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Xanadu-1 Well Construction Flora and vegetation assessment

Background

Westranch propose to undertake onshore exploration drilling TP/15 Exploration Permit Area as part of the Xanadu-1 work program (the Proposal). The primary objective of this Proposal is to assist with designing future drilling programs and further refining the structural detail of the Xanadu-1 deposit.

The Proposal involves construction of a conventional oil well for the purpose of exploration activities within the offshore TP/15 Exploration Permit Area. Disturbance associated with the Proposal will be undertaken onshore, approximately 42 km south of Dongara and 312 km north of Perth, within the Midwest region of Western Australia.

The Proposal will involve clearing of vegetation for the drilling area and access track, and the installation and testing of the well, including associated ground disturbance activities.

Strategen was previously engaged to commence works to support the Xanadu-1 work program, including (but not limited to):

1. Undertaking a Level 1 flora, vegetation and fauna habitat survey.
2. Referral of the project to the EPA under s 38 of the *Environment Protection Act 1986* (EP Act).

As part of this previous engagement, the Level 1 flora, vegetation and fauna habitat survey was undertaken in spring 2014 and a report on the outcomes was completed (Strategen 2016).

Since the 2014 survey, changes have been made to the Proposal footprint and access track alignment. Therefore a supplementary Level 1 flora and vegetation assessment was undertaken in November 2016 over previously un-surveyed areas to provide detail regarding the flora and vegetation values contained within the revised footprint area.

Objective

The objective of this report is to document the flora and vegetation values within the revised footprint area (the survey area) to determine:

1. Vegetation types and conditions within the revised footprint area.
2. Whether there are any conservation significant flora and vegetation and fauna values associated with the revised footprint area.
3. Whether the project will impact on Matters of National Environmental Significance (MNES) and consequently require consideration under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Methodology

Desktop assessment

Prior to visiting the survey area, revised desktop searches were undertaken of the following databases to establish whether any conservation significant fauna species could potentially occur within the survey area:

- NatureMap (Parks and Wildlife 2007-) (search area encompassed a 5 km radius from an approximately central point of the site)
- EPBC Act Protected Matters Search Tool (DEE 2016) (search area encompassed a 1 km radius from an approximately central point of the site).

The updated desktop assessments were used to inform the site investigation.

Flora and vegetation survey

A Level 1 flora and vegetation survey of the survey area (Figure 1) was undertaken in accordance with Guidance Statement 51 (EPA 2004) on 23 November 2016 by two ecologists. It should be noted that the most recent *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was published subsequent to this survey (December 2016); however, the survey methodology was reviewed against the requirements for a Reconnaissance Survey (formerly Level 1 survey) as defined in this document and meets the updated requirements.

Table 1 identifies staff involved in the field surveys, their role and qualifications.

Table 1: Personnel

Name	Role
Ms. R. Chesney Strategen (Senior Ecologist)	Planning, fieldwork, plant identification, data interpretation and report preparation
Ms. C. Courtauld Strategen (Ecologist)	Planning, fieldwork, plant identification, data interpretation and report preparation

The survey area was traversed on foot to record changes in vegetation structure. A quadrat was established and sampled when a different, previously unrecorded vegetation type was observed and the original area surveyed in spring 2014 was briefly traversed during the 2016 survey to ensure that no changes to recorded vegetation types have occurred (i.e. the 2016 survey area includes the original 2014 survey area). A total of four 10 m x 10 m vegetation quadrats were established across the survey area (in addition to five sampled during the 2016 survey [Strategen 2014]). Between quadrats, notes were recorded regarding vegetation type and structure, with opportunistic sampling of flora undertaken when previously unrecorded species were observed. At each quadrat, the following parameters were recorded:

- GPS location
- soil and landform characteristics
- vascular plant taxa present
- foliage cover (%)
- photograph
- overall condition of the vegetation.

Vegetation condition was measured using the condition rating scale of Keighery (1994):

1. Pristine: pristine or nearly so, no obvious signs of disturbance.
2. Excellent: vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3. Very Good: vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

4. Good: vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5. Degraded: basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6. Completely Degraded: the structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as “parkland cleared” with the flora comprising weed or crop species with isolated native trees or shrubs.

All plant specimens collected during the survey were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Florabase (Western Australian Herbarium 1998-).

Weed species recorded in the site assessment were evaluated as per the previous survey, using weed prioritising lists including the Weeds of National Significance (WoNS; AWC 2014) list and species declared under the BAM Act (DAFWA 2016), with additional reference to the *Midwest Region Environmental Weed Rankings Summary* (Parks and Wildlife 2013) and *Western Weeds* (Hussey et al. 2007).

Vegetation types defined in the current survey were aligned to those defined in the 2014 flora and vegetation survey (Strategen 2014). Mapping for both areas was consolidated for presentation in this survey report.

Constraints and limitations

Potential constraints and limitations that may have had an impact on the outcomes of the flora and vegetation assessment have been considered (Table 2).

Table 2: Potential constraints or limitations on the survey

Potential constraint or limitation	Impact on survey	Comment
Sources and availability of contextual information	Not a constraint	The Geraldton Sandplains are reasonably well-surveyed, including surveys within the neighbouring Beekeepers NR, and several sources of contextual information exist.
Proportion of flora collected and identified	Not a constraint	A total of 23 native species were recorded during the survey. Of these, all were able to be confirmed to at least species level. Four 10 x 10 m quadrats were sampled across the approximately 13 ha 2016 Survey Area (in addition to five quadrats in the 2014 Survey Area). The remainder of the Survey Area was traversed on foot to determine whether any additional vegetation types were present. Additional species not previously recorded within quadrats were recorded on an overall species list while traversing the site. As such, it is likely that the majority of native species present were recorded during the survey.
Survey timing	Not a constraint	The results presented in this report are the product of a spring (November) survey. Spring is considered the optimal survey time for the Southwest.
Survey completeness and intensity	Not a constraint	The survey was conducted at the intensity appropriate for a complete Level 1 survey as described by EPA Guidance Statement 51, in the appropriate season for the Geraldton Sandplains bioregion i.e., during the optimum flowering time for the majority of southwest WA flora species. Upon review of the <i>Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment</i> , the survey also met the requirements for a Reconnaissance Survey (formerly Level 1 survey).

Potential constraint or limitation	Impact on survey	Comment
Effects of disturbance	Not a constraint	The effects of disturbance (including the presence of weeds and planted revegetation areas) were not a constraint for this vegetation assessment. Remnant vegetation was in sufficiently good condition to enable determination of a vegetation type and, as such, conduct a comparison with known Threatened or Priority Ecological Communities in the area.
Access and resources	Not a constraint	The Survey Area was readily accessible by vehicle or by foot. Adequate resources were available to complete the survey as planned.
Experience levels	Not a constraint	The field survey and reporting were conducted by two ecologists, with six and two years field experience respectively.

Results

Desktop assessment

The 2016 database searches did not identify any additional conservation significant flora taxa potentially occurring within the when compared to results from the 2015 assessment.

Regional setting

The survey area lies within Beard vegetation associations 1026 and 255 (refer to Attachment 1), both within the Cliff Head System. The Cliff Head System occupies the coastal strip of dunes and, to the south, salt lakes. The vegetation varies from a low *Acacia/Melaleuca* heath on limestone platforms to dense thickets of *Acacias*, *Eucalyptus* and *Melaleucas* on sand ridges. The Beard vegetation associations are described as follows:

- Vegetation Association 255: Shrublands; mallee scrub, *Eucalyptus dongarraensis* (now *Eucalyptus obtusiflora* subsp. *dongarraensis*)
- Vegetation Association 1026: Mosaic: Shrublands; *Acacia rostellifera*, *A. cyclops* (in the south) and *Melaleuca cardiophylla* (in the north) thicket / Shrublands; *Acacia lasiocarpa* and *Melaleuca acerosa* heath.

Flora and vegetation survey

Four vegetation types were identified within the survey area, three of which were identified in the previous vegetation survey undertaken in 2014 (Strategen 2016) (Table 3, Figure 1; Figure 2). VT01 and VT02 identified in the 2016 supplementary survey aligned with the floristic composition of VT01 and VT02 defined in the previous survey (Strategen 2016). Most of the survey area was comprised of VT02 (i.e. coastal shrubland vegetation), which graded into VT03 (located along the dune top) and VT01 (associated with a wet depression in the eastern portion of the survey area) (Table 3, Figure 1; Figure 2).

A total of 13.7 ha was survey across the 2014 and 2016 vegetation assessments (refer to Figure 1). Of the 13.7 ha survey area, 13 ha is vegetated, while the remaining 0.7 ha comprises cleared tracks.

Table 3: Vegetation types recorded during surveys

Vegetation type	Description	Area (ha)	Proportion of Total Survey Area (%)
VT01	<i>Melaleuca lanceolata</i> , <i>Rhagodia preissii</i> subsp. <i>obovata</i> and <i>Acacia rostellifera</i> dense shrubland over sedges associated with winter-wet areas.	0.1	0.5
VT02	<i>Acacia rostellifera</i> low mid shrubland with occasional <i>Gyrostemon ramulosus</i> , <i>Melaleuca lanceolata</i> and <i>Anthocercis littorea</i> over <i>Rhagodia baccata</i> , <i>Scaevola</i> spp. and mixed Chenopods over <i>Acanthocarpus preissii</i> , <i>Conostylis candidans</i> and weedy grasses.	11.2	81.8
VT03	<i>Acacia rostellifera</i> and <i>Myoporum insulare</i> open shrublands over <i>Scaevola crassifolia</i> and <i>Spinifex longifolius</i> over * <i>Tetragonia decumbens</i> , <i>Carpobrotus virescens</i> , <i>Threlkeldia diffusa</i> and weedy grasses.	0.5	3.8
VT04	Low open heath of <i>Melaleuca lanceolata</i> , <i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> and <i>Acanthocarpus preissii</i> over weedy grasses.	1.2	8.8
Cleared or bare sand	Cleared areas and bare sand on the beach.	0.7	5.0
Total		13.7	100

Vegetation condition ranged from Completely Degraded in cleared areas associated with the existing track, to Excellent in remnant vegetation further from the track (Table 4, Figure 1; Figure 2). The main sources of disturbance were clearing associated with the track, and weed encroachment by the track margins.

Table 4: Vegetation condition of the total survey area by size

Vegetation condition rating	Surveyed area (ha)	Proportion of survey area (%)
Excellent	12.0	87.4
Very Good	1.0	7.6
Completely Degraded	0.7	5.0
Total	13.7	100

Conservation significant vegetation

None of the vegetation types recorded during the flora and vegetation survey resemble listed Threatened or Priority ecological communities known within the region.

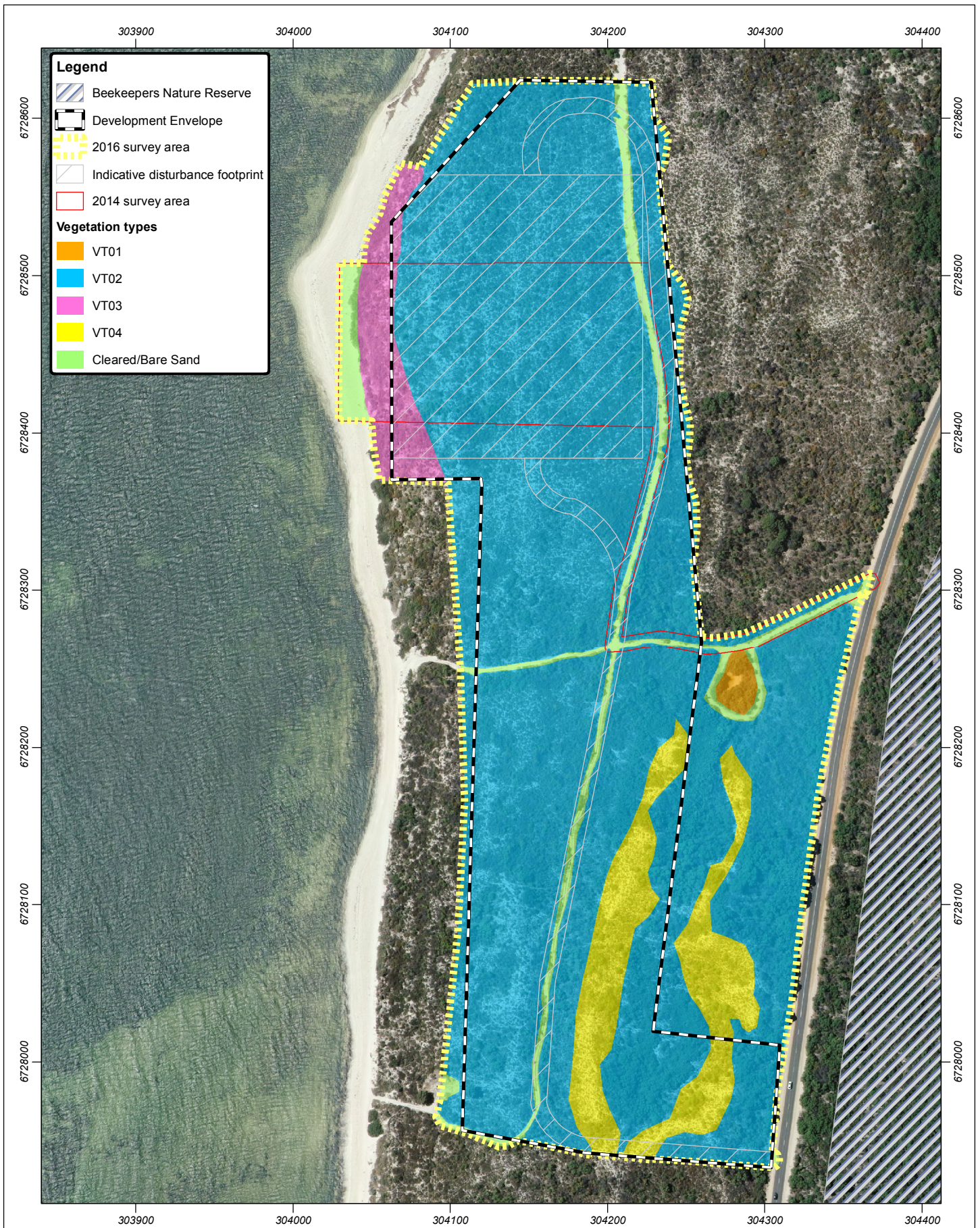
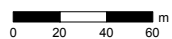


Figure 1 Vegetation Type

Scale 1:3,250 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 22/03/2017
 Author: DWhite
 Source: Aerial image: ESRI online 2010.

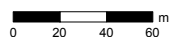


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Figure 2 Vegetation Condition

Scale 1:3,250 at A4



Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 22/03/2017

Author: DWhite

Source: Aerial image: ESRI online 2010.



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Flora

A total of 22 native plant taxa were recorded in the survey area during the 2016 supplementary survey (Table 5).

Table 5: Native plant taxa recorded in the survey area

Family	Species
Aizoaceae	<i>Carpobrotus virescens</i>
Arecaceae	* <i>Phoenix canariensis</i>
Asparagaceae	<i>Acanthocarpus preissii</i>
Campanulaceae	<i>Lobelia heterophylla</i>
Chenopodiaceae	<i>Rhagodia baccata</i>
	<i>Rhagodia preissii</i> subsp. <i>obovata</i>
	<i>Threlkeldia diffusa</i>
Cyperaceae	<i>Lepidosperma calcicola</i>
Fabaceae	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>
	<i>Acacia rostellifera</i>
	<i>Acacia</i> sp.
Goodeniaceae	<i>Scaevola thesioides</i>
Haemodoraceae	<i>Conostylis candicans</i>
Lamiaceae	<i>Hemiandra pungens</i>
Lauraceae	<i>Cassytha aurea</i>
Myrtaceae	<i>Eucalyptus erythrocorys</i>
	<i>Melaleuca huegelii</i>
	<i>Melaleuca lanceolata</i>
Orchidaceae	<i>Orchidaceae</i> sp.
Poaceae	<i>Austrostipa elegantissima</i>
	* <i>Avena barbata</i>
	* <i>Bromus diandrus</i>
Ranunculaceae	<i>Clematis linearifolia</i>
Rubiaceae	<i>Opercularia spermacocea</i>

Conservation significant flora

No conservation significant flora species were recorded during the flora and vegetation survey.

Introduced flora

Three introduced flora species were recorded during the flora and vegetation survey, one species (**Phoenix canariensis*; Canary Islands Date Palm) was likely planted (Table 6). One species is listed as High priority under the Environmental Weed Strategy for Western Australia (CALM 1999; Parks and Wildlife 2013). None of the introduced flora species are Weeds of National Significance (AWC 2014), and none are listed as a Declared Pest under the BAM Act (DAFWA 2016).

Table 6: Introduced flora species recorded during the site visits

Species	Common name	Declared Plant management status	Environmental Weed Strategy rating
* <i>Avena barbata</i>	Wild Oats	-	Moderate
* <i>Bromus diandrus</i>	Brome Grass	-	High
* <i>Phoenix canariensis</i>	Canary Island Date Palm	-	-

Discussion

Flora species and vegetation types recorded within the supplementary survey area are consistent with those recorded in the 2014 survey area.

The vegetation within the survey area is typical of the coastal region, mainly consisting of *Acacia rostellifera* shrublands over a range of low shrubs and grasses, transitioning to lower densities of shrubs on the dune top. The survey area contained high densities of introduced grasses along the edges of tracks. The majority of the survey area was in Very Good to Excellent condition, whilst the cleared areas and areas of weed incursion near the tracks were Completely Degraded.

None of the vegetation types recorded during the flora and vegetation survey resemble listed Threatened or Priority ecological communities known within the region.

The flora within the survey area resembled the previous survey results (Strategen 2016) with many of the same taxa recorded. There were less exotic species recorded compared to the previous survey, likely due to annual species senescing prior to the survey period (end of spring). No Declared weeds under the BAM Act were recorded during the survey.

No conservation significant taxa were recorded during the survey and are not likely to occur within the survey area based on the listed habitat preferences and known features of the site.

Conclusion

The results of the flora and vegetation assessment did not find any major environmental constraints that may affect the proposed clearing within the survey area. No conservation significant flora taxa or ecological communities have been recorded within the survey area, and none are thought likely to occur based on results of the assessment.

References

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