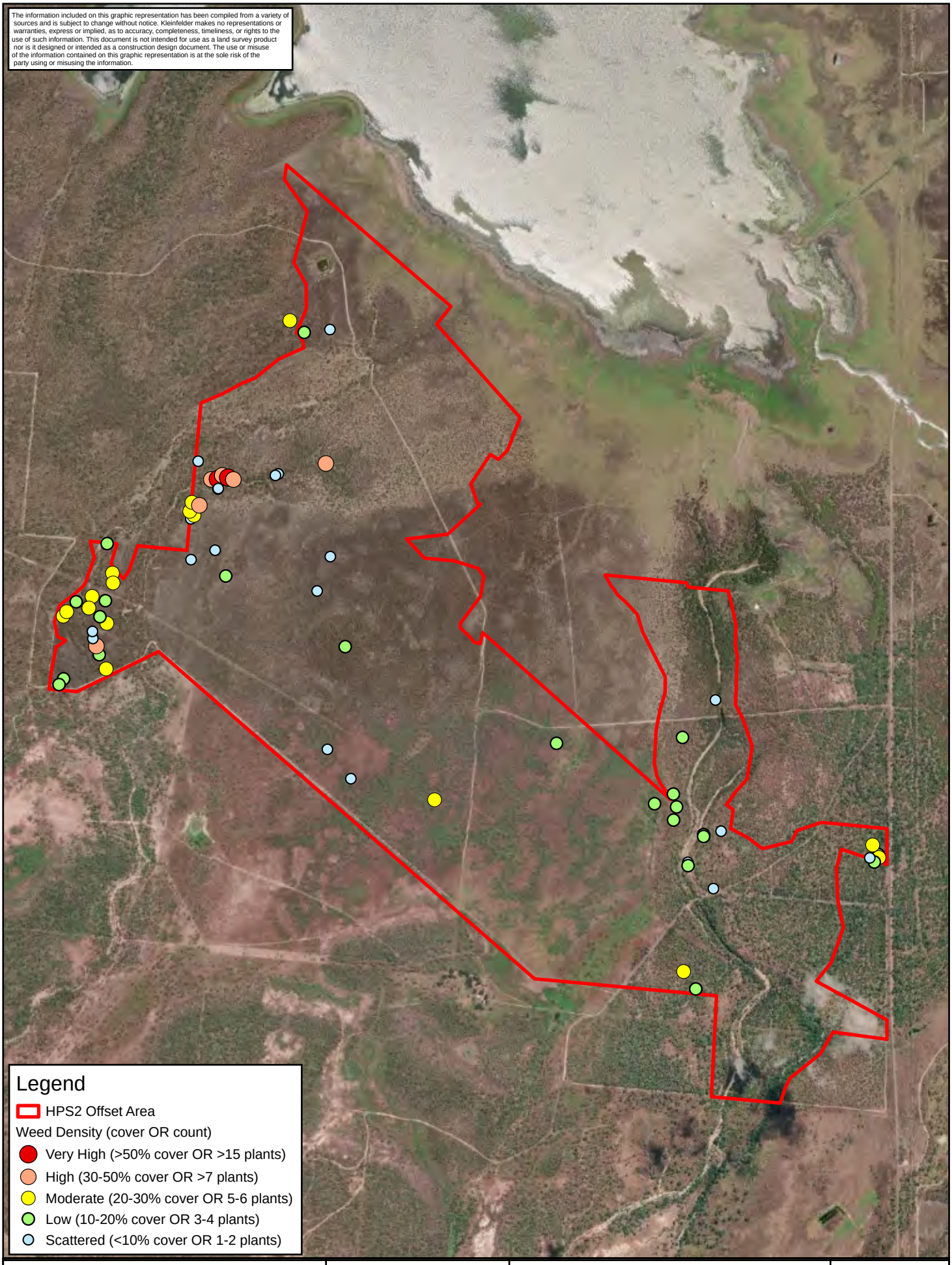
INFESTATION/ **EXTENT OF OCCURRENCE** CHINEE APPLE (ZIZIPHUS MAURITIANA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2a

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (2b)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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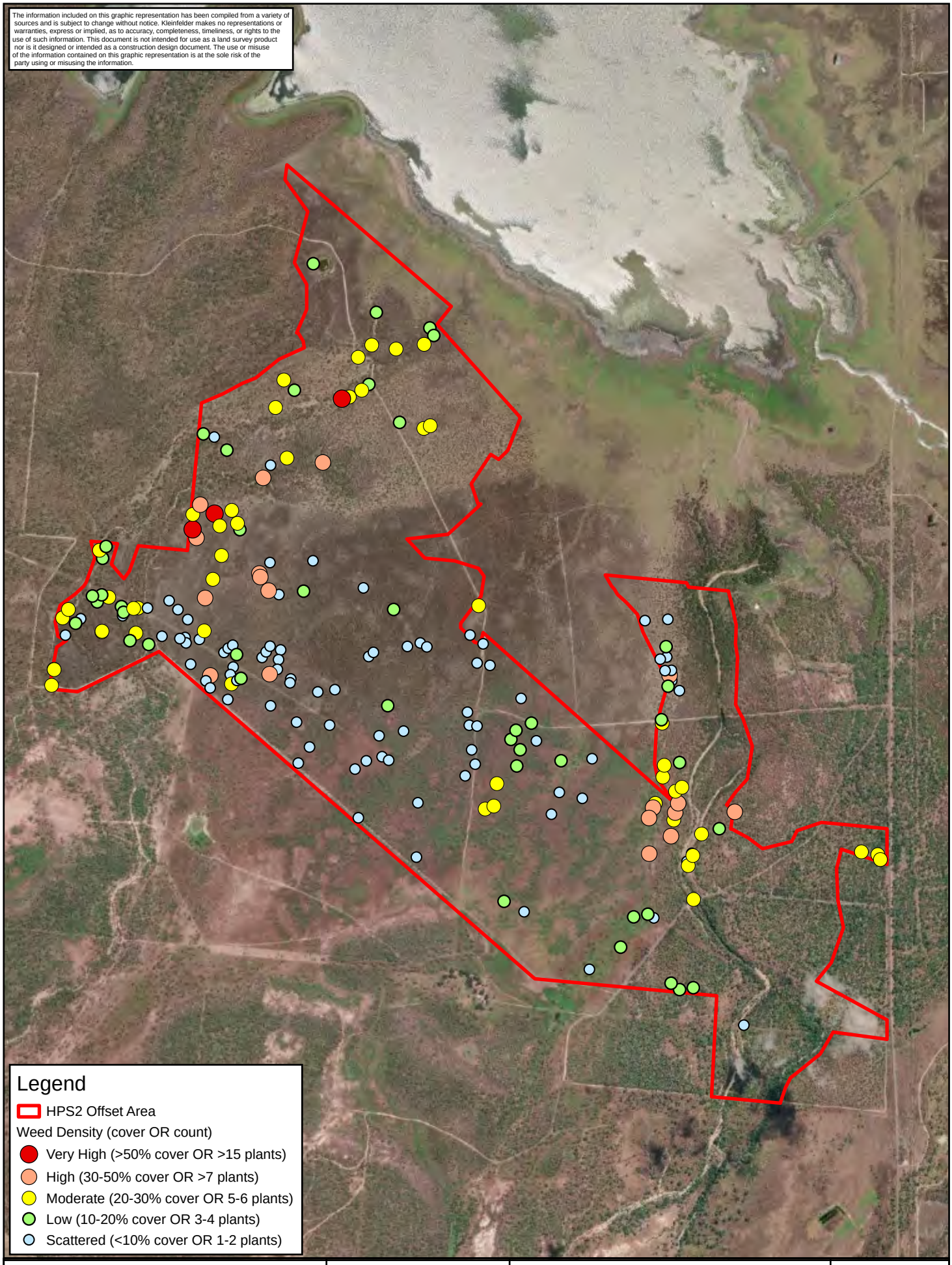
EXTENT OF OCCURRENCE FOR DECLARED WEEDS - LANTANA

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2b

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3c)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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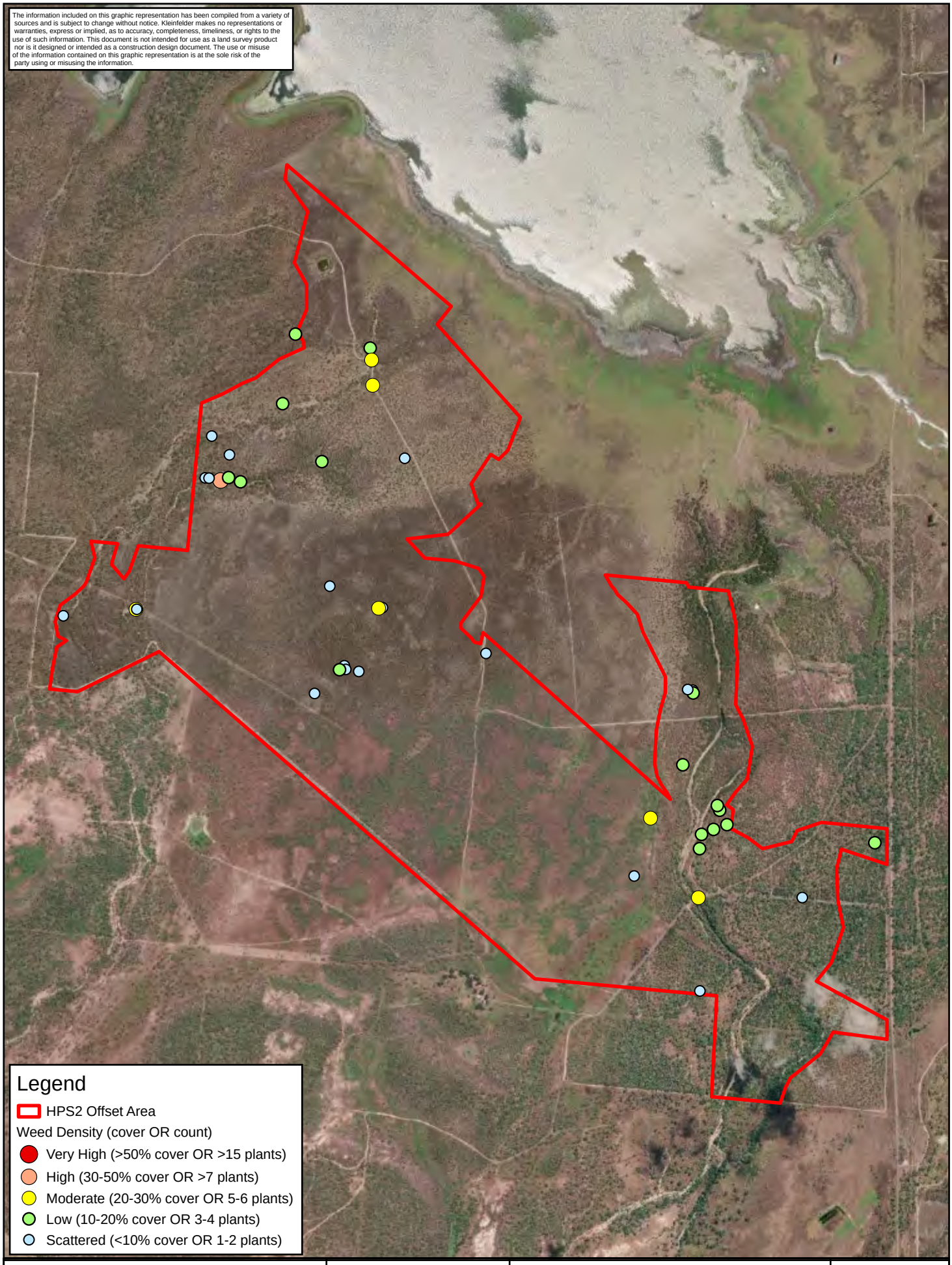
EXTENT OF OCCURRENCE FOR DECLARED WEEDS - RUBBER VINE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2c

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3b)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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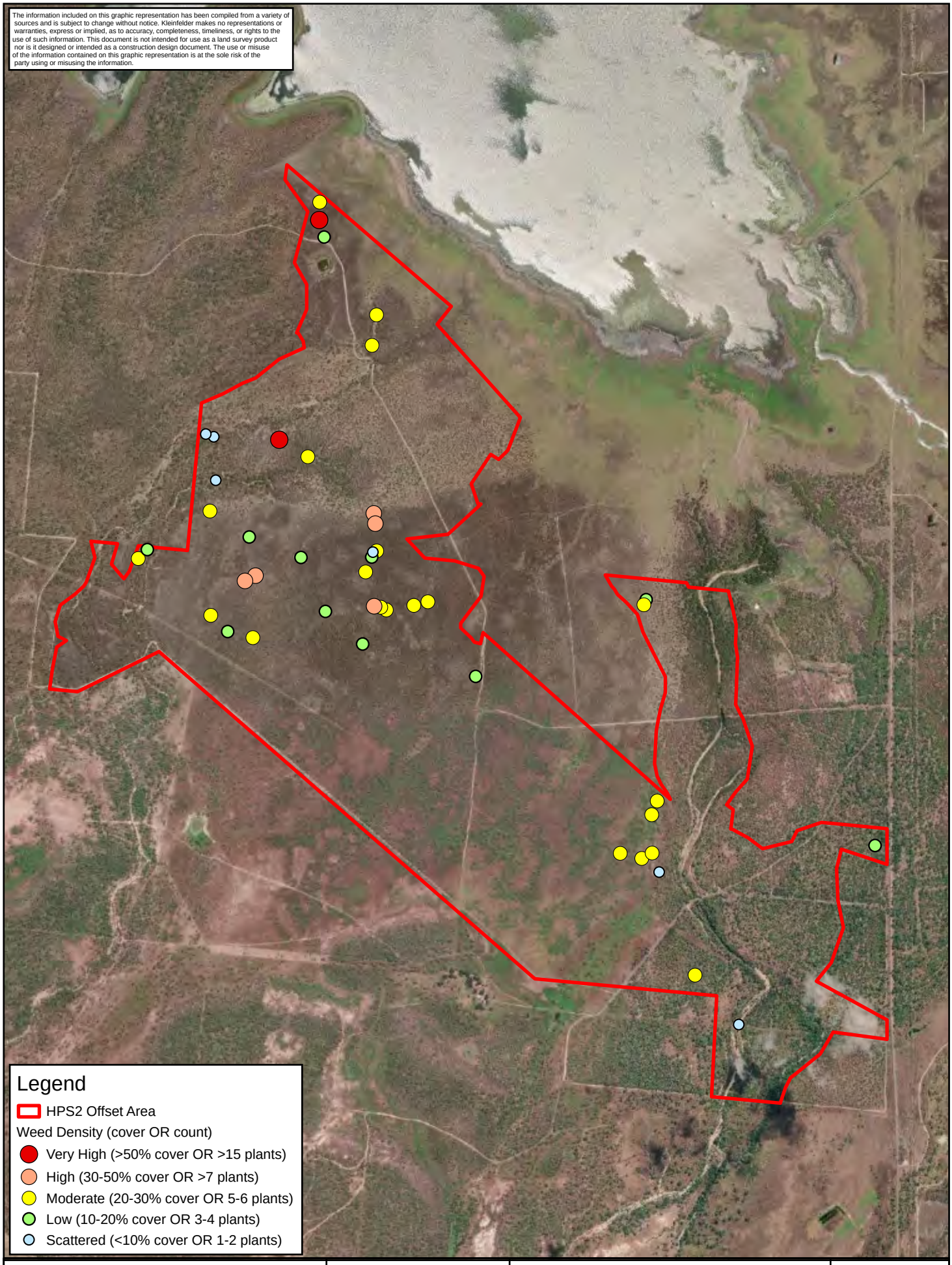
EXTENT OF OCCURRENCE FOR DECLARED WEEDS - SIAM WEED

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2d

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3d)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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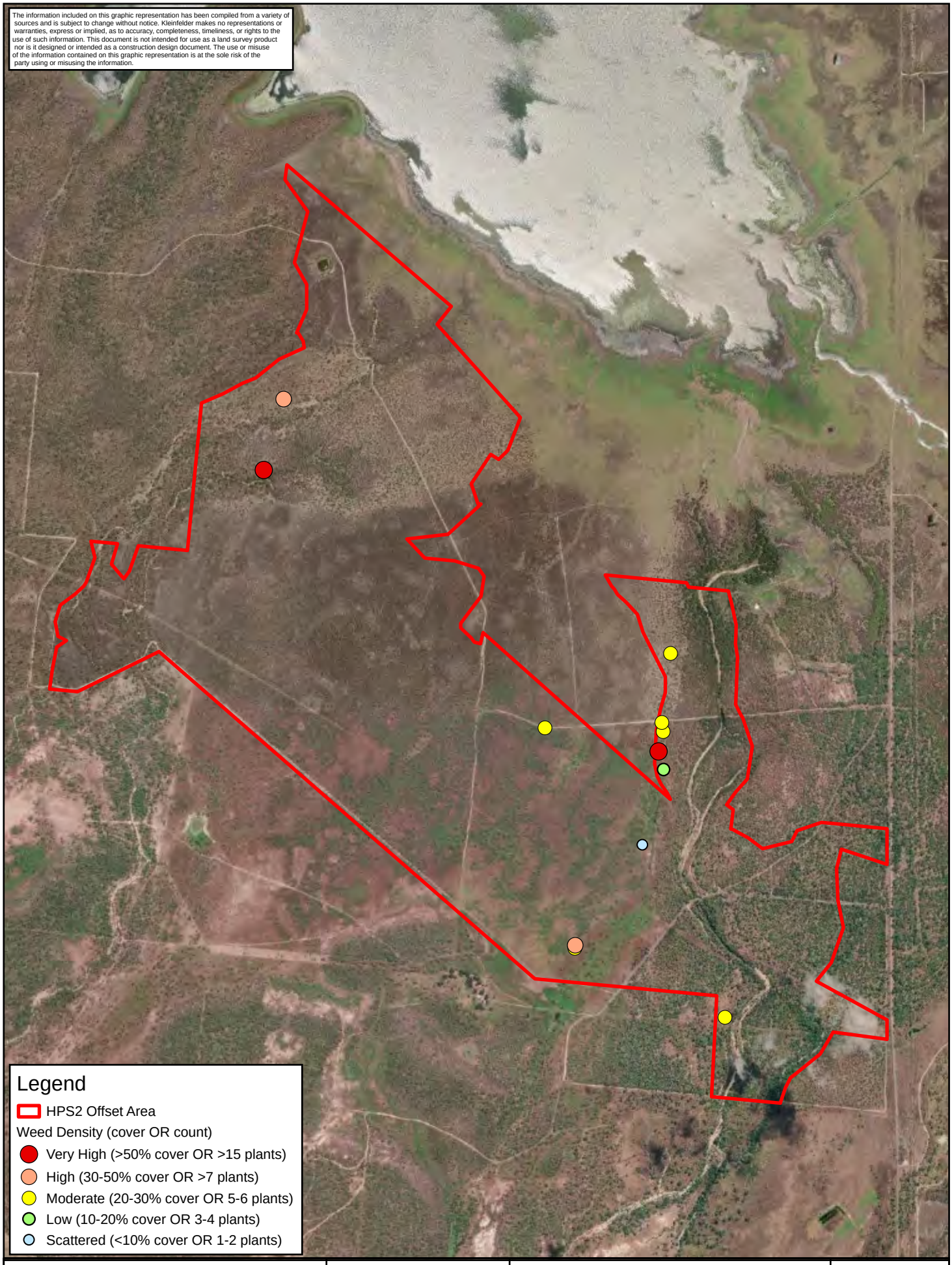
EXTENT OF OCCURRENCE FOR DECLARED WEEDS - SPOROBOLUS SP.

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2e

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3e)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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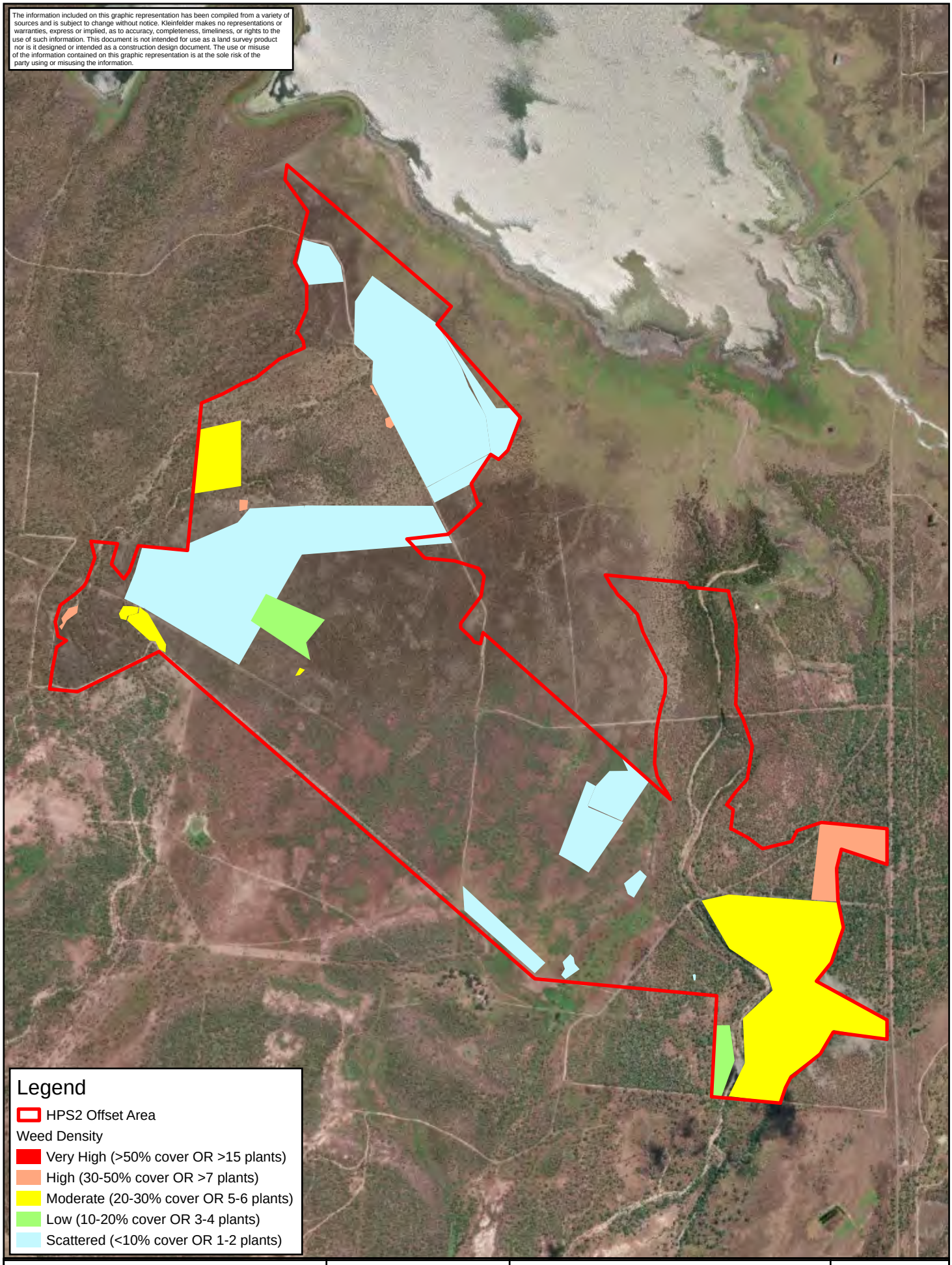
EXTENT OF OCCURRENCE FOR DECLARED WEEDS - SICKLEPOD

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

2f

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3h)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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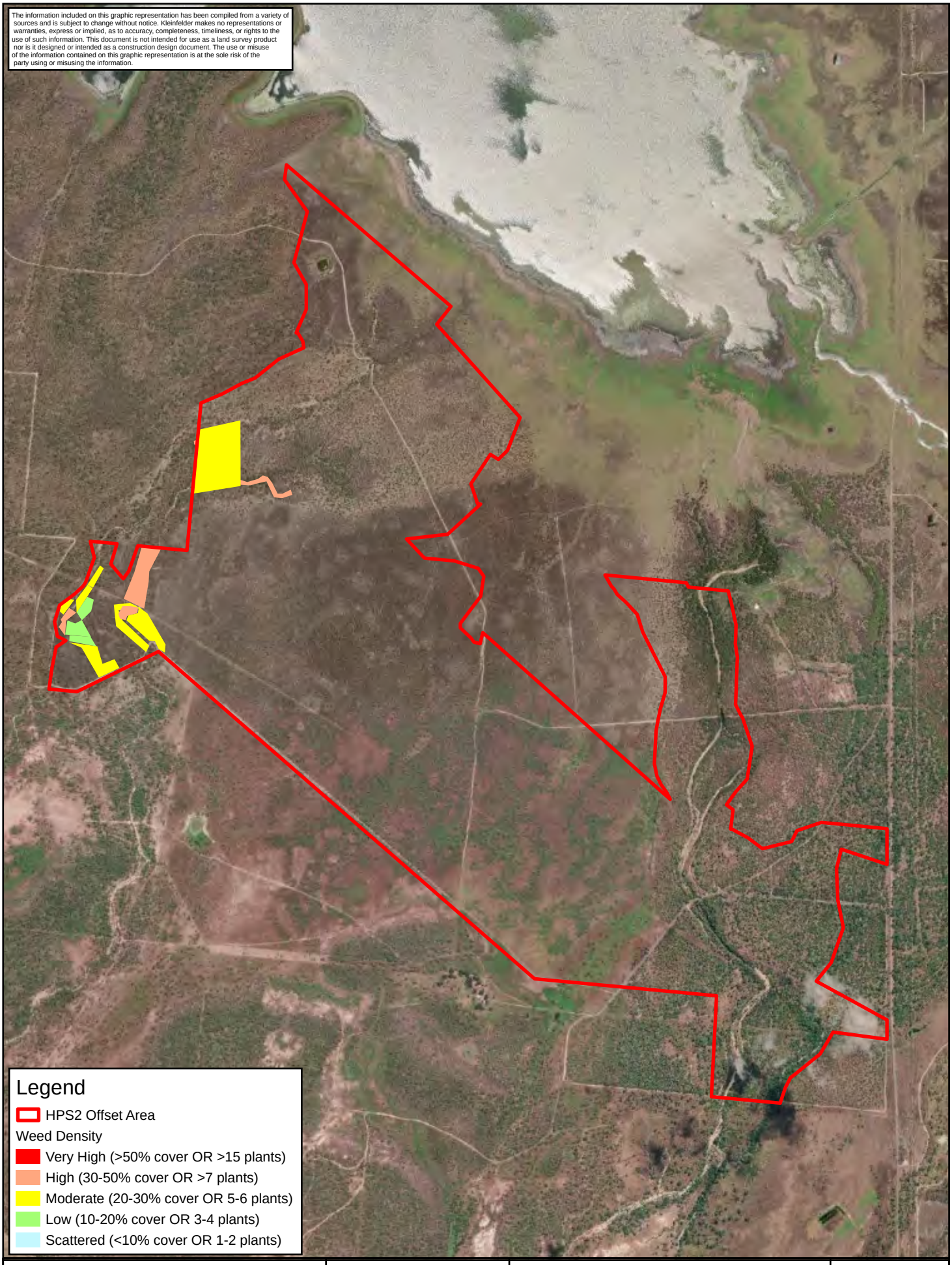
INFESTATIONS - RUBBER VINE (CRYPTOSTEGIA GRANDIFLORA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3a

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3f)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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INFESTATIONS - LANTANA (LANTANA CAMARA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3b

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3e)

0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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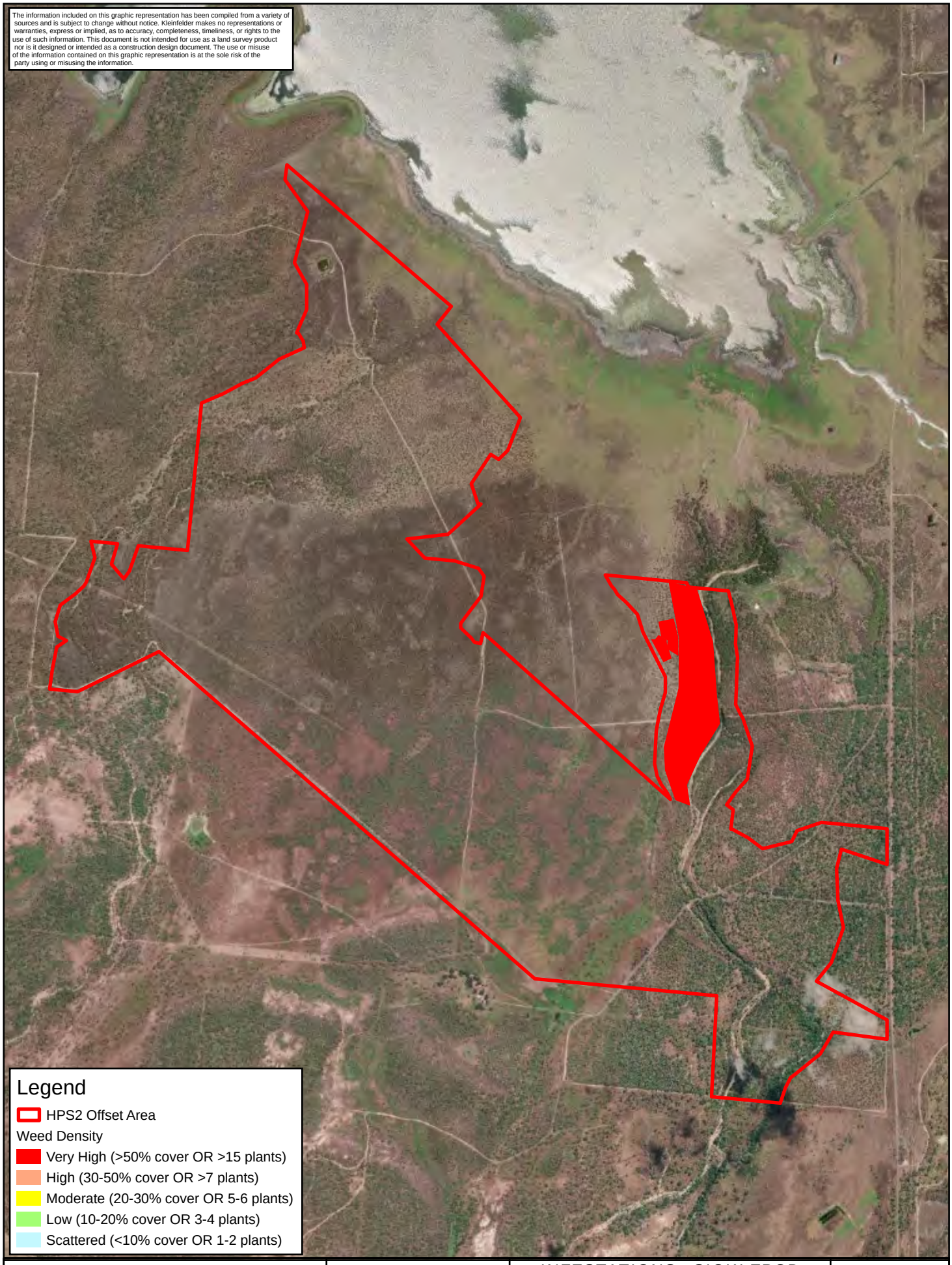
INFESTATIONS - SIAM WEED (CHROMOLAENA ODORATA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3c

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3g)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

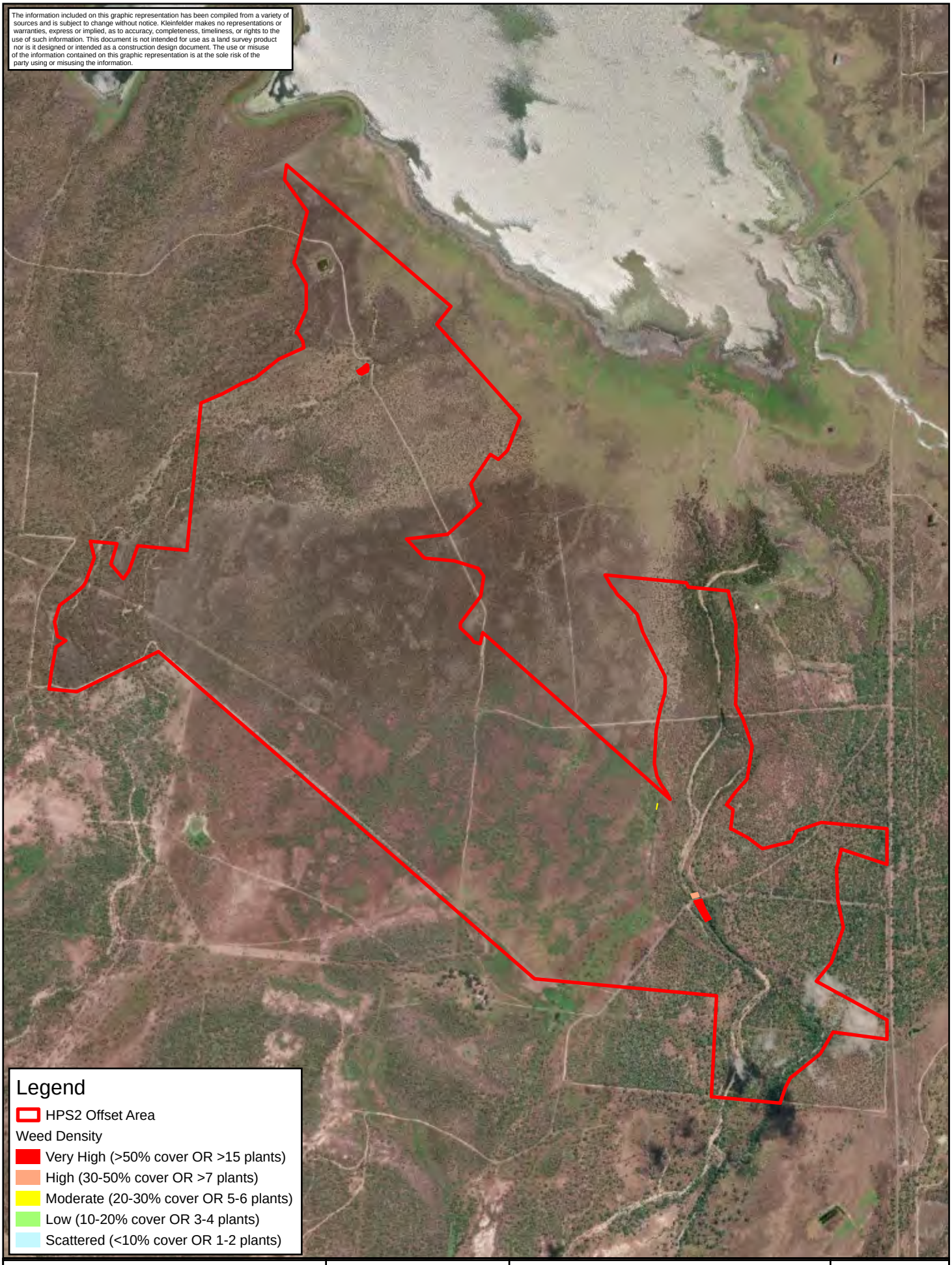
INFESTATIONS - SICKLEPOD (SENNA OBTUSIFOLIA, S. HIRSUTA, S. TORA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3d

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3h)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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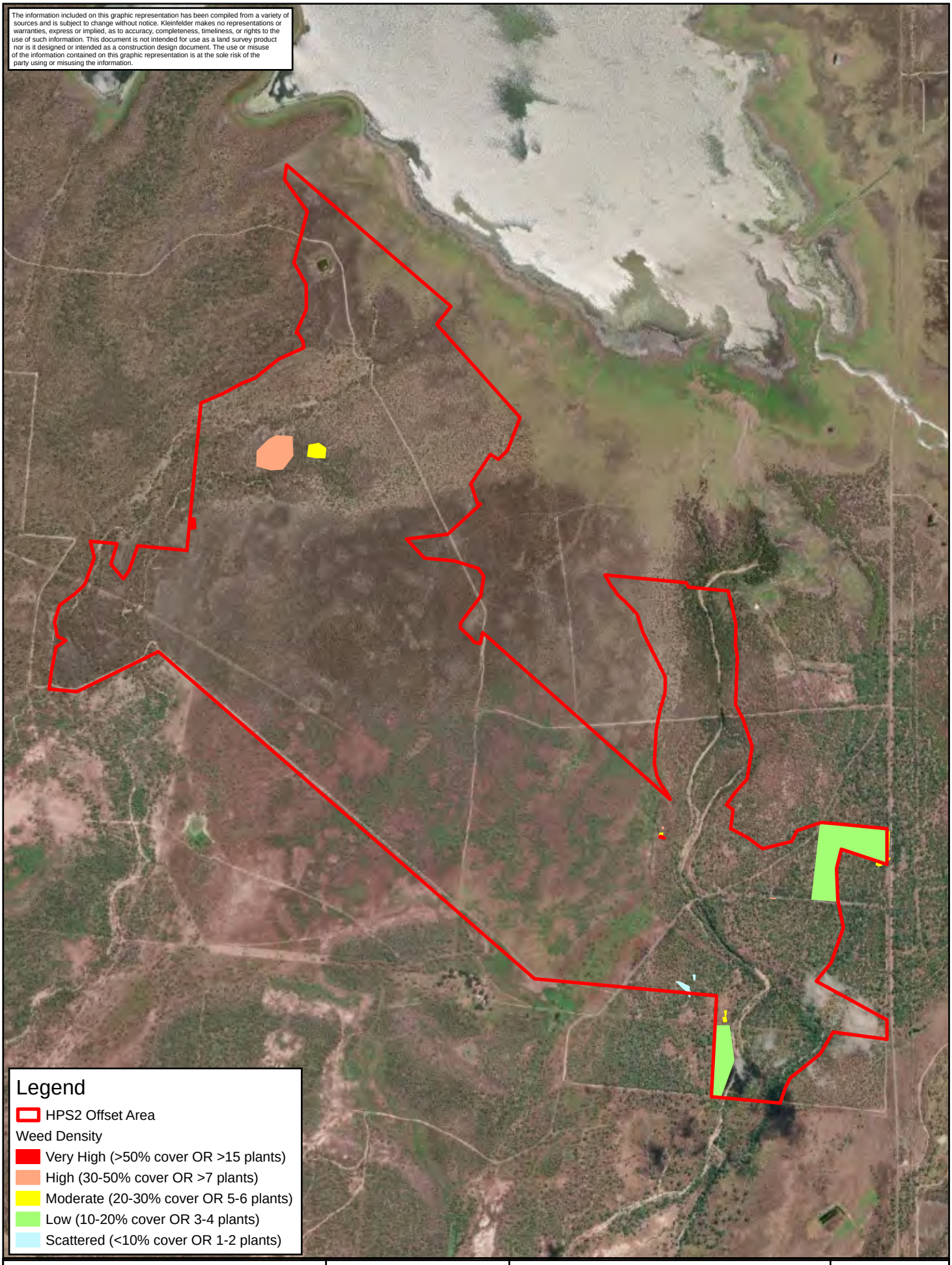
INFESTATIONS - GRADER GRASS (THEMEDA QUADRIVALVIS)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3e

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3d)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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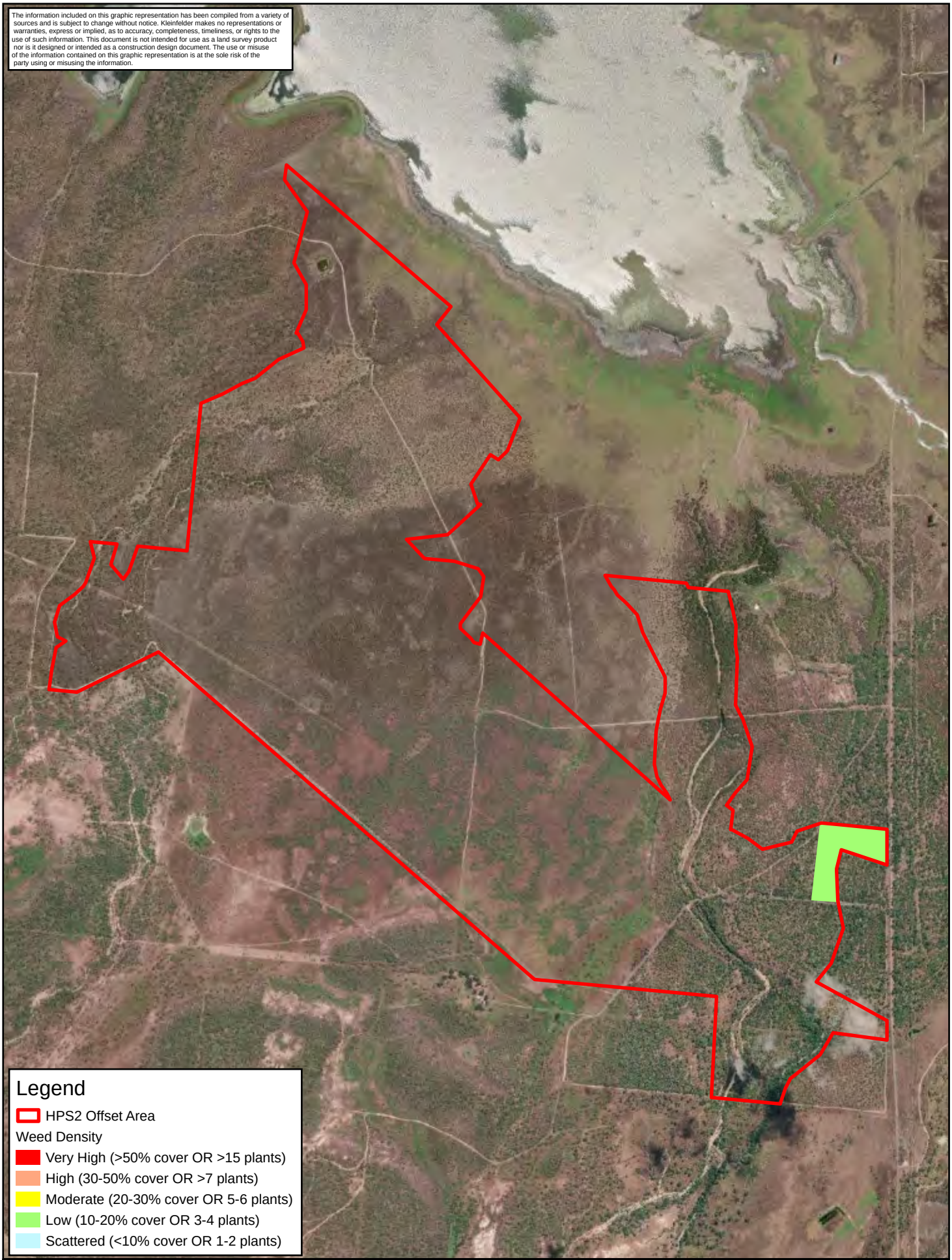
INFESTATIONS - GRADER GRASS (THEMEDA QUADRIVALVIS)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3f

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3c)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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DATE DRAWN:	30/09/2024 Version 1
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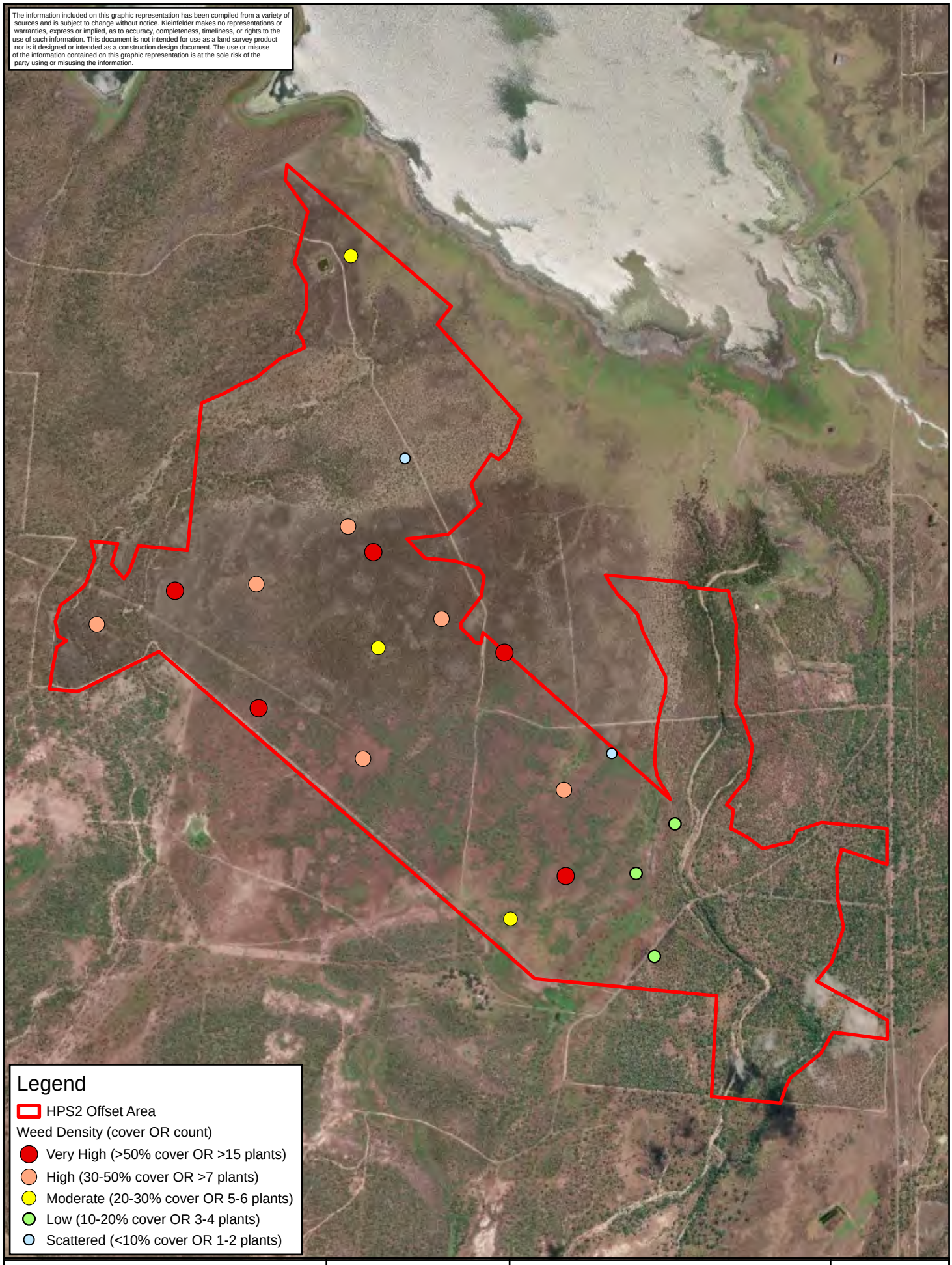
INFESTATIONS - THATCH GRASS (HYPARRHENIA RUFA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

3g

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (3i)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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DATE DRAWN: 2/10/2024	Version 1
DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

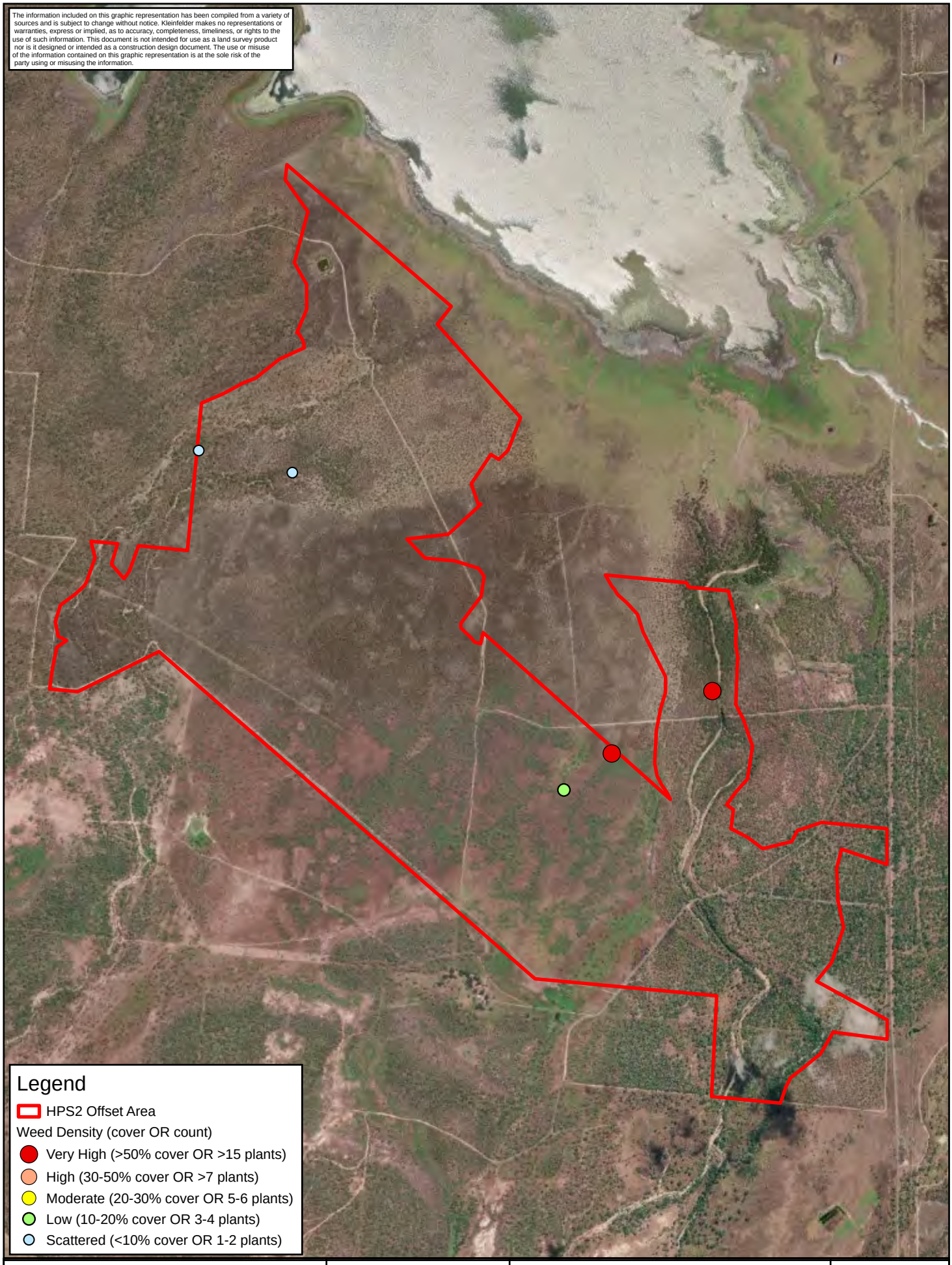
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - STYLO (STYLOSANTHES SCABRA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4a

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4a)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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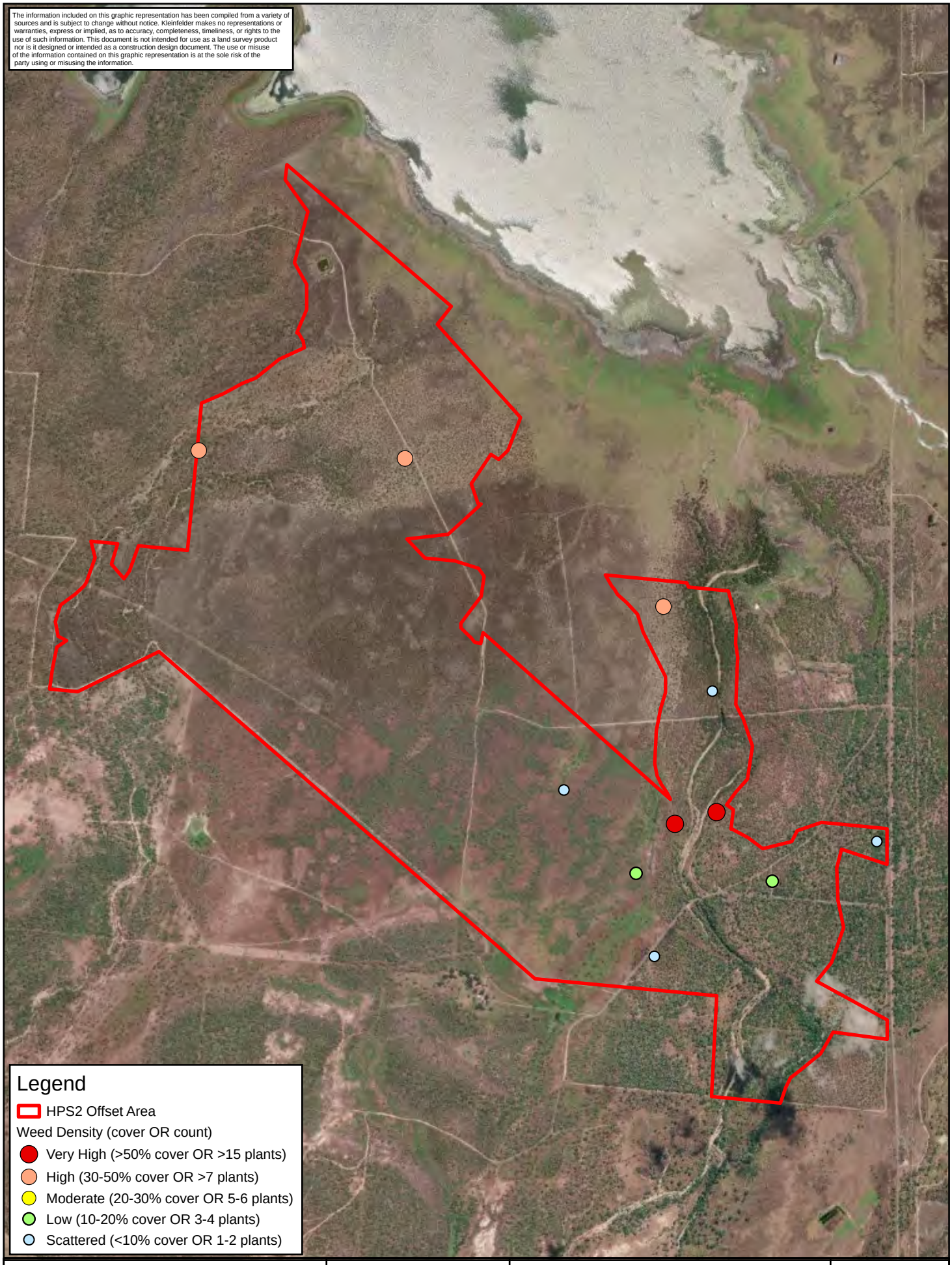
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - SIDA (SIDA ACUTA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4b

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4b)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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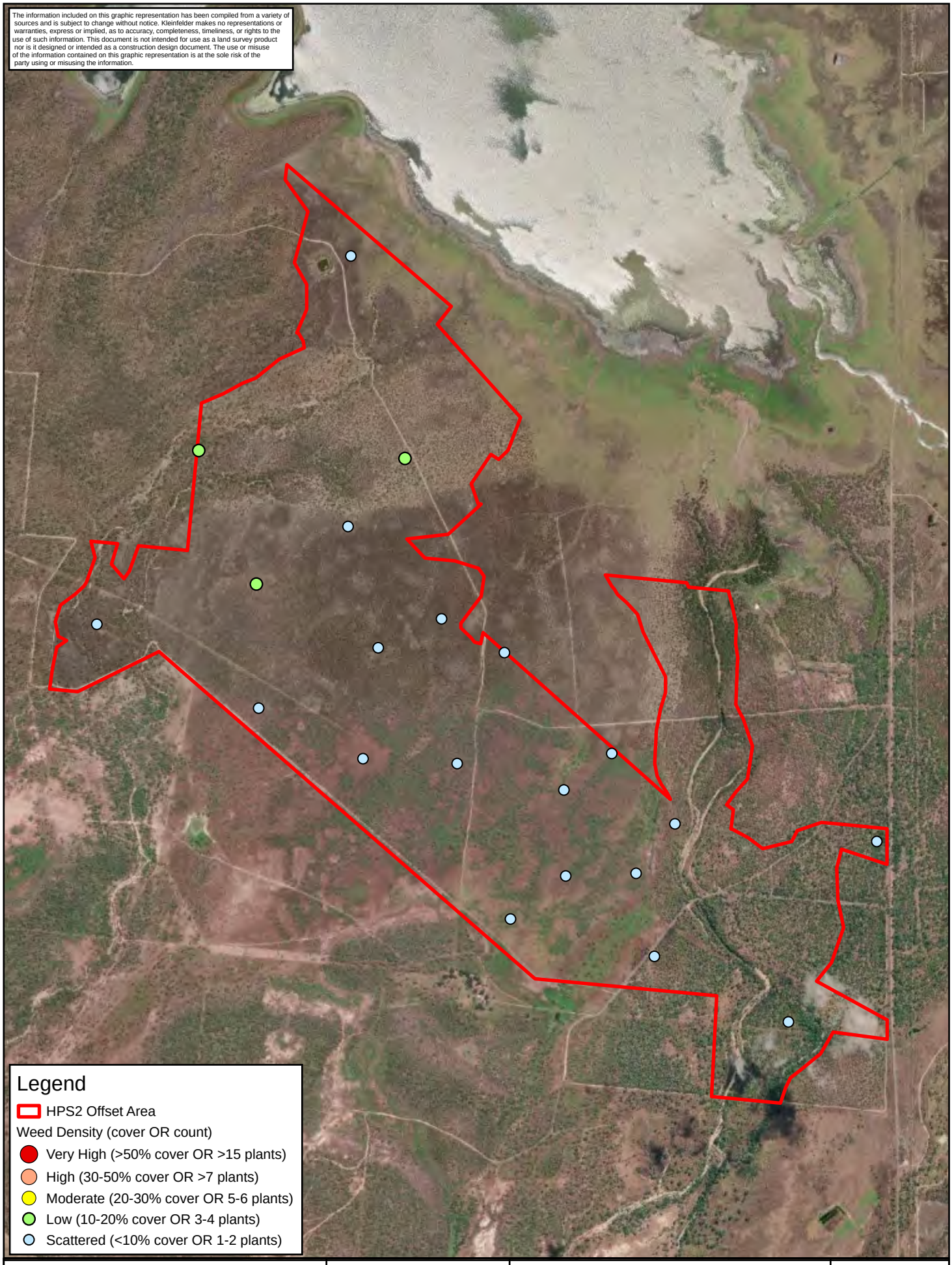
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - JOYWEED

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4c

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4c)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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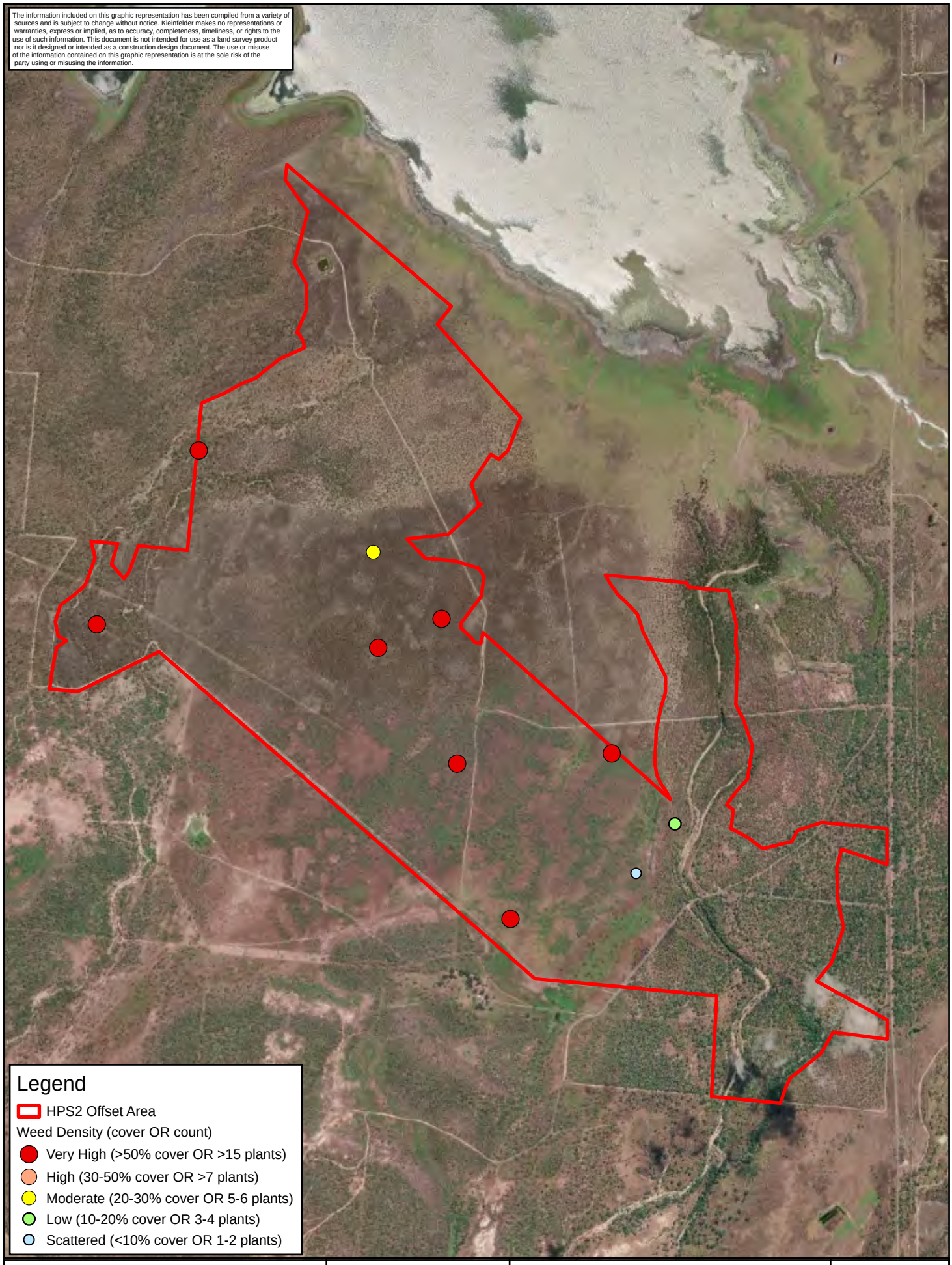
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - STINKING PASSIONFLOWER

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4d

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4d)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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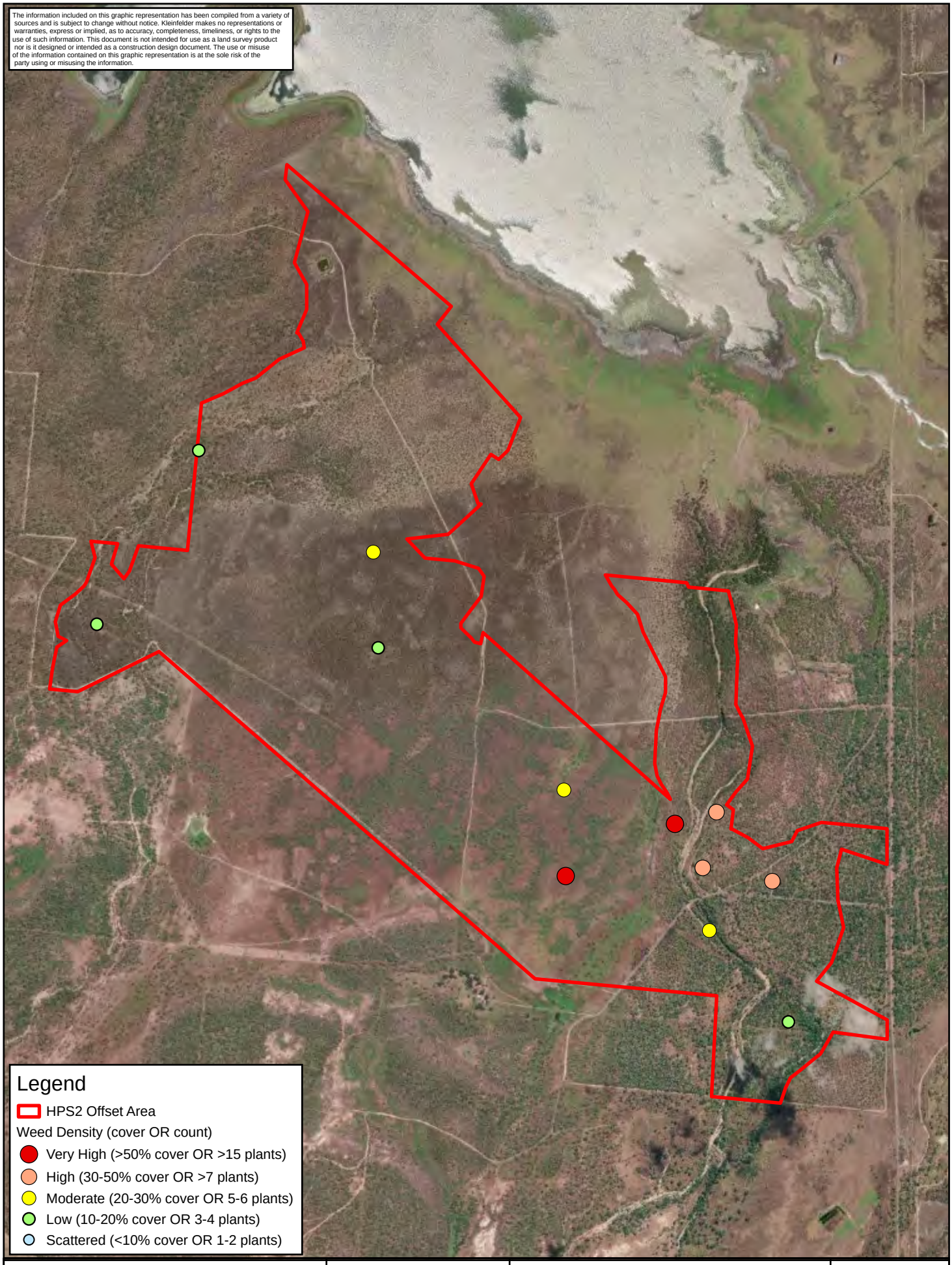
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - ROUND-LEAF CASSIA (CHAMAECRISTA ROTUNDIFOLIA)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4e

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4e)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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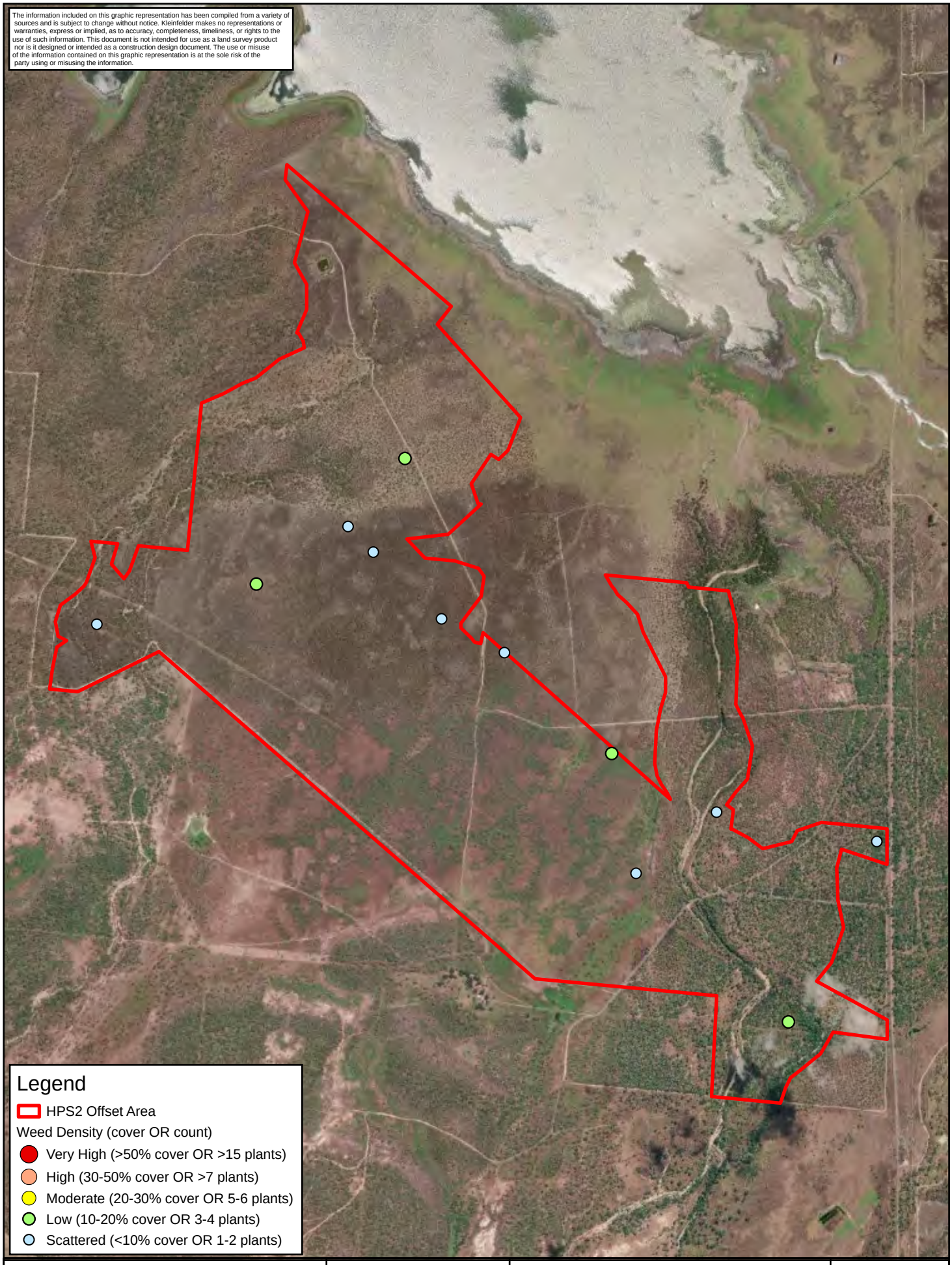
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - HOREHOUND (MESOSPHAERUM (SYN. HYPTIS) SUAVEOLENS)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4f

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4f)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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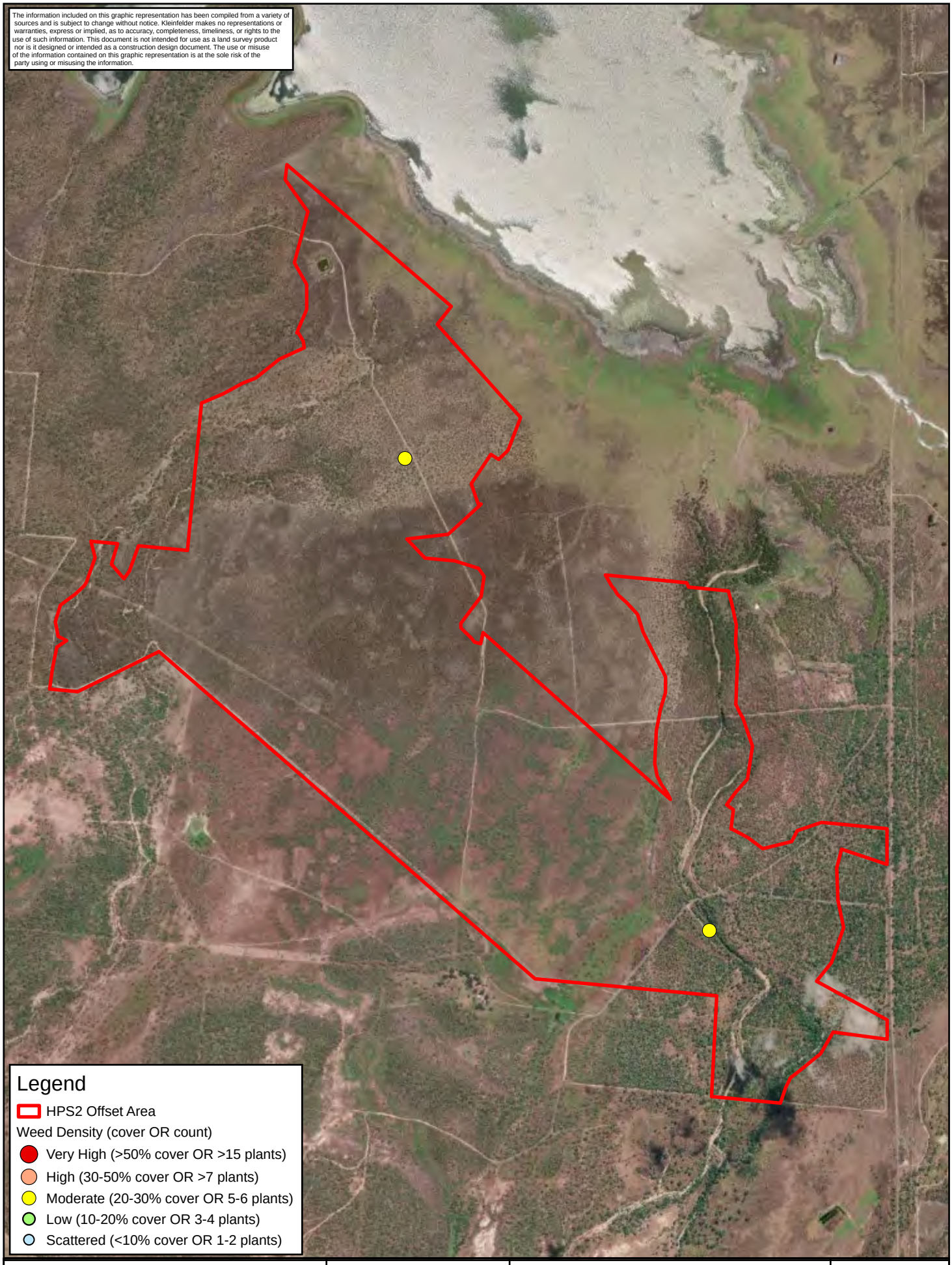
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - SNAKEWEED (STACHYTARPHETA JAMAICENSIS)

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4g

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4g)



0 120 240 480 720 960 1,200

Scale @ A4 1:24,000 Metres

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EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - LEUCAENA

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4h

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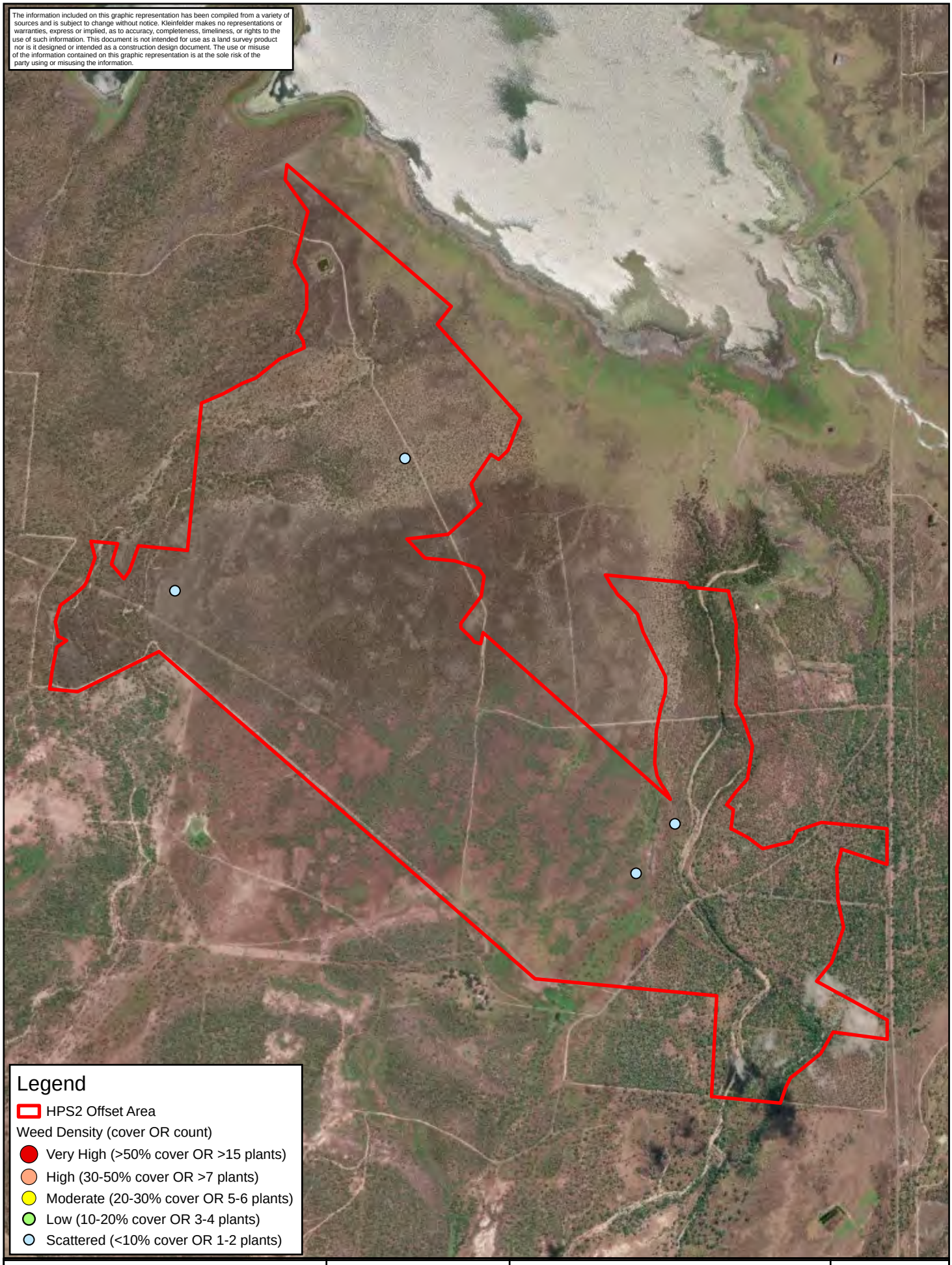

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Scale @ A4 1:24,000 Metres

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GDA 1994 MGA Zone 55

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PROJECT REFERENCE:	24005427
DATE DRAWN: 2/10/2024	Version 1
DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

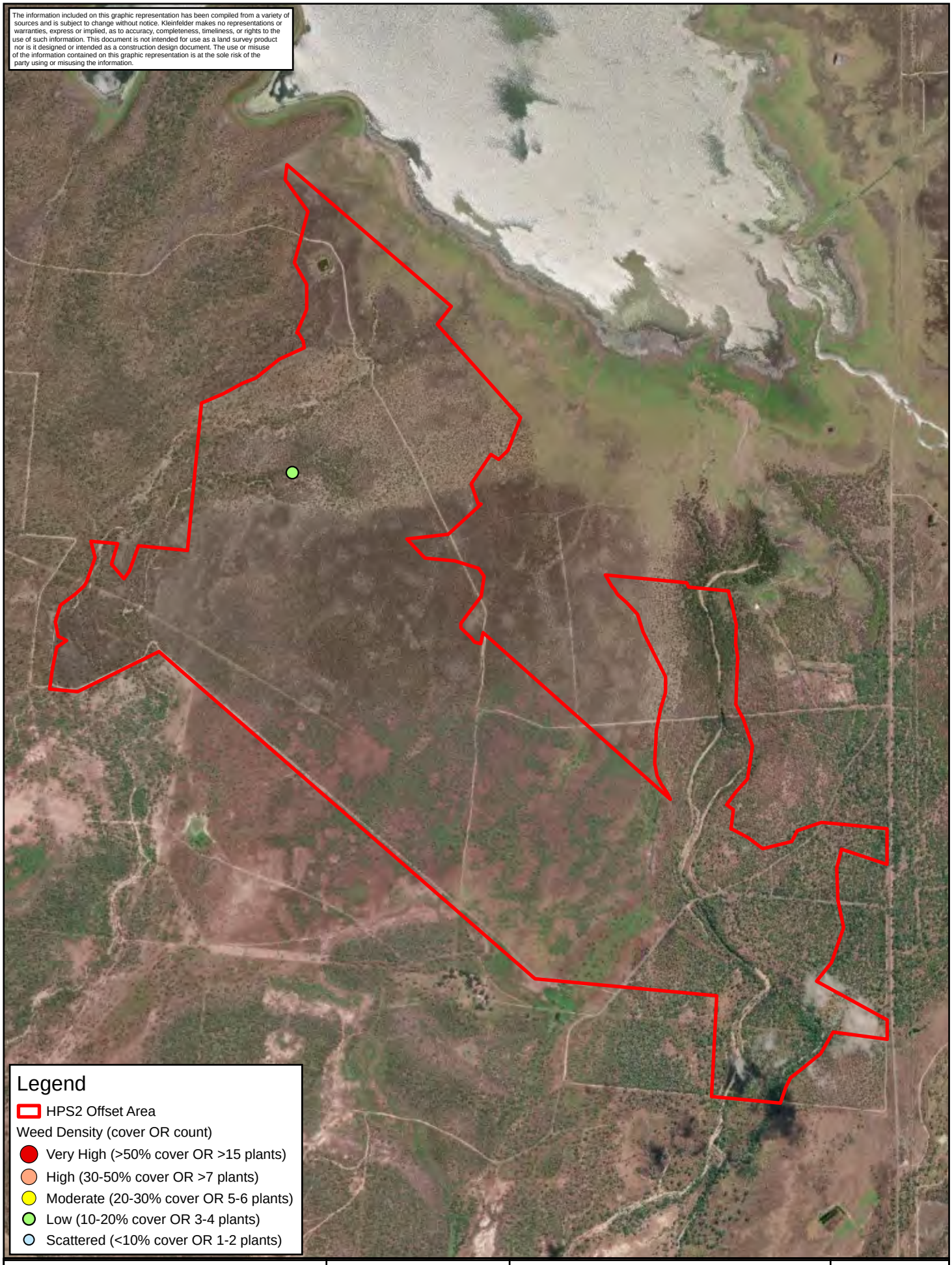
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - HOARY BASIL

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4i

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4i)



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DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

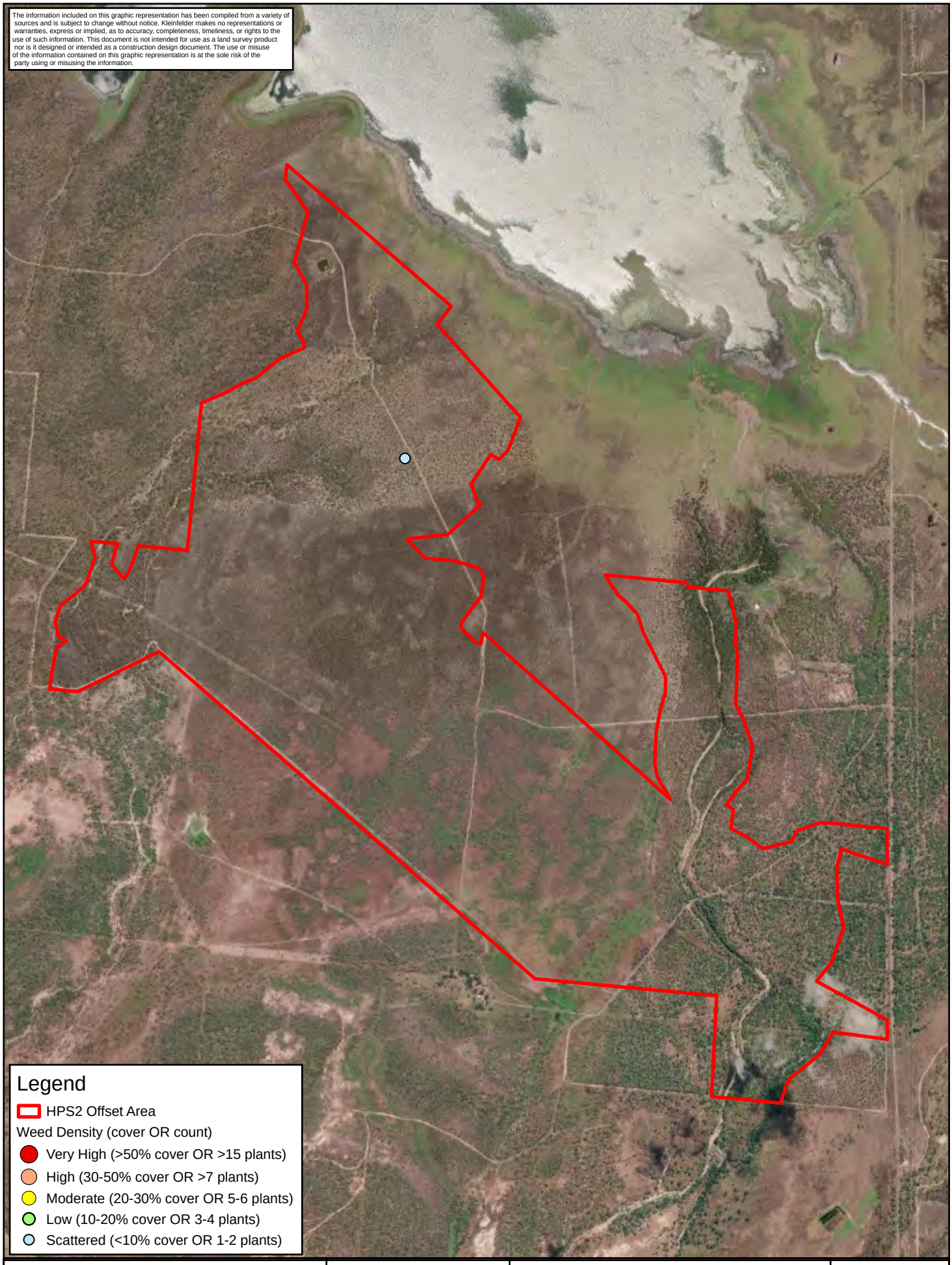
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - GUINEA GRASS

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4j

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4j)



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Scale @ A4 1:24,000 Metres

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DATA SOURCE: Esri - 2024	

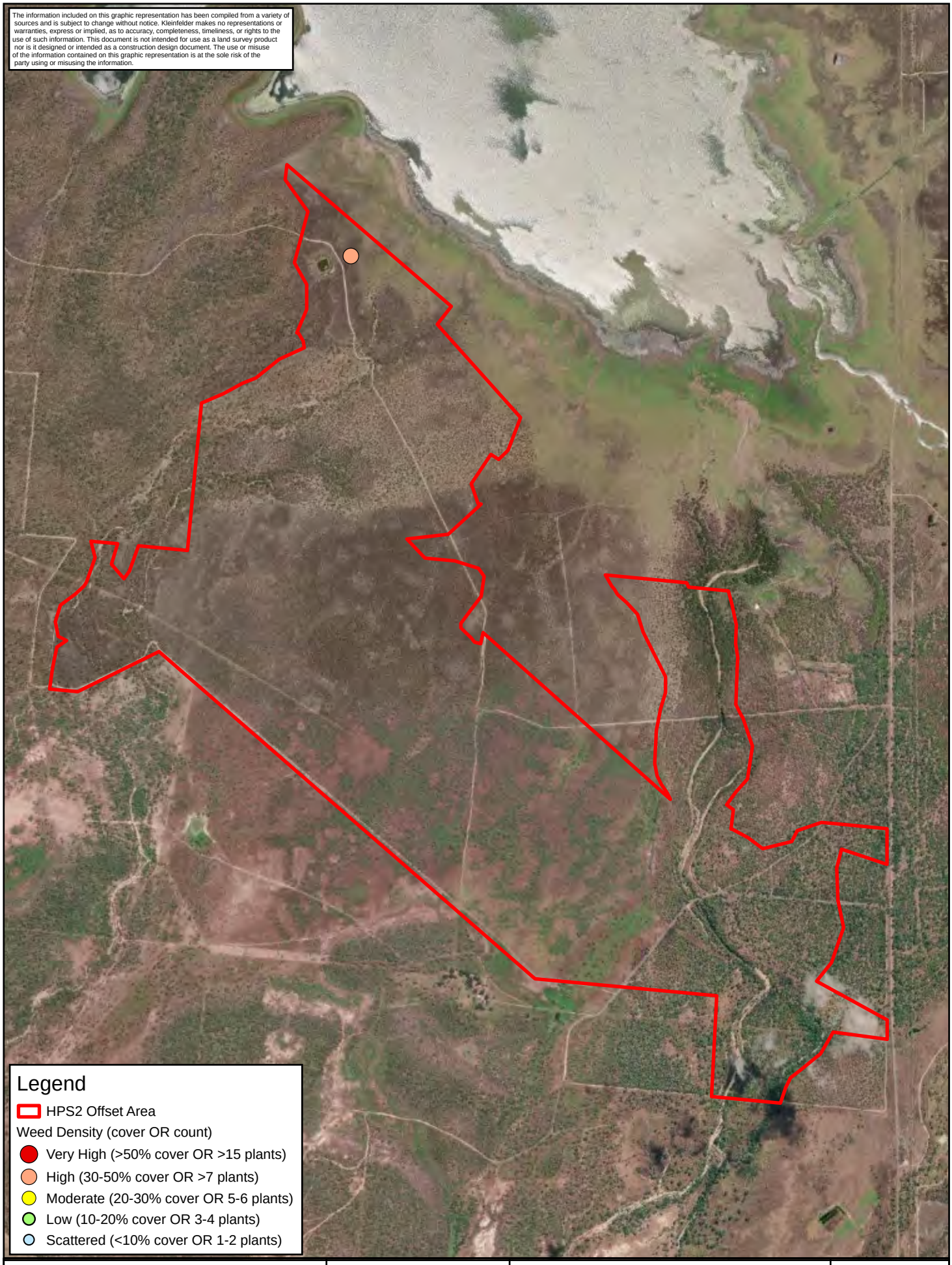
EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - PHASEY BEAN

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4k

Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4k)



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Scale @ A4 1:24,000 Metres

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DRAWN BY:	RHourigan
DATA SOURCE: Esri - 2024	

EXTENT OF OCCURRENCE OF NON-DECLARED WEEDS - PARA GRASS

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
WEED MANAGEMENT PLAN
PIPELINE ALIGNMENT

FIGURE:

4I

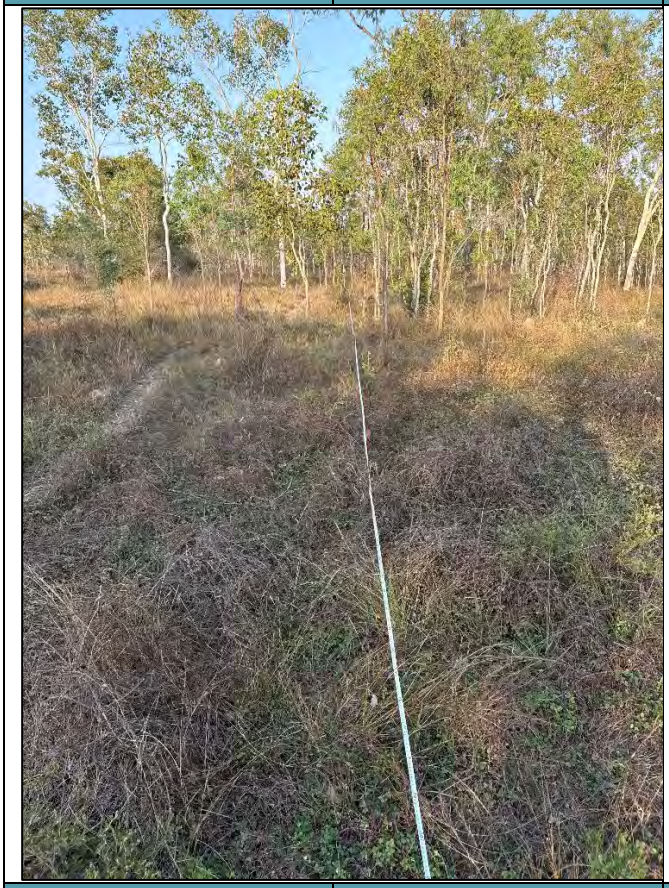
Path: J:\00 CLIENT FILES\132297_Townsville City Council\24005427_HaughtonPipelineStage2\240918_HaughtonPipeline_WeedManagementPlan\240926_HaughtonPipeline_WeedManagementPlan.aprx (4I)

ATTACHMENT 3 WEED PLOT LOCATIONS AND IMAGES

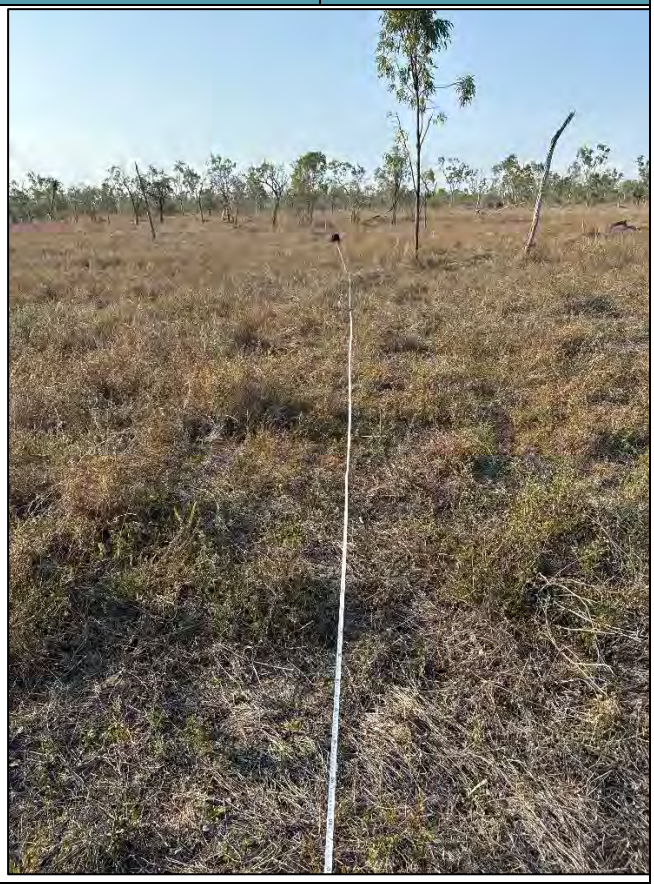
Site ID: W1	**Weed Management Zone:** FH-M	**Site ID:** W2	**Weed Management Zone:** CH-VH
Start: 16342839.77, -2212697.75	**Middle:** 16342818, -2212710	**Start:** 16342007.6, -2213715.881	**Middle:** 16342030, -2213721

Site ID: W3	**Weed Management Zone:** FH-M	**Site ID:** W4	**Weed Management Zone:** FH-M
Start: Not Collected	**Middle:** 16342509, -2213836	**Start:** 16343118.83, -2213777.98	**Middle:** 16343097, -2213764

Site ID: W5	Weed Management Zone: CH-VH
Start: 16341526.99, -2214614.731	Middle: 16341502, -2214624



Site ID: W6	Weed Management Zone: FH-M
Start: 16341900.1, -2214424.551	Middle: 16341906, -2214450



Site ID: W7	Weed Management Zone: FH-M
Start: 16342328.44, -2214443.267	Middle: 16342328, -2214416

Site ID: W8	Weed Management Zone: FH-M
Start: 16342825.25, -2214101.445	Middle: 16342802, -2214117

Site ID: W9	Weed Management Zone: FH-M
Start: 16342931.65, -2214275.876	Middle: 16342933, -2214251

Site ID: W10	Weed Management Zone: CH-H
Start: 16342363.11, -2215073.275	Middle: 16342339, -2215062

Site ID: W11	Weed Management Zone: CH-H
Start: 16342971.78, -2214727.855	Middle: 16342958, -2214748

Site ID: W12	Weed Management Zone: CH-H
Start: 16343277, -2214622.267	Middle: 16343286, -2214598

Site ID: W13	Weed Management Zone: FH-H	Site ID: W14	Weed Management Zone: FH-H
Start: 16343586.9, -2214759.502	Middle: 16343611, -2214774	Start: 16344428.83, -2214509.148	Middle: 16344434, -2214536

No photo

Site ID: W15	Weed Management Zone: FH-M	Site ID: W16	Weed Management Zone: CH-H
Start: 16342853.66, -2215307.972	Middle: 16342878, -2215325	Start: 16343370.49, -2215327.015	Middle: 16343366, -2215351

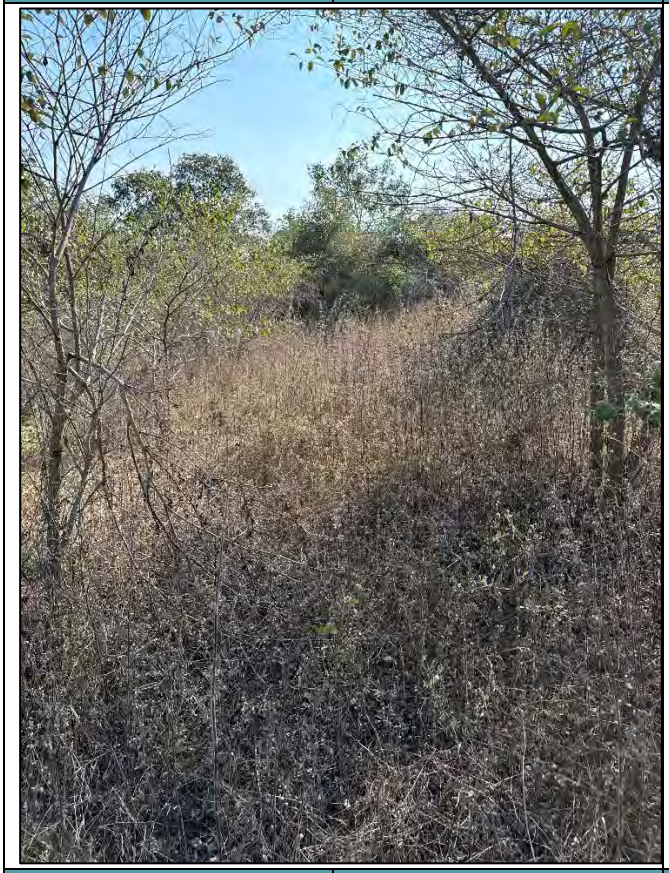
Site ID: W17	Weed Management Zone: CH-VH	Site ID: W18	Weed Management Zone: FH-H
Start: 16343898.19, -2215470.932	Middle: 16343918, -2215489	Start: 16344147.92, -2215318.3	Middle: 16344166, -2215300

Site ID: W19	Weed Management Zone: FH-H	Site ID: W20	Weed Management Zone: FH-H
Start: Not Collected	Middle: 16344686, -2214975	Start: 16344491.18, -2215690.92	Middle: 16344492, -2215666

No photo

Site ID: W21	Weed Management Zone: FH-H	Site ID: W22	Weed Management Zone: FH-M
Start: Not Collected	Middle: 16344707, -2215605	Start: 16343620.29, -2216144.355	Middle: 16343641, -2216160
No photo			
Site ID: W23	Weed Management Zone: FH-M	Site ID: W24	Weed Management Zone: CH-VH
Start: 16343935.49, -2215913.893	Middle: 16343927, -2215937	Start: 16344316.16, -2215912.05	Middle: 16344291, -2215923
		No photo	

Site ID: W25	Weed Management Zone: FH-H	Site ID: W26	Weed Management Zone: CH-VH
Start: 16344650.92, -2215890.01	Middle: 16344687, -2214976	Start: 16344993.73, -2215935.99	Middle: 16344996, -2215965



Site ID: W27	Weed Management Zone: FH-H	Site ID: W28	Weed Management Zone: FH-H
Start: 16345538.1, -2215785.141	Middle: 16345536.60, -2215759	Start: 16344368.26, -2216335.608	Middle: 16344385, -2216355

No photo

Site ID: W29	Weed Management Zone: CH-VH	Site ID: W30	Weed Management Zone: CH-VH
Start: 16344663.1, -2216211.2	Middle: 16344670, -2216221	Start: 16345077.72, -2216670.506	Middle: 16345078, -2216697
		No photo	

Note: co-ordinates provided are in eastings / northings.

Appendix D: Vehicle and Machinery Cleandown Procedures Checklist

4 Specific cleaning checklists[2]

4.1 Cars, trucks and four-wheel drives

CAUTION
DO NOT use high-pressure water jets in compartments that house electronic components.

Complete the basic cleaning outlined in Table 2 and also check the following areas, cleaning as necessary.

Interior

- Check and clean the foot wells.
- Check the carpets and mats.
- Check and clean the seatbelts.

Boot

- Check and clean the carpet (checking for deposits of hay, weed seeds, burrs and/or soil).
- Check and clean the spare tyre area.
- Check and clean other recesses in the boot or rear of the vehicle.

Engine bay

- Check and clean the radiator.
- Check and clean the grill.
- Check and clean the top of the transmission gearbox.
- Check and clean the recess under the windscreen wipers.
- Check and clean the air filters.

Underside

- Check and clean the wheel arches, wheel trims, flares, step treads and bumpers.
- Check and clean the mudflaps.
- Check and clean the tyre rims (particularly the near side).
- Check and clean the axles and differentials.
- Check and clean the spare tyres on four-wheel drives and station wagons. These are often suspended underneath.

Note: These are high-risk areas, as contaminants collect inside the horizontally positioned rim.

Other areas

- Check and clean all toolboxes, ladders and storage compartments.
- Check and clean the back or tray of trucks and four-wheel drives.

Remember: The key to successful cleaning is more than just ticking off a checklist
You should be thorough, systematic and consistent.
CHECK, CLEAN, RECHECK

[2] Adapted from the Australian Department of Agriculture's machinery cleaning guides and checklists—see More information, page 30

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