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Field guide for the environmental assessment of decommissioned petroleum well sites in the Cooper Basin, South Australia

ENERGY
Information Sheet

006

Background

In 1996 Primary Industries and Resources South Australia (now Department for Energy and Mining (DEM)) developed a field guide to assess the level of environmental rehabilitation of decommissioned petroleum well sites in the Cooper Basin, South Australia. Since this time DEM has assessed over 500 decommissioned petroleum and geothermal well sites based on the visual impact and revegetation of indigenous species.

Introduction

In 2006 this field guide was reviewed as the Cooper Basin has been opened up to other explorers and the level of exploration activities has expanded (Woodburn and Fatchen 2007).

Following external consultation on the findings of this review, the guide has been revised to include additional criteria for assessing gibber landscapes and predictive scoring for well sites on completion of restoration (i.e. time zero).

The guide remains an integral part of DEM's auditing procedure to achieve environmental objectives defined in the Statement of Environmental Objectives. The intent of this field guide is to apply the defined criteria to assess other decommissioned sites under the *Energy Resources Act 2000* including geothermal well sites, production facilities and pipelines.

This revised field guide supersedes the 1996 field guide which should no longer be used for assessing decommissioned and rehabilitated petroleum well sites.

Assessment tool

The assessment is based on the concept of goal attainment scaling in which stakeholders evaluate and seek consensus on the most important aspects of the goals to be achieved within a particular time frame, as well as the range of expected outcomes of the activities undertaken. Expected outcomes are documented as:

Score	Outcome
-2	much less than expected
-1	less than expected
0	expected
+1	more than expected
+2	much more than expected

The guide uses descriptive outcome criteria supported by colour photographs. The photographs are provided as an example only and do not represent an absolute situation. Where multiple outcomes are applicable to a particular site the final score will be the lowest, reflecting the lesser expected outcome.

The aim of the assessment is to ascertain the level of attainment of objectives at decommissioned well sites and to ensure that appropriate action is undertaken to reduce the environmental impact of well sites that score -1 or -2.

Environmental objectives

Fatchen and Woodburn (1997) studied the environmental impact of well sites and seismic lines in the Cooper Basin and concluded that the impact is mainly visual and not ecological. They suggested that a return of the physical configuration of an affected region would be an acceptable indicator of the level of return of the regional ecology. Therefore, when setting the objectives the focus was on those which could be assessed visually (Malavazos and Cockshell 1998). These are:

1. To minimise the visual impact through earthwork restoration, blending well sites and associated access tracks into the surrounding contours, and ensuring soil colour and material is returned to a level compatible with that of the surrounds.
2. The revegetation of indigenous species.

The Objective 1 assessment consists of two parameters; first, the effectiveness of the earthwork in restoring the original contours of the site and second, the extent to which the site is stabilised against erosion.

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Four categories of outcome criteria are set for this objective; one relates to the well site access track and the others to the well site location (plain, dune or gibber).

Revegetation is dependent on the vegetation type, soil type and moisture content in the soil which, in turn, is dependent on the timing and amount of rainfall in the region after earthwork restoration. From field observations in the Cooper Basin (Malavazos and Dobrzinski 1995) a five-year period has been selected as sufficient time for revegetation of well sites (provided earthwork restoration was effective). For an interval of less than five years, the assessment is carried out on an 'enabling' objective; i.e. a reliable short-term indicator for the achievement of long-term revegetation outcomes.

Therefore, two categories of outcome criteria are set up for Objective 2; one for well sites restored for less than five years and one for five years or more.

The guidelines are intended to ensure consistency in the assessment against these objectives by minimising the subjective judgement often associated with such qualitative assessment.

From the operational viewpoint it is considered that managing the visual impact will assist field staff in managing for minimal impact on the biological and physical environment. This in no way reduces the importance of long-term ecological consequences which are the subject of ongoing investigation and consultation.

Summary of criteria for assessing the restoration of decommissioned well sites in the Cooper Basin, South Australia.

Score	OBJECTIVE 1 To minimise the visual impact				OBJECTIVE 2 The revegetation of indigenous species [(a)]		
	Access tracks	**Interdune and floodplain well sites**	**Dune well sites**	**Gibber well sites**	**Predictive rehabilitation on well site decommissioning**	**Less than five years since well site decommissioning**	**At least five years since well site decommissioning**
-2	The track is prominent because of a scraped surface, windrows along its edges or gully erosion.	The site remains as a prominent consolidated surface with a distinct edge.	Extensive gully erosion down the face of the dune and/or a steep site edge are prominent.	Site is poorly formed and predominantly bare due to incomplete spreading or loss of the gibber.	No attempt has been made to restore the well site.	No revegetation is occurring.	There is no revegetation.
-1	The track surface has been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.	The site surface and edge have been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings	The site has been restored into the natural contour of the dune; but the colour of foreign material contrasts with the surroundings.	Site matches adjacent colours, but is visible due to inconsistent spreading of the gibber and some bare areas.	The restored surface is inconsistent with the surroundings.	Revegetation with inappropriate species.	The revegetation mostly consists of annuals and biennials; in contrast to the surroundings there are few perennials.
0	The track contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The site contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. Erosion gullies are present down the face of the dune, but they are not extensive or prominent.	Site matches adjacent contours with some imported material still evident within gibber spread.	There has been appropriate preparation of the ground surface to promote revegetation.	Colonisation of the original species is starting to occur.	The revegetation consists of annuals, biennials and perennials; but there are some bare patches which are inconsistent with the surroundings.
+1	The track contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The site contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. There are no erosion gullies down the face of the dune.	Site matches adjacent contours and the gibber is uniformly spread with no imported material evident.	N/A	The revegetation is extensive and consists of annuals and biennials; in contrast to the surroundings there are no perennials.	The revegetation, mostly perennials, is consistent with the surroundings; but there is a contrast in maturity between them.
+2	The track contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The site contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The edge and colour of the site blend with the surroundings. The site contours are indistinguishable whether viewed from the top or base of the dune.	Site is indistinguishable from the surrounds.	N/A	The revegetation is extensive and mostly consists of annuals and biennials; perennials are beginning to establish which is consistent with the surroundings.	The revegetation type, density and maturity is indistinguishable from the surroundings.

(a) See Wiltshire and Schmidt (2003) for identification of vegetation.

Objective 1: Minimise the visual impact

Access tracks

045045

-2 score

The track is prominent because of a scraped surface, windrows along its edges or gully erosion.

Fatchen Environmental

-1 score

The track surface has been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.

045047

0 score

The track contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).

045048

+1 score

The track contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.

045049

+2 score

The track contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.

Objective 1: Minimise the visual impact

Interdune and floodplain well sites

045035

-2 score

The site remains as a prominent consolidated surface with a distinct edge.

407740

-1 score

The site surface and edge have been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.

045037

0 score

The site contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).

045038

+1 score

The site contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.

045039

+2 score

The site contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.

Objective 1: Minimise the visual impact

Dune well sites

045045

-2 score

Extensive gully erosion down the face of the dune and/ or a steep site edge are prominent.

Fatchen Environmental

-1 score

The site has been restored into the natural contour of the dune; but the colour of foreign material contrasts with the surroundings.

045042

0 score

The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. Erosion gullies are present down the face of the dune, but they are not extensive or prominent.

045043

+1 score

The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. There are no erosion gullies down the face of the dune.

045044

+2 score

The edge and colour of the site blend with the surroundings. The site contours are indistinguishable whether viewed from the top or base of the dune.

Objective 1: Minimise the visual impact

Gibber well sites

P1030083 (Fatchen Environmental)

-2 score

Site is poorly formed and predominantly bare due to incomplete spreading or loss of the gibber.

P1030149 (Fatchen Environmental)

-1 score

Site matches adjacent contours but is visible due to inconsistent spreading of the gibber and some bare areas.

P1030139 (Fatchen Environmental)

0 score

Site matches adjacent contours with some imported material still evident within gibber spread.

P1030152 (Fatchen Environmental)

+1 score

Site matches adjacent contours and the gibber is uniformly spread with no imported material evident.

P10301352 (Fatchen Environmental)

+2 score

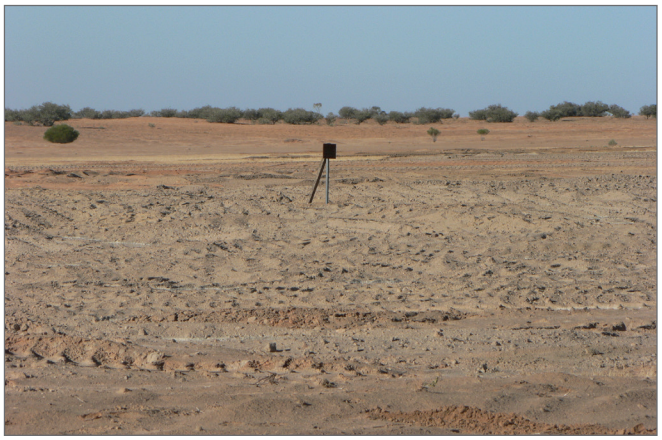
Site is indistinguishable from the surrounds.

Objective 2: Predictive rehabilitation on well site decommissioning

Fatchen Environmental

-2 Score

No attempt has been made to restore the wellsite.



Fatchen Environmental

-1 Score

The restored surface is inconsistent with the surroundings.

407741

0 score

There has been appropriate preparation of the ground surface to promote revegetation.

Objective 2: Revegetation of indigenous species

Less than five years since well site decommissioning

045050

-2 score

No revegetation is occurring.

407742

-1 score

Revegetation with inappropriate species.

045037

0 score

Colonisation of the original species is starting to occur.

045053

+1 score

The revegetation is extensive and consists of annuals and biennials; in contrast to the surroundings there are no perennials.

045899

+2 score

The revegetation is extensive and mostly consists of annuals and biennials; perennials are beginning to establish which is consistent with the surroundings.

Objective 2: Revegetation of indigenous species

At least five years since well site decommissioning

407743

-2 score

There is no revegetation.

045051

-1 score

The revegetation mostly consists of annuals and biennials; in contrast to the surroundings there are few perennials.

045052

0 score

The revegetation consists of annuals, biennials and perennials; but there are some bare patches which are inconsistent with the surroundings.

045899

+1 score

The revegetation, mostly perennials, is consistent with the surroundings; but there is a contrast in maturity between them.

045054

+2 score

The revegetation type, density and maturity is indistinguishable from the surroundings.

References

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Acknowledgement of Country

As guests on Aboriginal land, the Department for Energy and Mining (DEM) acknowledges everything this department does impacts on Aboriginal country, the sea, the sky, its people, and the spiritual and cultural connect ions which have existed since the first sunrise. ur responsibility is to share our collective knowledge, recognise a difficult history, respect the relationships made over time, and create a stronger future. We are ready to walk, learn and work together.

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