



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose permit number:	CPS 185/4
Permit holder:	Water Corporation
Purpose of clearing:	Clearing for <i>project activities</i>
Duration of permit:	20 April 2013 – 20 April 2014

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Permit number:	CPS 185/4
Permit holder:	Water Corporation
Purpose of clearing:	Clearing for <i>project activities</i>
Duration of permit:	21 April 2013 – 21 April 2014

The permit holder is authorised to clear native vegetation for the above stated purpose, subject to the conditions of this Permit, including as amended or renewed.

PART I - TYPE OF CLEARING AUTHORISED

1. Type of clearing authorised

- (a) In accordance with this Permit, the permit holder may clear native vegetation for *project activities*, which means any one or more of the following:
- (i) new *water services infrastructure*, including *drains*, pipelines, pump stations, and valve pits;
 - (ii) new infrastructure such as building, fences, gates, posts, boards, scaffolding, hurdles, other erections and structures to support the construction or operation of *water services infrastructure*;
 - (iii) new *temporary works*;
 - (iv) new *camps*;
 - (v) in order to maintain the efficacy of the following new and *existing water services infrastructure*, to the following extents:
 - (A) for a building or structure – 20m from the building or structure;
 - (B) for a *drain* or fence line – 5m from the *drain* or fence line;
 - (C) for a vehicle track used to access new and *existing water services infrastructure* – 5m track width;
 - (vi) *project surveys*, including surveying and geotechnical studies;
 - (vii) *pre-construction activities*; and
 - (viii) native vegetation clearing for the purposes of upgrading any of the above activities where such activities are not exempt from requiring a clearing permit.
- (b) This Permit authorises the permit holder to clear native vegetation for *project activities* to the extent that the permit holder has the power to clear native vegetation for those *project activities* under the *Water Corporation Act 1995* or any other *written law*.

2. Clearing not authorised

- (a) This Permit does not authorise the permit holder to clear native vegetation for *project activities* where:
- (i) it does not have the power to clear native vegetation for those *project activities* under the *Water Corporation Act 1995* or any other *written law*;
 - (ii) the clearing may be seriously at variance with the *clearing principles*; or
 - (iii) those *project activities* are incorporated in any *proposal* that is *referred* to and assessed under Part IV of the *EP Act* by the *EPA*.
- (b) If a *proposal* incorporating a *project activity* has been *referred* to the *EPA*, this Permit does not authorise any clearing for that *project activity* until:

- (i) the *EPA* has given notice under section 39A(3) of the *EP Act* that it has decided not to assess the *proposal*; and
 - (ii) either:
 - (A) the period within which an appeal against the *EPA*'s decision may be lodged has expired without an appeal being lodged; or
 - (B) an appeal has been lodged against the *EPA*'s decision not to assess the *proposal* and the appeal was dismissed.
- (c) If the permit holder intends to clear native vegetation under this Permit for a *project activity* that is incorporated in a *proposal* referred to in condition 2(b), then the permit holder must have regard to any advice or recommendations made by the *EPA* under section 39A(7) of the *EP Act*.

3. Application

This Permit allows the permit holder to authorise persons, including employees, contractors and agents of the permit holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit.

4. Requirements prior to undertaking clearing

- (a) Prior to clearing any native vegetation under this Permit, the permit holder must:
- (i) comply with the *Assessment Procedure* and the *Assessment Principles* set out in this Permit;
 - (ii) if an *offset* is required to be implemented pursuant to condition 8(c), provide the CEO with an *offset proposal* for the CEO's approval;
 - (iii) if a *management strategy* is required to be implemented pursuant to condition 8(d), provide the CEO with a *management strategy* for the CEO's approval; and
 - (iv) if *revegetation* and *rehabilitation* is required to be done pursuant to condition 12, provide the CEO with a *Revegetation Plan*.
- (b) The permit holder need not comply with condition 4(a)(iv) if the area to be *revegetated* and *rehabilitated* is:
- (i) less than 0.5 hectares;
 - (ii) not located in an *ESA*; and
 - (iii) an area where the proposed clearing that triggers the obligation to *revegetate* and *rehabilitate* is not at variance with one or more of the *clearing principles*.

PART II - ASSESSMENT PROCEDURE

5. Avoid, minimise etc clearing

The permit holder must have regard to the following principles, set out in order of preference:

- (a) avoid the clearing of native vegetation;
- (b) minimise the amount of native vegetation to be cleared; and
- (c) reduce the impact of clearing on any *environmental value*.

6. Assessment of Clearing Impacts

- (a) Once the permit holder has complied with condition 5 of this Permit, if any native vegetation is to be cleared the permit holder must conduct a *desktop study* assessing the clearing to be undertaken against each of the *clearing principles* in accordance with the *Assessment Principles* set out in Part III of this Permit.

- (b) The *desktop study* must be conducted having regard to the permit holder's *Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation* and, subject to condition 6(l), must include production of a *PEIA Report*.
- (c) The *PEIA Report* must set out:
- (i) the manner in which the permit holder has had regard to the principles set out in condition 5;
 - (ii) the manner in which the permit holder has had regard to the permit holder's *Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation* in conducting a *desktop study*;
 - (iii) the amount (in hectares) and boundaries of clearing required for the *project activity*;
 - (iv) how each of the *clearing principles* has been addressed through the *desktop study*;
 - (v) whether there are likely to be any *impacts* that may be at variance or seriously at variance with the *clearing principles*; and
 - (vi) whether, in accordance with the *Assessment Principles*:
 - (A) *rehabilitation* and *revegetation*, or a *management strategy*, is likely to be required under Part IV of this Permit; and
 - (B) an *offset* is likely to be required under Part V of this Permit.
- (d) Where the outcome of the *desktop study* indicates that the clearing may be at variance or seriously at variance with one or more of the *clearing principles*, the permit holder must undertake *EIA* in accordance with this condition, and seek submissions in accordance with condition 7 of this Permit.
- (e) Without limiting condition 6(d), where the information available is insufficient to allow the permit holder to assess the proposed clearing against one or more of the *clearing principles* as part of the *desktop study*, the permit holder must undertake *EIA* in accordance with this condition.
- (f) Where required pursuant to condition 6(d), the permit holder must conduct an *EIA* addressing those *environmental values* identified in the *desktop study* as likely to be affected by the clearing to an extent that may be at variance or seriously at variance with the *clearing principles*.
- (g) Where required pursuant to condition 6(e), the permit holder must conduct an *EIA* assessing each of those *clearing principles* for which there was insufficient information available to undertake a *desktop study*.
- (h) *EIA* must be conducted having regard to the permit holder's *Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation* and, subject to condition 6(l), must include production of an *EIA Report*.
- (i) *EIA* must include a *biological survey*, and:
- (i) where the area to be cleared may be affected by *dieback*, a *dieback survey*;
 - (ii) where the clearing may have a detrimental impact on the *environmental values* of a *wetland*, a *wetland field assessment*; and
 - (iii) any additional surveys and field assessments that are required to determine the *impacts* of the clearing on any *environmental value* protected by the *clearing principles*,

and every such survey or field assessment must be conducted by an *environmental specialist*.

- (j) Any *biological survey* carried out pursuant to condition 6(i) that relates to flora must be conducted having regard to *EPA Guidance Statement No.51*.
- (k) The *EIA Report* must set out:
 - (i) copies of any submissions received pursuant to condition 7, and a statement addressing each of those submissions;
 - (ii) the manner in which the permit holder has had regard to the permit holder's *Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation* in conducting an *EIA*;
 - (iii) the results of any surveys and field assessments carried out pursuant to conditions 6(h) and 6(i);
 - (iv) any *impacts* likely to occur as a result of the clearing, including a description of those *impacts* that may be at variance or seriously at variance with the *clearing principles*;
 - (v) any *rehabilitation, revegetation, management strategy* or other means of rectification that the permit holder will adopt to address the *impacts*; and
 - (vi) any *offsets* developed in accordance with Part V of this Permit that the permit holder will implement to address the *impacts*.
- (l) Where the permit holder conducts a *PEIA* and an *EIA* simultaneously:
 - (i) the permit holder may produce one report, to be known as an *Assessment Report*, which contains all of the information required to be provided by this condition in a *PEIA Report* and an *EIA Report*; and
 - (ii) if the permit holder produces an *Assessment Report*, there is no need to produce a *PEIA Report* or an *EIA Report* for the proposed clearing.
- (m) Subject to condition 6(n), after undertaking the *EIA* the permit holder must prepare, implement and adhere to an *EMP* to address the *impacts*, in accordance with condition 10 of this Permit.
- (n) Where the results of the *EIA* indicate that clearing for the *project activity* may be seriously at variance with the *clearing principles*, the permit holder must apply to the CEO for a clearing permit in respect of that clearing.

7. Submissions

- (a) The permit holder must invite submissions from the following parties about those *impacts* of the proposed clearing that may be at variance or seriously at variance with the *clearing principles*:
 - (i) the *Department's* Native Vegetation Conservation Branch;
 - (ii) the Office of the Commissioner of Soil and Land Conservation in the Department of Agriculture and Food;
 - (iii) the Department of Water's Drainage and Waterways Branch;
 - (iv) the Conservation Council of Western Australia Inc.;
 - (v) the local government responsible for the area that is to be cleared;
 - (vi) the owner (as defined in section 51A of the *EP Act*), or occupier (as defined in section 3 of the *EP Act*), of any land on which the clearing is proposed to be done;
 - (vii) any other environment or community groups that the permit holder reasonably considers may have an interest in the clearing that is proposed to be done; and

- (viii) any other party that the permit holder reasonably considers may have an interest in the clearing that is proposed to be done.
- (b) The permit holder must provide the following information to the parties from whom it invites submissions under condition 7(a):
 - (i) a description of the land on which the clearing is to be done;
 - (ii) a description of the *project activities* for which the clearing is to be done;
 - (iii) the size of the area to be cleared (in hectares);
 - (iv) in what manner the permit holder considers that the clearing may be at variance or seriously at variance with the *clearing principles*;
 - (v) an outline of any *rehabilitation, revegetation, management strategy* or *offset* proposed to be implemented in relation to the clearing;
 - (vi) the contact details of the person to whom submissions must be sent; and
 - (vii) the date by which submissions must be made.
- (c) The permit holder must allow a period of at least 21 days for submissions to be made.
- (d) Any submissions received by the permit holder under this condition 7 must be addressed in the *EIA Report* in accordance with condition 6(k) of this Permit.

PART III - ASSESSMENT PRINCIPLES

8. Assessment against the Clearing Principles

- (a) In complying with condition 6 of this Permit, the permit holder must have regard to the *Department's Guide to Assessment: Clearing of Native Vegetation under the Environmental Protection Act 1986*, contained in Annexure 6 to this Permit, when conducting an assessment of the proposed clearing against the *clearing principles*.
- (b) If part or all of the clearing to be done may be seriously at variance with one or more of the *clearing principles* then condition 6(n) applies.
- (c) If part or all of the clearing to be done is or is likely to be at variance with one or more of the *clearing principles*, then the permit holder must implement an *offset* in accordance with Part V of this Permit with respect to that native vegetation.
- (d) If part or all of the clearing to be done is or is likely to be at variance with *clearing principle (g)*, *clearing principle (i)* or *clearing principle (j)*, the permit holder must implement a *management strategy*, approved by the CEO in accordance with conditions 4(a)(iii) and 11 of this Permit, with respect to that clearing.
- (e) In making a determination under condition 8(b) as to whether part or all of the clearing to be done may be seriously at variance, or under conditions 8(c) and 8(d) as to whether part or all of the clearing to be done is or is likely to be at variance, with one or more of the *clearing principles*, the permit holder must obtain and have regard to the advice of an *environmental specialist*.

9. Other

In assessing the clearing for the *project activity* against the *clearing principles*, the permit holder must have regard to any approved policy (as defined in section 3 of the *EP Act*) and

any planning instrument (as defined in section 51O of the *EP Act*), that applies to the area of native vegetation to be cleared.

PART IV – MANAGEMENT

10. Environmental management plan

- (a) The permit holder must prepare, implement and adhere to an *EMP* if required by condition 6(m) of this Permit.
- (b) The *EMP* must have regard to the permit holder's *Drafting and Implementing Environmental Management Plans* and include:
 - (i) a plan for managing the *impacts*;
 - (ii) a table setting out the permit holder's commitments to the *EMP*'s requirements;
 - (iii) a program for monitoring compliance with the permit holder's commitments;
 - (iv) a copy of the *Revegetation Plan*, where required under condition 12 of this Permit.

11. Management strategy

- (a) Where the permit holder is required under this Permit to comply with this condition 11, the permit holder must prepare, implement and adhere to a strategy designed by an *environmental specialist*, in consultation with the Commissioner of Soil and Land Conservation, to avoid, mitigate or manage the *land degradation, water quality deterioration*, or flooding that triggered the permit holder's obligation to comply with this condition.
- (b) Once the permit holder has developed a *management strategy*, the permit holder must provide that *management strategy* to the CEO prior to undertaking any clearing of an area to which the *management strategy* is related, and prior to implementing the *management strategy*.

12. Revegetation and Rehabilitation

- (a) The permit holder must *revegetate* and *rehabilitate* the following areas once those areas are no longer required for the following purpose for which they were cleared under this Permit:
 - (i) *temporary works*;
 - (ii) *extraction sites*;
 - (iii) *camps*;
 - (iv) *project surveys*;
 - (v) *pre-construction activities*; or
 - (vi) other *project activities* where part or all of the area cleared is no longer required to be used for the purpose for which it was cleared.
- (b) The permit holder need not *revegetate* and *rehabilitate* an area specified in condition 12(a) if the permit holder intends to use that cleared area for another *project activity* within 12 months of that area no longer being required for the purpose for which it was originally cleared under this Permit.
- (c) The *revegetation* and *rehabilitation* of an area pursuant to this condition 12:
 - (i) must be carried out as soon as possible once the permit holder no longer requires that area for a *project activity*, in accordance with conditions 12(a) and 12(b); and

- (ii) must be undertaken according to a *Revegetation Plan* that the permit holder must provide to the CEO prior to clearing native vegetation from the area that is to be *revegetated* and *rehabilitated*.
- (d) The permit holder need not comply with condition 12(c)(ii) if the area to be *revegetated* and *rehabilitated* is:
- (i) less than 0.5 hectares;
 - (ii) not located in an *ESA*; and
 - (iii) an area where the proposed clearing that triggers the obligation to *revegetate* and *rehabilitate* is not at variance with one or more of the *clearing principles*.
- (e) A *Revegetation Plan* must be developed having regard to the permit holder's *Revegetation Guideline – Techniques and Monitoring* and must involve the following steps:
- (i) *site preparation*;
 - (ii) *weed control*;
 - (iii) *regeneration, direct seeding or planting*, at an *optimal time*;
 - (iv) a *vegetation establishment period*; and
 - (v) ongoing maintenance and monitoring.
- (f) Any area of native vegetation that does not form part of the area to be cleared for the *project activity* and that has been damaged as a result of the clearing by the permit holder must be *revegetated* and *rehabilitated* in accordance with conditions 12(c) and 12(d).

13. Dieback, other pathogen and weed control

- (a) When undertaking any clearing, *revegetation* and *rehabilitation*, or other activity pursuant to this Permit in any part of a *region* that has an average annual rainfall of greater than 400 millimetres and is south of the 26th parallel of latitude, the permit holder must take the following steps to minimise the risk of introduction and spread of *dieback*:
- (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
 - (ii) avoid the movement of soil in wet conditions;
 - (iii) if movement of soil in wet conditions is necessary, the permit holder must prepare, implement and adhere to a *dieback* management plan developed in consultation with the *Department* for minimising the spread of *dieback*;
 - (iv) ensure that no *dieback*-affected *road building materials, mulches* or *fill* are brought into an area that is not affected by *dieback*; and
 - (v) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.
- (b) Where the permit holder considers, having regard to the advice of an *environmental specialist*, that the area to be cleared may be susceptible to a pathogen other than *dieback*, the permit holder must take appropriate steps to minimise the risk of the introduction and spread of that pathogen.
- (c) When undertaking any clearing, *revegetation* and *rehabilitation*, or other activity pursuant to this Permit the permit holder must take the following steps to minimise the risk of the introduction and spread of *weeds*:
- (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

- (ii) ensure that no *weed-affected road building materials, mulch, fill* or other material is brought into the area to be cleared; and
 - (iii) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.
- (d) At least once in each 12 month period for the *term* of this Permit, the permit holder must remove or kill any *weeds* growing within areas cleared, *revegetated* and *rehabilitated*, or the subject of an *offset* implemented by the permit holder under this Permit where those *weeds* are likely, having regard to the advice of an *environmental specialist*, to spread to and result in *environmental harm* to adjacent areas of native vegetation that are in *good or better condition*.

PART V – OFFSETS

14. Determination of offsets

- (a) In determining the *offset* to be implemented with respect to a particular area of native vegetation proposed to be cleared under this Permit, the permit holder must have regard to the offset principles contained in condition 15 of this Permit.
- (b) Once the permit holder has developed an *offset proposal*, the permit holder must provide that *offset proposal* to the CEO for the CEO's approval in accordance with condition 4(a)(ii), prior to undertaking any clearing to which the *offset* related, and prior to implementing the *offset*.

15. Offset principles

For the purpose of this Part, the offset principles are as follows:

- (a) *direct offsets* should directly counterbalance the loss of the native vegetation;
- (b) *contributing offsets* should complement and enhance the *direct offset*;
- (c) *offsets* are implemented only once all avenues to avoid, minimise, rectify or reduce environmental impacts have been exhausted;
- (d) the *environmental values*, habitat, species, ecological community, physical area, ecosystem, landscape, and hydrology of the *offset* should be the same as, or better than, that of the area of native vegetation being *offset*;
- (e) a ratio greater than 1:1 should be applied to the size of the area of native vegetation that is offset to compensate for the risk that the *offset* may fail;
- (f) *offsets* must entail a robust and consistent assessment process;
- (g) in determining an appropriate *offset*, consideration should be given to ecosystem function, rarity and type of *ecological community*, vegetation *condition*, habitat quality and area of native vegetation cleared;
- (h) the *offset* should either result in no net loss of native vegetation, or lead to a net gain in native vegetation and improve the condition of the natural environment;
- (i) *offsets* must satisfy all statutory requirements;
- (j) *offsets* must be clearly defined, documented and audited;
- (k) *offsets* must ensure a long-term (10-30 year) benefit; and
- (l) an *environmental specialist* must be involved in the design, assessment and monitoring of *offsets*.

16. Duration of offsets

- (a) The permit holder must ensure that an *offset* implemented under this Permit continues to be implemented for the *term* of this Permit.

- (b) If for any reason an *offset* is not continually implemented for the *term* of this Permit, the permit holder must:
 - (i) implement the *offset* again within 12 months of becoming aware that the *offset* is not being maintained; and
 - (ii) if necessary, modify the *offset* in a manner that increases the likelihood that the *offset* will be implemented for the *term* of this Permit.

PART VI – MONITORING, REPORTING & AUDITING

17. Monitoring

- (a) The permit holder must monitor:
 - (i) areas *revegetated* and *rehabilitated* under this Permit to determine compliance with the relevant *Revegetation Plan* and the conditions of this Permit; and
 - (ii) areas the subject of an *offset* implemented under this Permit to determine compliance with the relevant *offset proposal* and the conditions of this Permit.
- (b) Monitoring pursuant to this condition 17 must be done having regard to –the permit holder’s *Revegetation Guideline – Techniques and Monitoring*.

18. Records of assessment and clearing

The permit holder must maintain the following records for activities done pursuant to this Permit, as relevant:

- (a) in relation to the clearing of native vegetation:
 - (i) a copy of any *PEIA Report*, *EIA Report* and *Assessment Report* produced in accordance with condition 6;
 - (ii) a copy of the *EMP* produced in accordance with conditions 6 and 10;
 - (iii) for a cleared area greater than 0.5 hectares, a map showing the location where the clearing occurred, recorded in an *ESRI Shapefile*;
 - (iv) for a cleared area of 0.5 hectares or less, a co-ordinate of the location where the clearing occurred;
 - (v) the size of the area cleared (in hectares); and
 - (vi) the dates on which the clearing was done;
- (b) in relation to the *revegetation* and *rehabilitation* of areas:
 - (i) a copy of each *Revegetation Plan* provided to the CEO in accordance with condition 12(c);
 - (ii) a map showing the location of any area *revegetated* and *rehabilitated* in accordance with condition 12, recorded in an *ESRI Shapefile*;
 - (iii) a description of the *revegetation* and *rehabilitation* activities undertaken pursuant to condition 12; and
 - (iv) the size of the area *revegetated* and *rehabilitated* (in hectares);
- (c) in relation to each *offset* implemented:
 - (i) a copy of each *offset proposal* approved by the CEO in accordance with condition 14(b);
 - (ii) a map showing the location of any *offset* implemented pursuant to condition 14, recorded in an *ESRI Shapefile*;
 - (iii) a description of the *offset* implemented pursuant to condition 14; and

- (iv) the size of the area of the *offset* (in hectares);
- (d) in relation to each *management strategy* implemented:
 - (i) a map showing the location of any area to which a *management strategy* has been applied in accordance with condition 11, recorded in an *ESRI Shapefile*;
 - (ii) a description of the *management strategy* implemented under condition 11; and
 - (iii) the size of the area to which the *management strategy* was applied (in hectares);
- (e) in relation to the control of *weeds*, *dieback* and other pathogens:
 - (i) a copy of any management plan prepared in accordance with condition 13(a)(iii); and
 - (ii) for any pathogen other than *dieback*, the appropriate steps taken in accordance with condition 13(b).

19. Reporting

- (a) The permit holder must provide to the CEO, on or before 30 June of each year, a written report of activities done by the permit holder under this Permit between 1 January and 31 December of the preceding year.
- (b) The report must set out the records required to be maintained pursuant to condition 18 of this Permit, except for those records relating to cleared areas of less than 0.5 hectares that:
 - (i) are not located in an *ESA*;
 - (ii) do not require an *offset* to be implemented; and
 - (iii) are not at variance with one or more of the *clearing principles*.

20. Internal auditing

- (a) The permit holder must conduct *internal environmental audits* for areas specified in condition 20(c) to determine the permit holder's compliance with the conditions of this Permit, with particular emphasis on:
 - (i) the location and extent of native vegetation cleared;
 - (ii) the implementation status of any *offsets* imposed;
 - (iii) the effectiveness of any *management strategies* implemented; and
 - (iv) the implementation status of any *revegetation* or *rehabilitation* undertaken.
- (b) The permit holder must conduct its first *internal environmental audit* within 6 months of the date of this Permit. Subsequent *internal environmental audits* must be conducted annually.
- (c) The areas to be audited under condition 20(a) must be selected by the auditor using a structured and documented risk-based selection framework, and must include at least one cleared area in each *region* in which clearing has been done under this Permit within the previous 12 months.
- (d) The permit holder must provide written reports of the *internal environmental audits* conducted pursuant to this condition 20 to the CEO on or before 30 December of each year for the *term* of this Permit, which reports must include details of steps taken by the permit holder to address any non-compliance with conditions of this Permit.

21. External auditing

- (a) The permit holder must engage an external accredited *lead environmental auditor* to undertake environmental audits of the permit holder's compliance with the conditions of this Permit for each of the *regions* in which clearing is done under this Permit.
- (b) The *external environmental audits* must be done on or before 20 April 2014 and/or as otherwise required by the CEO.
- (c) The permit holder must provide the *lead environmental auditor's* written reports of the *external environmental audits* to the CEO on or before 30 December in each year that an *external environmental audit* is conducted and/or as otherwise required by the CEO.

PART VII – INTERPRETATION & DEFINITIONS

22. Interpretation

The following rules of interpretation apply to this Permit:

- (a) a reference to any *written law* includes a reference to that *written law* as amended, repealed or replaced from time to time;
- (b) if a word or phrase is defined, other parts of speech and grammatical forms of that word or phrase have corresponding meanings.

23. Severance

It is the intent of these conditions that they shall operate so that, if a condition or part of a condition is beyond the CEO's power to impose, or is otherwise ultra vires or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the CEO's power to impose and are not otherwise ultra vires or invalid.

24. Inconsistency

- (a) The *EP Act* prevails to the extent of any inconsistency between its provisions and the conditions of this Permit.
- (b) Subject to condition 24(a), this Permit prevails to the extent of any inconsistency between its conditions (including its Schedules), and the provisions of any other document referred to in this Permit.

25. Definitions

The following meanings are given to terms used in this Permit and the attached Advice:

<i>Assessment Principles</i>	means the assessment principles set out in Part III of this Permit;
<i>Assessment Procedure</i>	means the assessment procedure set out in Part II of this Permit;
<i>Assessment Report</i>	has the meaning given to that term in condition 6(1) of this Permit;

<i>authorised survey/s</i>	has the meaning given to it in section 3 of the <i>Licensed Surveyors Act 1909</i> ;
<i>biological survey</i>	means a site visit undertaken by an <i>environmental specialist</i> to: <ul style="list-style-type: none"> (a) verify <i>desktop study</i> information; (b) delineate key flora, fauna, soil, and groundwater and surface water values and potential sensitivity to impact; (c) undertake <i>vegetation condition mapping</i>; and (d) undertake vegetation mapping by delineating on a map the <i>ecological communities</i> formed within a given area, and the nature and extent of each combination, within the area to be cleared at the scale of the best available mapping information;
<i>bioregion</i>	has the meaning given to it in regulation 3 of the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> ;
<i>camp/s</i>	means any facilities required to be established by the permit holder at the site of a project activity such as offices, storerooms, workshops, toilets, washing facilities, accommodation, change rooms, shelter sheds, drying conveniences, mess rooms;
<i>clearing principle/s</i>	means the principles for clearing native vegetation set out in Schedule 5 of the <i>Environmental Protection Act 1986</i> ;
<i>condition</i>	means the rating given to native vegetation using the <i>Keighery scale</i> and refers to the degree of change in the structure, density and species present in the particular vegetation in comparison to undisturbed vegetation of the same type;
<i>contributing offset/s</i>	has the same meaning as is given to that term in the Environmental Protection Authority's <i>Preliminary Position Statement No. 9 (Version 2): Environmental Offsets</i> , June 2005;
<i>defined wetland</i>	has the meaning given to it in clause 3 of the <i>Environmental Protection (Environmentally Sensitive Areas) Notice 2005</i> ;
<i>Department</i>	means the Western Australian Department of Environment and Conservation;
<i>desktop study</i>	means a literature review, including a map-based information search of all current and relevant literature sources and databases;
<i>dieback</i>	means the effect of <i>Phytophthora</i> species on native vegetation;

<i>Dieback Management Guideline</i>	means the permit holder's corporate procedure for providing guidance on <i>dieback</i> management, Document No. (TBC) Version (Draft), dated February 2008, contained in Annexure 5 to this Permit;
<i>dieback survey</i>	means a site visit undertaken by an <i>environmental specialist</i> to: (a) verify <i>desktop study</i> information; (b) identify indicator species; and (c) carry out soil sampling in areas significantly affected by <i>dieback</i> ;
<i>direct offset/s</i>	has the same meaning as is given to that term in the Environmental Protection Authority's <i>Preliminary Position Statement No.9 (Version 2): Environmental Offsets</i> , June 2005;
<i>direct seeding</i>	means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species;
<i>Drafting and Implementing Environmental Management Plans</i>	means the permit holder's corporate procedure for preparing an environmental management plan, Document No.425448 Version 3, dated 5 February 2008, contained in Annexure 3 to this Permit;
<i>drain</i>	means a conduit on or under any land; or channel provided it is wholly constructed, which was or is used or intended to be used to carry surplus water, and includes any part of such conduit or channel but does not include a watercourse as defined in the <i>Rights in water and Irrigation Act 1914</i> ;
<i>ecological community</i>	means a naturally occurring biological assemblage that occurs in a particular type of habitat (English and Blythe, 1997; 1999) – the scale at which ecological communities are defined will depend on the level of detail in the information source, therefore no particular scale is specified;
<i>EIA</i>	means environmental impact assessment, as described in condition 6 of this Permit;
<i>EIA Report</i>	means the document produced as an outcome of conducting an <i>EIA</i> in accordance with condition 6 of this Permit;
<i>EMP</i>	means environmental management plan, as described in condition 10 of this Permit;
<i>engineering survey/s</i>	means any inspection or measurement taken by a surveyor engaged by the permit holder for the purpose of planning, investigating and design for a <i>project activity</i> ;

<i>environmental specialist</i>	means a person who is engaged by the permit holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;
<i>EP Act</i>	means the <i>Environmental Protection Act 1986</i> ;
<i>EPA</i>	means the Western Australian Environmental Protection Authority;
<i>EPA Guidance Statement No.51</i>	means the publication “Guidance for the Assessment of Environmental Factors: Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia”, No.51, (2004), Environmental Protection Authority;
<i>ESA</i>	means an environmentally sensitive area, as declared by a notice under section 51B of the <i>Environmental Protection Act 1986</i> ;
<i>ESRI Shapefile</i>	means an ESRI Shapefile with the following properties: (a) Geometry type: polygon; (b) Geographic Coordinate System: Geocentric Datum of Australia 1994; (c) Datum: Geocentric Datum of Australia 1994;
<i>existing water services infrastructure</i>	means infrastructure necessary for the provision of water supply, sewerage, drainage (to the extent that these are consistent with the definition of drain) or irrigation services as provided for under the <i>Water Corporation Act 1995</i> and any other written laws, that is in existence at the time clearing is sought to be carried out under this Permit;
<i>external environmental audit</i>	means an audit conducted by a <i>lead environmental auditor</i> in accordance with condition 21 of this Permit;
<i>extraction sites</i>	includes gravel pits, borrow pits, water bores and other sites from which <i>road building materials</i> are extracted;
<i>fill</i>	means material used to increase the ground level, or fill a hollow;
<i>firebreak/s</i>	means a firebreak established in accordance with the <i>Bush Fires Act 1954</i> ;
<i>geological survey/s</i>	means a survey conducted in order to obtain information about the suitability of the ground for a <i>project activity</i> , and includes geotechnical surveys;

<i>good or better condition</i>	means that the vegetation is in either pristine, excellent, very good or good condition according to <i>Keighery scale</i> ;
<i>impacts</i>	means any impact of clearing on <i>environmental values</i> ;
<i>internal environmental audit</i>	means an audit conducted by the permit holder in accordance with condition 20 of this Permit;
<i>Keighery scale</i>	means the vegetation condition scale described in <i>Bushland Plant Survey: A Guide to Plant Community Survey for the Community (1994)</i> as developed by B.J. Keighery and published by the Wildflower Society of WA (Inc), Nedlands, Western Australia;
<i>land degradation</i>	includes salinity, erosion, soil acidity and waterlogging;
<i>lead environmental auditor</i>	means an individual certified as a lead environmental auditor by either: (a) RABQSA International; or (b) an organisation accredited to ISO/IEC 17024 by, or by a body recognised by, the Joint Accreditation System of Australia and New Zealand);
<i>management strategy / management strategies</i>	means any activity, method or approach implemented pursuant to condition 11 of this Permit;
<i>mulch/es</i>	means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;
<i>offset</i>	means an offset required to be implemented under Part V of this Permit;
<i>offset proposal</i>	means an offset determined by the permit holder in accordance with condition 14(a);
<i>optimal time</i>	means the optimal time for undertaking <i>direct seeding</i> and <i>planting</i> as set out in the table in Schedule 2 of this Permit;
<i>PEIA</i>	means preliminary environmental impact assessment, as described in condition 6 of this Permit;
<i>PEIA Report</i>	means the document produced as an outcome of conducting a preliminary environmental impact assessment in accordance with conditions 6(a) and (c) of this Permit;
<i>planting</i>	means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

<i>pre-construction activities</i>	means establishing storage areas, erecting fences and doing similar activities that are required to be done prior to, and in association with, the carrying out of a project activity;
<i>Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation</i>	means the permit holder’s corporate procedure for undertaking preliminary environmental impact assessment, Document No.592094 Version 1, dated 21 February 2008, contained in Annexure 1 to this Permit;
<i>project activity / project activities</i>	means those activities described in condition 1(a) of this Permit;
<i>project surveys</i>	means <i>authorised surveys, engineering surveys and geological surveys</i> ;
<i>proposal</i>	has the meaning given to it in section 3 of the <i>Environmental Protection Act 1986</i> ;
<i>referred</i>	means referred to the Environmental Protection Authority under Part IV of the <i>Environmental Protection Act 1986</i> ;
<i>regeneration</i>	means <i>revegetation</i> that can be established from in situ seed banks contained either within the topsoil or seed-bearing <i>mulch</i> ;
<i>region</i>	means one of the following regions: (a) Metropolitan; (b) South West; (c) Wheatbelt South; (d) Wheatbelt North; (e) Great Southern; (f) Goldfields-Esperance; (g) Midwest; (h) Gascoyne; (i) Pilbara; and (j) Kimberley;
<i>rehabilitate / rehabilitated / rehabilitation</i>	means actively managing an area containing native vegetation in order to improve the ecological function of that area;
<i>revegetate / revegetated / revegetation</i>	means the re-establishment of a cover of native vegetation in an area such that the species composition, structure and density is similar to pre-clearing vegetation types in that area, and can involve <i>regeneration, direct seeding and/or planting</i> ;

<i>Revegetation Guideline – Techniques and Monitoring</i>	means the permit holder's corporate procedure for providing guidance on undertaking revegetation, Document No.592092 Version 1, dated 21 February 2008, contained in Annexure 2 to this Permit;
<i>Revegetation Plan</i>	means a plan developed by the permit holder for the revegetation and <i>rehabilitation</i> of a site in accordance with condition 12;
<i>road building materials</i>	means rock, gravel, soil, stone, timber, boulders and water;
<i>site preparation</i>	means management of existing site topsoil and preparation of the finished soil surface, for example by ripping or tilling the soil surface and respreading site topsoil and chipped native vegetation;
<i>temporary works</i>	means access tracks, spoil areas, side tracks, site offices, storage areas, laydown areas and similar works associated with a project activity that are temporary in nature;
<i>term</i>	means the duration of this Permit, including as amended or renewed;
<i>vegetation condition mapping</i>	means to delineate on a map the condition attributes of vegetation within an area, according to the <i>Keighery scale</i> ;
<i>vegetation establishment period</i>	means a period of at least two summers after the <i>revegetation</i> during which time replacement and infill <i>revegetation</i> works may be required for areas in which revegetation has been unsuccessful, and involves regular inspections of <i>revegetation</i> sites to monitor the success of <i>revegetation</i> ;
<i>water quality deterioration</i>	includes sedimentation, turbidity, eutrophication, salinity, or alteration of pH affecting surface water or groundwater;
<i>water services infrastructure</i>	means infrastructure necessary for the provision of water supply, sewerage, drainage or irrigation services as provided for under the <i>Water Corporation Act 1995</i> ;
<i>Weed Management Guideline</i>	means the permit holder's corporate procedure for providing guidance on <i>weed</i> management, Document No. 592093 Version 1, dated 21 February 2008, contained in Annexure 4 to this Permit;
<i>weed/s</i>	means a species listed in Appendix 3 of the "Environmental Weed Strategy" published by the Department of Conservation and Land Management (1999), and plants declared under section 37 of the <i>Agriculture and Related Resources Protection Act 1976</i> ;

wetland field assessment means a site visit by an *environmental specialist* to:
(a) verify *desktop study* information; and
(b) delineate key flora and fauna values of *defined wetlands*
and their potential sensitivity to impact,
in accordance with the permit holder's *Environmental
Guideline: Supplementary Guidance on Environmental Impact
Assessment*;

wetland/s has the same meaning as it is given in Schedule 5 of the
Environmental Protection Act 1986;

written law has the same meaning as it is given in section 5 of the
Interpretation Act 1984.



M Warnock
A/MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

21 March 2013

SCHEDULE 1

Optimal Timing for Seeding and Planting

Region	Optimal Timing	
	Seeding	Planting
Gascoyne	May in south of <i>region</i> ; November-December in north of <i>region</i> .	No <i>planting</i> without irrigation.
Goldfields – Esperance	April-May. Earlier in south than in north.	No <i>planting</i> without irrigation.
Great Southern	April-May throughout <i>region</i> . Seeding during September-October within 30km of the coast can also be successful due to warm temperatures and spring coastal showers.	May-June.
Kimberley	October-December, preferably just before rain.	No <i>planting</i> without irrigation.
Metropolitan	April-June.	May-July.
Midwest	April-May in south of <i>region</i> ; November-December in extreme north of <i>region</i> .	May-June in southern part of <i>region</i> only.
Pilbara	November-December but preferably just before rain.	No <i>planting</i> without irrigation.
South West	April-June.	May-June.
Wheatbelt North	May – June.	June- July.
Wheatbelt South	April-June.	May-June.

ANNEXURE 1

Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation

Doc ID 592094-v2E	Custodian Manager Environmental Impact Assessment and Approvals
Version Date 16 November 2009	Accountabilities Framework Level 1 – Manage Environment
Next Review Date November 2011	Level 2 – Manage Environmental Approvals

1. Purpose

This document provides a procedure for Water Corporation's Environment Branch to conduct Preliminary Environmental Impact Assessment (PEIA) for Water Corporation projects proposing to clear native vegetation. The PEIA will determine any potential environmental aspects and impacts of Water Corporation maintenance, construction and infrastructure projects and whether approvals or further assessment is necessary and / or whether referral to State and / or Commonwealth regulators is required.

2. Scope

The PEIA for a proposed project will typically include the following:

- o Assessment to determine the key environmental aspects and impacts of a project proposing to clear native vegetation;
- o Assessment to determine whether proposed clearing associated with the project is exempt under the Environmental Protection Act 1986 (EPAct) or the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (the Clearing Regulations) and whether a clearing permit is required;
- o Where a clearing permit is required, determine whether clearing can be carried out under an existing permit, or whether another permit is required;
- o Assessment of the project clearing activities against the Clearing Principles (EPAct: Schedule 5);
- o Consultation with relevant stakeholders as required;
- o Assessment to determine whether the project clearing is likely to have a significant effect on the environment (e.g. clearing is likely to be at variance or seriously at variance with the clearing principles) and therefore may require supplementary environmental impact assessment (EIA) or referral to the Environmental Protection Authority (EPA);
- o Assessment to determine whether the project clearing will have a significant impact on any Matters of National Environmental Significance and therefore require referral to the Department of the Environment, Water, Heritage and the Arts (DEWHA); and
- o Record and report on the findings.

3. Definitions

Clearing is the killing of, removal of, severing or ringbarking of trunks or stems of, or the doing of any other substantial damage, including draining or flooding land, burning and grazing of stock, to some or all of the native vegetation in an area (Government of Western Australia, 1986). (*Clearing* does not include pruning of native vegetation, to the extent the pruning does not cause substantial damage to the native vegetation.)

Clearing Principles are the principles for clearing native vegetation set out in Schedule 5 of the EP Act (refer to Appendix 1).

Declared Rare Flora (DRF) are plant taxa declared by the Minister for the Environment under the Wildlife Conservation Act as "rare flora" if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Declared plants cannot be disturbed without Ministerial approval. These plant taxa are categorised as either "Declared Rare Flora – Extant Taxa" or "Declared Rare Flora – Presumed Extinct Taxa" (not been collected, or otherwise verified, over the past 50 years despite thorough searching).

Environmental Offsets are beneficial activities undertaken to counterbalance an adverse environmental impact to achieve 'no net environmental loss' or aspirationally a 'net environmental benefit' (EPA, 2007).

Environmentally Sensitive Areas are defined areas having significant environmental value which have been declared in Regulation 6 of the Clearing Regulations.

Environmental Specialist means a person who is engaged by the permit holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under Clearing Permit 185.

Environmental value means:

- (a) a beneficial use; or
- (b) an ecosystem health condition (as defined under Section 3 of the EP Act) (Government of Western Australia, 1986).

'Good' condition or better means that the vegetation is in either pristine, excellent, very good or good condition according to the Keighery scale (Keighery, 1994).

Native vegetation means indigenous aquatic or terrestrial vegetation but does not include vegetation that was intentionally sown, planted or propagated unless:

- (a) that vegetation was sown, planted or propagated as required under the EP Act or another written law; or
- (b) that vegetation is of a class declared by regulation to be included in this definition and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation (Government of Western Australia, 1986).

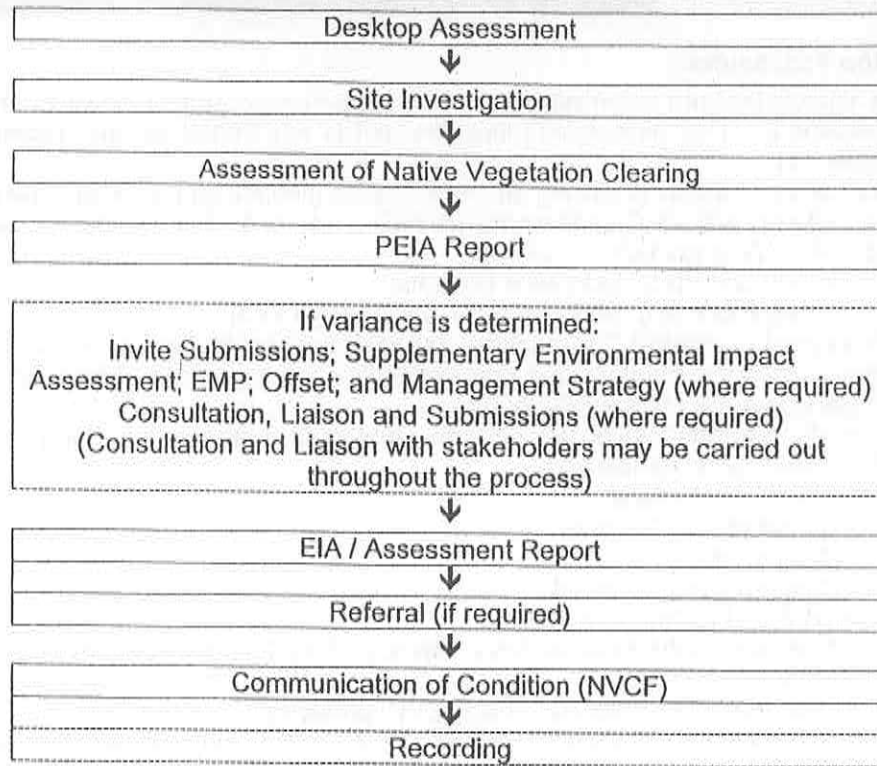
Priority Flora are plant taxa that have been designated a priority category as their threatened status is under review, particularly as knowledge of their distribution and threats are poorly known. The priority categories are:

- o Priority One - few, generally less than 5, populations which are under threat and primarily on lands not managed for conservation;
- o Priority Two - few, generally less than 5, populations with some that are not under immediate threat and are on conservation reserves;
- o Priority Three - several populations, with some that are not under immediate threat and are on conservation reserves; and
- o Priority Four - adequately surveyed and considered not immediately threatened but needs ongoing monitoring.

4. Procedure

4.1. Preliminary Assessment of Environmental Impacts

New projects typically involving the clearing of native vegetation undergo a three stage assessment process within the Water Corporation: 1) Planning Phase Assessment; 2) Internal Environmental Impact Assessment; and 3) Assessment under the 'Preliminaries to Works' protocol. The PEIA is carried out during the Internal Environmental Impact Assessment stage, and includes, but is not limited to, the following.



4.1.1. Desktop Assessment

Environmental aspects that are potentially relevant to the proposed project activities are assessed during a desktop assessment. This assessment includes, but is not limited to, the assessment of potential impact on or related to:

- Biodiversity Aspects (including but not limited to dieback and other diseases or pathogens (consultation with DEC), and weeds (including weeds declared under the *Biosecurity and Agriculture Management Act 2007*));
- Threatened and Protected Fauna Habitats;
- Threatened Flora (e.g. Declared Rare and Priority Flora);
- Threatened Ecological Communities (including relevant Matters of National Environmental Significance as defined by the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*);
- Vegetation Representation (i.e. current extent as compared to pre-European extent; Associations and Complexes);
- Watercourse or Wetland:
 - Conservation Category
 - Multiple-use
 - Resource enhancement
 - RAMSAR (Commonwealth)
 - Australian Nature Conservation Agency – Directory of Important Wetlands (Commonwealth)
 - Environmental Protection Policy (EPP) protected:
- Land Degradation (including Water Erosion, Soil Acidity, Soil Salinity, and Waterlogging);
- Conservation Areas (including adjacent buffer or linkage areas, Bush Forever, Land in Conservation Estate, Covenanted Lands);
- Groundwater:
 - Groundwater Dependent Ecosystems
 - Public Drinking Water Source Areas (PDWSA)
 - PDWSA Protection Advice (other advice)
 - Country Areas Water Supply Act Water Reserves;
- Surface waters / drainage; and
- Flooding.

4.1.1.1. Methodology

The Water Corporation's extensive spatial datasets (predominantly derived from and maintained by external government agencies), as well as other web based tools are searched and analysed (using GIS applications, including Water Corporation's Netmaps) to determine whether the project will impact areas with significant environmental value. The datasets are reviewed and updated regularly by the Water Corporation's Spatial Information Management Group.

Where dataset or web tool resources are unavailable, the relevant government agencies should be consulted for advice and assistance.

Where certain environmental aspects (detailed in Section 4.1.1) will potentially be significantly impacted, further assessment will be required (refer to Section 4.1.3.2).

4.1.2. Site investigation

Where further information regarding the project area (including its environmental value) is required, a site visit should be carried out by a Water Corporation Environmental Officer. Site visits will include an inspection of the proposed project area during which a basic vegetation assessment and identification of any potential impacts will be carried out. Photos of the project area and its surroundings should be taken. A Department of Environment and Conservation (DEC) officer may also be requested to participate in the site investigation if it is deemed that their specific site advice or clarification is required.

4.1.3. Assessment of Native Vegetation Clearing

4.1.3.1. Mitigation

If clearing of native vegetation is proposed, measures to mitigate the clearing should be addressed. The following principles should be followed as practicable:

- (a) avoid the clearing of native vegetation;
- (b) minimise the amount of native vegetation to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

4.1.3.2. Assessment against the Clearing Principles.

The clearing proposed must be assessed against the Clearing Principles established in Schedule 5 of the EP Act (refer to Appendix 3 for clearing assessment report form). Each principle should be properly assessed in accordance with the DEC's Guide to the Assessment of Applications to Clear Native Vegetation.

Where clearing may be at variance with one or more of the clearing principles:

- (a) supplementary EIA (e.g. biological survey); will be required;
- (b) submissions must be invited from relevant stakeholders; and
- (c) an Environmental Management Plan (EMP) will be required.

(Refer below for further information)

Where clearing is likely to be or is at variance with:

- (a) one or more of the clearing principles, environmental offsets will likely be required, and/or
- (b) Clearing Principle 'g', 'i', and/or 'j' in particular, a Management Strategy pertaining to the relevant Clearing Principle(s) will be required.

(Refer below for further information)

Where clearing is or is likely to be seriously at variance with one or more of the clearing principles, consultation must be carried out with the DEC to confirm whether the clearing will be seriously at variance. If it is determined that the proposed clearing activity will be seriously at variance one or more of the clearing principles:

- (a) the proposed clearing activities will not be permitted under Clearing Permit CPS 185, and application for a separate (new) clearing permit will need to be made; or
- (b) the project may need to be referred to the EPA under Section 38 of the EP Act (a Section 38 referral form will need to be completed) for a level of assessment to be set (refer to Section 4.1.4). Advice should be sought from the EPA Service Unit during this process.

Invitation for Submissions

Where clearing of native vegetation may be or will likely be at variance with one or more of the clearing principles, submissions pertaining to the proposed clearing activities must be invited from, but not limited to, the following stakeholders.

- o DEC (Native Vegetation Conservation Branch)
- o DoAF (Office of the Commissioner of Soil and Land Conservation)
- o DoW (Drainage and Waterways Branch)
- o Conservation Council
- o LGA
- o Land owner or occupier
- o Any Environment, Community Group or other party that may have a reasonable interest in the proposed clearing activity.

Invitations should be sent in the form of a letter (refer to AQUA Doc. 949799). A period of 21 days must be allowed for submissions to be made. The letter should contain enough detail for the stakeholder to be able to determine and assess any relevant impacts. Prior to sending the letter, a courtesy phone call to each relevant stakeholder should be made explaining the proposed clearing activity and potential impacts.

Where required, supplementary information should be provided to relevant stakeholders (in particular the DEC and Conservation Council) to further describe the proposed clearing activity and to clarify any queries. This may be in the form of a presentation or meeting.

Written records of any consultation must be maintained.

Supplementary Environmental Impact Assessment

Following (or during) the PEIA, if it is determined that the proposed clearing activity may be or is likely to be at variance with one or more of the clearing principles, supplementary Environmental Impact Assessment (EIA) (e.g. biological surveys) pertaining to the relevant clearing principle(s), should be undertaken (e.g. by an external Consultants) to determine the significance of potential impacts and verify the variance status. Supplementary EIA should be carried out in accordance with the Water Corporation's *Scope of Works: Flora and Fauna Assessment*. Consultation with relevant stakeholders may also be carried out at this stage. The table below details a number of environmental factors that, if impacted, may trigger further assessment.

Environmental Factors	EP Act	EPBC Act	Supplementary EIA
Threatened Flora or Ecological Community	√	√	DEC database query + Flora Survey + Management Plan + Consultation with relevant agency (e.g. DEC or DEWHA)
Significant or Protected Fauna Habitat	√	√	DEC database query + Fauna Survey + Management Plan + Consultation with relevant agency (e.g. DEC or DEWHA)
Riparian Vegetation*	√		Flora Survey
Dieback Infected Area			DEC consultation + Dieback Survey + Management Plan

*Vegetation associated with artificial drains and drainage structures operated by Water Corporation is not considered to be riparian vegetation.

Environmental Management Plan

Where required, an Environmental Management Plan should be developed (either internally or externally) with regard to Water Corporation's *Drafting and Implementing Environmental Management Plans* and include:

- o a plan for managing the impacts;
- o a table setting out commitments to the EMP's requirements;
- o a program for monitoring compliance with commitments; and
- o a copy of the Revegetation Plan (if required).

Environmental Offsets

Environmental offset packages should be developed in consultation with the Environment Branch, Corporate Real Estate Branch and DEC and in accordance with the following offset principles:

- (a) direct offsets should directly counterbalance the loss of the native vegetation;
- (b) contributing offsets should complement and enhance the direct offset;
- (c) offsets are implemented only once all avenues to avoid, minimise, rectify or reduce environmental impacts have been exhausted;
- (d) the environmental values, habitat, species, ecological community, physical area, ecosystem, landscape, and hydrology of the offset should be the same as, or better than, that of the area of native vegetation being offset;
- (e) a ratio greater than 1:1 should be applied to the size of the area of native vegetation that is offset to compensate for the risk that the offset may fail;
- (f) offsets must entail a robust and consistent assessment process;
- (g) in determining an appropriate offset, consideration should be given to ecosystem function, rarity and type of ecological community, vegetation condition, habitat quality and area of native vegetation cleared;
- (h) the offset should either result in no net loss of native vegetation, or lead to a net gain in native vegetation and improve the condition of the natural environment;
- (i) offsets must satisfy all statutory requirements;
- (j) offsets must be clearly defined, documented and audited;
- (k) offsets must ensure a long-term (10-30 year) benefit; and
- (l) an environmental specialist must be involved in the design, assessment and monitoring of offsets.

Refer to the EPA's *Position Statement No. 9 Environmental Offsets* and *Guidance Statement No. 19 Environmental Offsets* for further guidance.

Management Strategy

Where required, a Management Strategy should be prepared by and environmental specialist, in Consultation with the Commissioner of Soil and Land Conservation. The Management Strategy should

include measures to avoid, mitigate or manage the land degradation (clearing principle 'g'), water quality deterioration (clearing principle 'l'), or flooding (clearing principle 'j') that triggered the requirement for a Management Strategy.

4.1.3.3. Requirements Prior to Clearing

Prior to clearing any native vegetation (in accordance with CPS 185), the following requirements must be adhered to:

- (a) Comply with the Assessment Procedure and the Assessment Principles set out in Clearing Permit CPS 185;
- (b) If an offset is required to be implemented, an offset proposal must be provided the CEO of the DEC for approval;
- (c) If a management strategy is required to be implemented, the management strategy must be provided the CEO of the DEC for approval; and
- (d) If revegetation and rehabilitation is required, a Revegetation Plan must to be provided the CEO of the DEC for their record (unless the area to be revegetated and rehabilitated is: less than 0.5 hectares; not located in an ESA; and an area where the proposed clearing that triggers the obligation to revegetate and rehabilitate is not at variance with one or more of the clearing principles).

4.1.4. Referral to EPA (or DEWHA)

For projects where clearing of native vegetation:

- is not exempt;
 - cannot be carried out under a clearing permit (e.g. clearing is seriously at variance with the clearing principles); or
 - significantly impacts on areas of environmental value,
- referral to the EPA is likely.

Liaison with the EPA Service Unit will assist in determining whether referral is required. Where referral is required, a Section 38 referral form will need to be completed and submitted to the EPA for a level of assessment to be set.

For projects where clearing of native vegetation is likely to impact significantly on Matters of National Environmental Significance as established under the EPBC Act, referral to the DEWHA is likely. The DEWHA has developed a guideline that provides guidance on determining whether a proposed action is likely to have a significant impact on Matters of National Environmental Significance (guidelines can be found at the EPBC Act website).

4.2. Reporting

4.2.1. Preliminary EIA report

As part of the PEIA, a report (PEIA Report) (AQUA doc. 2169612) will be produced and will set out, but not be limited to, the following:

- project description;
 - Background (e.g. project planning and previous assessments)
 - Project area (e.g. location boundaries and maps)
 - Existing Environment (e.g. vegetation types / associations, condition and representation (current extent) of the vegetation to be cleared or impacted)
- the manner in which environmental impact mitigation has been carried out;
- the area (in hectares) and boundaries of clearing required for the project activity;
- findings of the desktop assessment;
- assessment of each of the clearing principles;
- whether there are likely to be any impacts that may be at variance or seriously at variance with the clearing principles;
- whether rehabilitation, revegetation, or an EMP is likely to be required;
- whether an environmental offset is likely to be required; and
- whether referral to EPA/DEWHA is recommended.

(A copy the report and other associated documentation produced in relation to the assessment of clearing impacts, must be maintained for record and audit purposes.)

4.2.2. EIA Report / Assessment Report

Where Supplementary Environmental Impact Assessment is required, a report (EIA Report) will be produced and will set out, but not be limited to, the following:

- o copies of any submissions received and a statement addressing each of those submissions;
- o the manner in which the permit holder has had regard to the permit holder's Procedure: Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation in conducting an EIA;
- o the results of any surveys and field assessments carried out;
- o any impacts likely to occur as a result of the clearing, including a description of those impacts that may be at variance or seriously at variance with the clearing principles;
- o any rehabilitation, revegetation, management strategy or other means of rectification that the permit holder will adopt to address the impacts; and
- o any offsets developed that will need to be implemented to address the impacts.

Where the permit holder conducts a PEIA and an EIA simultaneously, the permit holder may produce one report, to be known as an Assessment Report, which will contain all of the information required to be provided by this condition in a PEIA Report and an EIA Report. If an Assessment Report is developed, there is no need to produce a PEIA Report or an EIA Report for the proposed clearing.

(A copy the report(s) and other associated documentation produced in relation to the assessment of clearing impacts, must be maintained for record and audit purposes.)

4.3. Communication of Conditions (Native Vegetation Clearing Form)

Following the assessment of the proposed clearing and reporting, conditions pertaining to the specific clearing proposal will be communicated to the Clearing Proponent via the Native Vegetation Clearing Form (NVCF). The NVCF will contain only relevant conditions from Clearing Permit 185-1, as well other general conditions that will require addressing. The NVCF will be reviewed and signed-off by both Manager Environmental Impact Assessment and Approvals and the Clearing Proponent.

4.4. Records

Records associated with the PEIA in relation to the clearing of native vegetation will be maintained in AQUA, Water Corporation's corporate document and records management system, for record and auditing purposes, and will include the following:

- (i) a copy of any PEIA Report (and any associated documentation) produced;
- (ii) a map showing the location where the clearing occurred, recorded in ESRI Shapefile format;
- (iii) the area cleared (in hectares); and
- (iv) the date(s) of the clearing.

The following clearing activity information should be provided to Environment Branch by the Responsible Officer:

- o Location of cleared area, including GPS coordinates (GDA 94) of the cleared area (e.g. boundary) or map showing location of area cleared (GDA 94)
- o Size of the area cleared (ha);
- o Date the area was cleared;
- o Photos depicting area cleared (including the area prior to clearing) (where possible); and
- o Assessment Details (e.g. PEIA Report information) (where possible).

(These details should be entered into a AQUA for record and auditing purposes.)

To assist the tracking of conditional statutory approvals (i.e. any licence, permit or statement that allows an activity to be undertaken subject to legally binding conditions) and compliance recording, regulatory conditions imposed on project clearing activities will need to be forwarded to the Environment Branch Compliance Officer (RCMS Coordinator) to be entered into the Water Corporation's Regulatory Conditions Management System (RCMS). RCMS is based on the hierarchal level structure of the *approval*, the *conditions* of the approval, and the *actions* undertaken to substantiate compliance with each condition. For assistance using RCMS, refer to Water Corporation Guideline: Using the Regulatory Conditions Management System (RCMS).

5. Related Documentation

Australian Standard *Pruning of Amenity Trees* (AS 4373-1996)

Department of Environment and Conservation (2009), *Guide to the Assessment of Applications to Clear Native Vegetation* (Online). Perth, Western Australia.

Water Corporation's Guideline: Drafting and Implementing Environmental Management Plans

Water Corporation Guideline: Using the Regulatory Conditions Management System (RCMS)

Water Corporation Scope of Works: Flora and Fauna Assessment

6. References

Environmental Protection Authority (2007). *Environmental Offsets: Draft Guidance Statement No 19*, Perth, Western Australia, June 2007.

Environmental Protection Authority (2006). *Environmental Offsets: Position Statement No. 9*. Perth, Western Australia, January 2006.

Government of Western Australia (2004). *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Government of Western Australia (1998a). *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Government of Western Australia (1998b). *Environmental Protection (Swan and Canning Rivers) Policy 1998*.

Government of Western Australia (1992a). *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.

Government of Western Australia (1992b). *Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992*.

Government of Western Australia (1992c). *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*.

Government of Western Australia (1986). *Environmental Protection Act 1986*.

Keighery, B.J. (1994). *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Manager Environment
16 November 2009

Document Revision History

21 Feb 2008	Original version
16 Nov 2009	Amended version

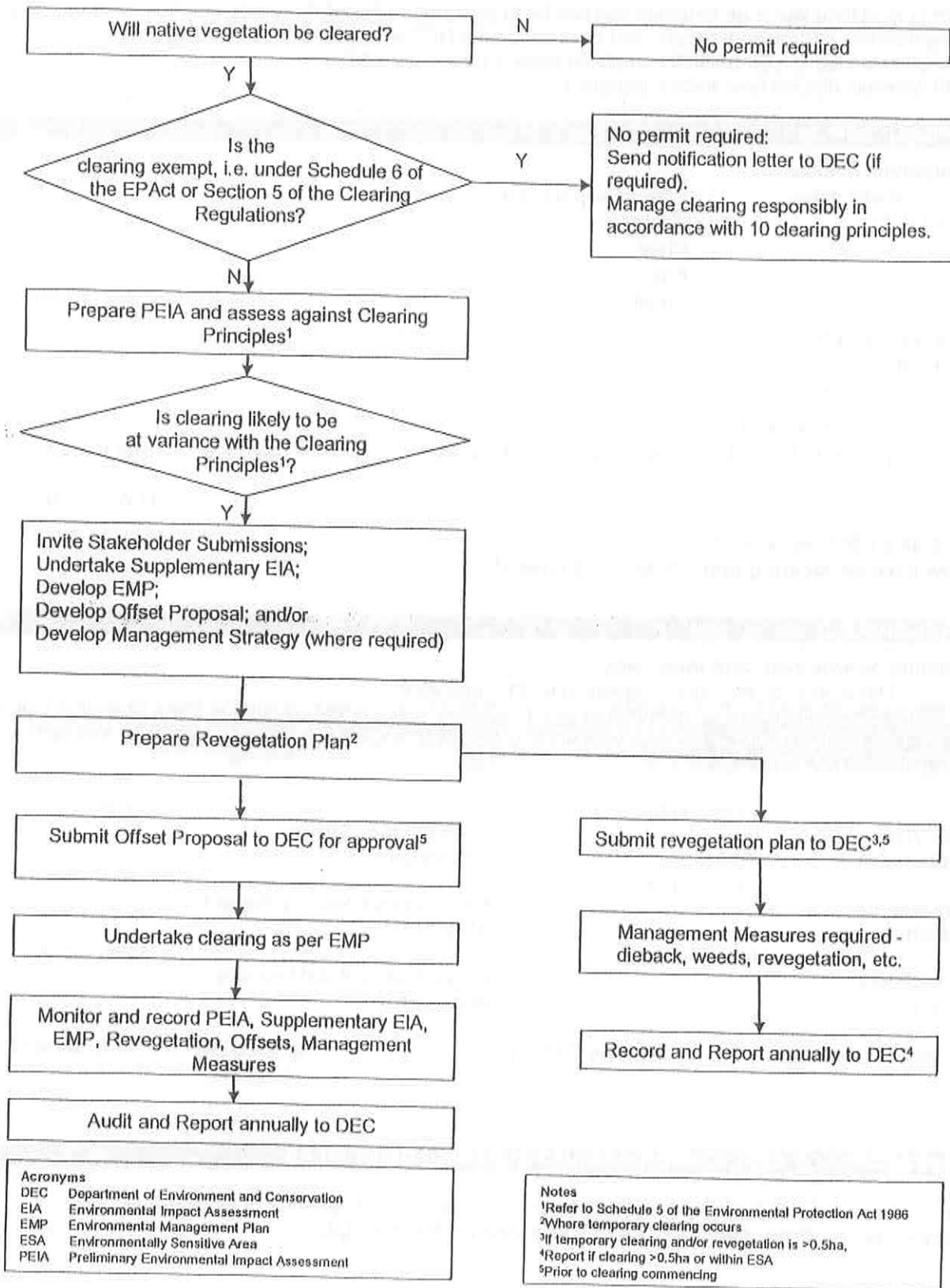
Appendix 1: Clearing Principles

Native vegetation should not be cleared if:

- (a) it comprises a high level of biological diversity;
- (b) it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;
- (c) it includes, or is necessary for the continued existence of, rare flora;
- (d) it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community;
- (e) it is significant as a remnant of native vegetation in an area that has been extensively cleared;
- (f) it is growing in, or in association with, an environment associated with a watercourse or wetland;
- (g) the clearing of the vegetation is likely to cause appreciable land degradation;
- (h) the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;
- (i) the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or
- (j) the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

(Ref: Schedule 5 of the Environmental Protection Act 1986)

Appendix 2: Native Vegetation Clearing Process Flow Chart



Acronyms
 DEC Department of Environment and Conservation
 EIA Environmental Impact Assessment
 EMP Environmental Management Plan
 ESA Environmentally Sensitive Area
 PEIA Preliminary Environmental Impact Assessment

Notes
¹Refer to Schedule 5 of the Environmental Protection Act 1986
²Where temporary clearing occurs
³If temporary clearing and/or revegetation is >0.5ha,
⁴Report if clearing >0.5ha or within ESA
⁵Prior to clearing commencing

(Ref: PM#2366468vR - Preliminary Environmental Impact Assessment Procedure - Clearing of Native Vegetation - Flowchart.ppt.PPT.DRF)

Appendix 3: Vegetation Clearing Assessment Report

(This report template is an example and has been prepared to assist Water Corporation in addressing "Assessment of Clearing Impacts" and is based on the DEC's template. For guidance on how to complete the form, refer to DEC completed reports (active permits) at https://secure.dec.wa.gov.au/cps_reports/.)

AREA UNDER ASSESSMENT DETAILS

Proponent details

Proponent's name: **Water Corporation**
 Contacts: Name:
 Phone:
 Fax:
 Email:

Property details

Property:
 Colloquial name:

Area under assessment

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:	Site Plan Attached
				<input type="checkbox"/> Yes <input type="checkbox"/> No

Avoidance/Minimise clearing

How have the clearing impacts been minimised?

BACKGROUND

Existing environment and information

Description of the native vegetation under application
 (Vegetation Condition can be determined using - Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community - Wildflower Society of WA (Inc), Nedlands, Western Australia)

Site Visit Undertaken	<input type="checkbox"/> Yes <input type="checkbox"/> No	Fauna / Flora Survey Undertaken	<input type="checkbox"/> Yes <input type="checkbox"/> No
Site Report Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No	Fauna / Flora Survey Report Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No
Site Photos Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No	Other Relevant References Attached	<input type="checkbox"/> Yes <input type="checkbox"/> No

Vegetation Complex	Clearing Description	Vegetation Condition	Comment
--------------------	----------------------	----------------------	---------

ASSESSMENT OF APPLICATION AGAINST CLEARING PRINCIPLES

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.
 Comments: Proposal is XXXXXXXX variance to this Principle

Methodology

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause or exacerbate the incidence or intensity of flooding.

Comments Proposal is XXXXXXXX variance to this Principle

Methodology

Planning Instrument, Native Title, RIWI Act Licence, EP Act Licence, Works Approval, Previous EPA decision or other matter

Comments

Methodology

SUBMISSIONS

If required have submissions been requested and addressed

Submission Requested from	Request Sent (Date)	Submission Received (Date)	Issues Raised / Comments Made
---------------------------	---------------------	----------------------------	-------------------------------

ASSESSOR'S RECOMMENDATIONS

List of Principles seriously at variance, at variance or maybe at variance

Recommendation (does this clearing require a Revegetation Management Plan / Offset Proposal / Environmental Management Plan / Management Strategy / New Application under CPS 185/1)

References

OFFICER PREPARING REPORT

Position: Title
XXXXXXXXX Regional Office/Approvals Branch
Water Corporation
Phone

Date

ANNEXURE 2

Revegetation Guideline – Techniques and Monitoring

Doc ID 592092-v2	Custodian Manager, Environmental Operations
Version Date 21 May 2009	Accountabilities Framework Level 1 – Manager Environment
Next Review Date May 2011	Level 2 – Manager Environmental Compliance

1. Purpose

Biodiversity can be affected by the Water Corporation's activities, particularly through its management of land and asset development. The Water Corporation aims to protect and enhance biodiversity on land under its influence and is committed to avoiding or minimising adverse impacts on biodiversity (Water Corporation Policy: *Biodiversity Policy*).

This Guideline covers establishment of native vegetation in disturbed areas, particularly where native vegetation has been cleared. It is designed to guide Water Corporation employees, but not replace specialist advice regarding revegetation projects.

2. Scope

Rehabilitation normally comprises two stages:

- Landform design and reconstruction of a stable land surface; and
- Revegetation on the reconstructed landform.

This guideline focuses on the revegetation stage and subsequent monitoring and maintenance requirements following revegetation.

This document addresses the following areas:

- The importance of revegetation;
- Key issues in the planning, implementation and ultimate success of revegetation works;
- The steps involved in the management of revegetation works; and
- Supporting technical information about revegetation techniques.

This document should be used by Water Corporation employees who are involved with the planning and implementation of revegetation works, including, but not limited to:

- Project Managers;
- Asset and Contract Managers;
- Operation Managers;
- Contract Managers; and
- Environmental Officers.

3. Definitions

Biodiversity	The variety of all life forms - the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. (Commonwealth of Australia, 1996).
Direct Seeding	A method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species.
Planting	The re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species.
Provenance	Used to refer to seed collected from a natural population. Provenance is also used to describe patterns of genetic variation exhibited by a species over its geographic range (Mortlock, 1999).
Regeneration	Revegetation that can be established from <i>in situ</i> seed banks contained either within the topsoil or seed-bearing mulch.

Rehabilitation	A process where disturbed land is returned to a stable, productive and self-sustaining condition, taking future land use into account (this process differs from the narrower definition of restoration by not aspiring to fully replace all of the original components of an ecosystem) (EPA, 2006).
Restoration	The process of fully repairing the composition, structure, function and dynamics of pre-existing indigenous ecosystems (EPA, 2006).
Revegetation	The re-establishment of a cover of native vegetation in an area such that the species composition, structure and density is similar to pre-clearing vegetation types in that area, and can involve regeneration, direct seeding and/or planting.
Site Preparation	Management of existing site topsoil and preparation of the finished soil surface, for example by ripping or tilling the soil surface and respreading site topsoil and chipped native vegetation.

4. Revegetation and Monitoring Guideline

4.1. Introduction

Water Corporation's development of infrastructure can result in the clearing of some native vegetation. Clearing of native vegetation can lead to degradation of soils and water resources, raised water tables and salinisation, release of greenhouse gases and decline and loss of biodiversity. Where practical, revegetation is therefore important, either through natural regeneration or strategic replanting programs. Good planning and environmental management will minimise the impacts of clearing on the environment and aid in the preservation of biodiversity through re-establishment of habitats and corridors for native species

Successful revegetation requires good planning well in advance of any physical activities (refer to [Section 4.2.2](#)). It is important that site constraints and project commitments are identified and responded to.

4.2. Considerations

4.2.1. Establishing Objectives

A clear objective for a revegetation project should be defined. Revegetation is undertaken for a variety of purposes including:

- to enhance existing native vegetation;
- to enhance rare or threatened species or plant communities;
- to stabilise soil;
- to reduce or control salinity;
- to manage pests, for example, attracting native birds to control insects; as habitat for native wildlife;
- to act as a sink for greenhouse gases;
- to improve water quality;
- to improve the amenity around homes and buildings; for aesthetic reasons, for example, screening unwanted views; and
- to create a pleasant living and working environment; for social and educational purposes.

As a minimum, the revegetation should be stable and on-going maintenance of the established vegetation should be minimal.

The design of the revegetation, including the species chosen, their placement, densities, the shape and size of the works, should reflect the objectives of the revegetation. If multiple outcomes are intended, there are likely to be different requirements to consider in the design of the works. For example, if the primary goal is to enhance biodiversity, the plant species, their arrangement and the width and length of the revegetation will be quite different to establishing vegetation for aesthetics purposes.

For projects that have been subject to statutory assessment by the Environmental Protection Authority (EPA), specific objectives will be set. Constraints may be applied, for example, on plant species selection, seed collection and propagation. The Project or Asset Manager may also set revegetation objectives. Goals and targets for revegetation must be realistic for the location and project (refer to [Section 4.5.1](#)). When establishing an objective, it is important that sufficient resources are allocated to the project budget (refer to [Section 4.2.2](#)) in order for rehabilitation aims to be met.

4.2.2. Planning

Successful projects have good planning. Projects that involve establishing native vegetation are no exception. Careful planning helps to set objectives, identify tasks to be done, ensures that the resources are available and that activities are undertaken when needed. Planning ensures that the best possible results can be achieved.

Planning should be carried out well in advance of any physical activities. Effective revegetation means identifying and responding to the site constraints (e.g. weeds) and project commitments. Planning should involve making the best use of the materials available on site, such as not wasting the existing soil and vegetation resources. A comprehensive Revegetation Plan (refer to [Section 4.3](#)) detailing how an area of land should be revegetated and what the final land use will be should be established as early as possible in the development of a project.

The key steps in revegetation are detailed below:

- Site assessment;
- Preliminary Planning (including setting of objectives);
- Development of a Revegetation Plan;
- Site Preparation;
- Weed and Pest Management;
- Seed collection, propagation and/or acquisition;
- Implementation;
- Vegetation establishment; and
- Monitoring and maintenance (especially on-going weed and pest control).

4.2.2.1. Timing

Timing is a key consideration throughout the whole process of establishing vegetation. Identifying the appropriate timing in your area for seed collection, site preparation, seeding and planting for the species and site conditions involved is essential.

The timing of seeding and planting is site specific and heavily dependent on thorough weed control and soil moisture conservation. Ideally, seeding or planting should be undertaken when the soil has wetted up and temperatures are still reasonably warm. This would normally be immediately prior to or at the 'break of season' (i.e. after winter rains have started). Thorough weed control will often widen the 'window-of-opportunity' for planting or seeding. As seasons can be variable, having preparation completed well in advance enables revegetation to occur when the conditions are most favourable. Soil preparation should occur by April (for the majority of regions).

The following table is a guide for the timing of activities in areas of medium to high rainfall and semi-arid environments. The timing of the activities should still be tailored to the local environmental conditions. It is recommended that planning, and in some cases preparatory on-ground works, such as seed collection, plant acquisition and weed control, begin more than a year before seeding or planting.

Activity	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	
1. Planning*										
2. Preparing the ground										
Soil preparation										
Weed control*										
3. Pest animal management										
Pest control										
Fencing										
4. Seeds and seedlings										
Seed collection, cleaning and ordering*										
Plant orders and propagation*										
5. Revegetation										
Natural regeneration										
Direct seeding and planting										
6. Maintenance										
7. Monitoring										

Refers to the timing of activities for both semi-arid and medium to high rainfall environments
 Refers to medium to high rainfall (500mm plus p.a.) areas only
 Refers to northern Midwest and North West regions areas only

*These activities should commence in advance of the seasons shown. Ideally:

- begin planning two or more years ahead of seeding or planting;
- start weed control at least twelve months prior to seeding or planting or earlier depending on the site;
- order seed two years before seeding or planting; and
- order plants at least twelve months prior to planting.

4.2.2.2. Site Assessment

A site assessment will assist to determine a number of site characteristics, including but limited to, slope, species diversity, weed and disease issues, stockpiling requirements, and revegetation techniques to be used and will allow for more effective planning of revegetation works. Where possible, relevant stakeholders (e.g. Project Managers, Environment Officers (preferably with botanical experience), and Revegetation Contractors) should meet on site to discuss possible constraints and assess opportunities. The table below provides a checklist of things to note when conducting your site assessment.

Site assessment checklist		
Flora and fauna	✓	Native vegetation
	✓	Weeds
	✓	Native wildlife (or evidence of)
	✓	Introduced animals and birds (or evidence of)
Soils	✓	Type of soil/s, structure and health
Other features	✓	Topography and contours
	✓	Aspect
	✓	Wetlands, creeks, drainage lines, ridges, escarpments etc.
Land and water issues	✓	For example, erosion by wind or water; salinity
Infrastructure above and below ground	✓	Dams, bores, buildings, roads, easements, powerlines, underground cables/pipes etc.

Site assessment checklist	
Access	✓ People, vehicles and machinery. The level of access available will influence the revegetation techniques chosen and the transport of materials, such as plants, across the site.
Surrounding landscape	✓ What is surrounding the site that will have positive and negative effects on the revegetation?

4.2.3. Budget Considerations

A detailed budget must be developed that includes funds for activities prior to (e.g. weed control, seed collection and propagation and soil preparation), during (vegetation establishment) and following the revegetation works (on-going monitoring and maintenance (inc. weed and pest control)). Projects will vary in cost depending on size, location and project characteristics. It is important to note that certain aspects, e.g. weed and pest control must be considered throughout the revegetation program. Such aspects are often overlooked and can lead to failed revegetation programs.

4.2.4. Engagement of Consultants and Contract Arrangements

Pre-qualified environmental consulting service providers can be engaged via the Environmental Consultants Panel. For more information regarding the engagement of a consultant via the Environmental Consultants Panel, please refer to the Water Corporation's user guide *Panel for the Provision of Environmental Consulting Services* located on the [Procurement Branch's website](#).

Contract arrangements should include a Revegetation Scope of Works, detailing specific requirements of works, including establishment of the new vegetation as well as any remedial works, monitoring requirements and contract arrangement for ongoing site management, that may be necessary to assure the project objectives will be met. The specific arrangements must be based on an assessment of project risks. For assistance developing a scope of works, please contact the Environment Branch.

4.2.5. Regional Differences

Revegetation requirements will differ across the State, with climate being a large factor in determining these requirements. Climate can and should influence the timing of revegetation activities as well as the revegetation method used. Historically in the more arid areas, (i.e. where rainfall is low and rainfall variability is moderate to high) the most cost effective method has proven to be topsoil management (refer to [Section 4.4.1](#)) along with some direct seeding and allowing natural regeneration to occur. Planting is generally limited to the Southwest corner of the State where annual rainfall is relatively high and reliable.

4.3. Revegetation Plan

A Revegetation Plan should be developed by the specialist consultant/contractor engaged to carry out the revegetation works. The plan should define the scope and extent of the works and the methods to cost effectively deliver the works. An initial site assessment will be necessary to determine relevant site conditions, constraints and requirements.

Ideally, the Revegetation Plan should include:

- A project outline;
- Layout and Site Description;
- Site Preparation Techniques;
- Weed (and other pest - where required) Control Measures and Recommendations (pre installation and post installation);
- Recommended Species List and source details (seed mix and/or seedlings selection to be determined by contractor);
- Revegetation Techniques – i.e. regeneration, direct seeding or planting details (inc. an optimal timing, planting locations, densities, etc.);
- Vegetation Establishment Period;

- Revegetation Completion (success) Criteria;
- Ongoing Monitoring and Maintenance Program and methodology;
- Implementation Schedule/Timeline (e.g. a timetable/Gantt chart displaying when the revegetation activities are proposed to occur (e.g. site preparation in xx month of xx year, weed control 12 months prior to planting, during establishment and after planting for xx years; monitoring in xx month/s for xx years, etc.); and
- Project limitations and issues.

4.4. Site Management

4.4.1. Topsoil Management

Topsoil from areas being cleared should be retained for subsequent site rehabilitation as it typically contains most of the seeds and other plant propagules (e.g. rhizomes, lignotubers, roots etc.), important micro organisms, organic matter and plant nutrients.

Two areas of importance when dealing with topsoil are depth of stripping and duration of storage. As the seed bank predominantly occurs within the top few centimetres of topsoil, shallow ripping (e.g. <100mm) is recommended. Double stripping techniques can also aid in improving the success of rehabilitation. Double stripping involves the removal of the top 100mm of soil and the then the removal of the next 300mm of soil, placing them in different stockpiles and re-using them in the appropriate order, to cover new rehabilitated sites.

While fresh topsoil is clearly preferable to optimise revegetation outcomes, temporary stockpiling of topsoil may be unavoidable. Stockpiling of topsoil can reduce its quality. Stockpiles can become anaerobic, organic matter and nutrients may be lost, seeds deteriorate, other plant propagules die and populations of beneficial soil micro-organisms are reduced significantly. Seeds of species that don't have hard coats are particularly susceptible to loss during stockpiling.

Where stockpiling is unavoidable, it should be for the least time possible and should be:

- as low a possible with a large surface area – 2m high or less;
- stabilised with vegetation or other soil stabilisers to protect from erosion, weeds etc. if the stockpiles are expected to be required for more than a few months before reuse; and
- located where they will not be disturbed.

The timing of topsoil removal is important. Clearing and soil removal should be carried out after seed set, where possible, to maximise the stores of seed in the soil. For example, in the jarrah forest, topsoil should be collected in summer when the seed bank is at its highest. Soil should not be removed or spread when it is too wet or too dry, as this can lead to compaction, loss of structure and loss of viability of seed. Ripping and mound ploughing (if wet) are common methods used to improve the success of revegetation through the alleviation of compaction and the establishment of a seed bed (refer to [Section 4.4.3.1](#)).

4.4.2. Revegetation Methods

4.4.2.1. Species Selection and Collection

Species selection will depend on the future land use, soil conditions and climate and should be consistent with the revegetation objectives and a baseline flora survey carried out (a baseline flora survey should be carried out prior to any clearing activities to determine the pre-clearing vegetation characteristics at the site). In some instances, species selection may be subject to statutory requirements. As a minimum, the species should include the most common local trees and shrubs matched with soil type. Where revegetation is carried out in areas of conservation importance, species establishment should include as many of the locally-occurring species as possible. Where possible, as much seed as possible should be collected from areas proposed for clearing (prior to any clearing being carried out) and neighbouring areas. This will ensure the seed stocks are of local provenance.

Not all native species successfully establish in areas that have been altered. If this is the case, and the objective is to re-establish vegetation as closely as possible to the original native

vegetation, then species from outside the project area may need to be introduced. Species that have similar growth forms to the original vegetation and grow well in comparable soils will be most appropriate. Care should be taken to avoid introducing a species that could become a fire hazard, invade surrounding areas of native vegetation or become weeds.

Most species used in revegetation works will be locally-occurring provenance native plants. Native plants, and particularly locally-occurring species, are preferable over other species because of:

- their generally better survival and growth in the local environment;
- reduced likelihood of becoming invasive;
- their indirect and direct biodiversity value (inc. suitability to local fauna); and
- their contribution to a local 'sense of place'.

Particular species can be identified from site-specific flora surveys (ideally carried out in spring) or from various other sources including:

- local knowledge of revegetation contractors and botanists, and regional staff within the Departments of Agriculture and Food and/or Department of Environment and Conservation; and
- various databases.

4.4.2.2. Seeding Methods

Regeneration from topsoil

Revegetation outcomes can be achieved through management of existing seed banks or the use of seed banks contained within topsoil maintained from the site or 'grafted' from elsewhere. *In situ* seed banks can be used where the topsoil is largely intact and weed seed numbers are low. Regeneration can be encouraged by scarification (loosening the top few centimetres) of the soil. This method may be particularly suitable for very small areas.

Where regeneration from existing topsoil alone will be inadequate, it might be possible to apply a fresh topsoil containing seed of target plant species. Within reason, topsoil can be spread more thinly when reapplied to cover a larger area than originally stripped.

When regenerating from topsoil, the potential for the introduction of weeds and dieback infection should be addressed (refer to [Section 4.4.3.4](#) and [Section 4.4.3.5](#) respectively).

Direct seeding

Direct seeding involves distributing seed directly onto sites that have been suitably prepared to encourage germination and growth. In the more arid parts of the State, successful establishment can be expected to take longer and be less reliable.

Natural regeneration or direct seeding from topsoil is the preferred approach for all regions of the state where re-establishment of 'natural' vegetation is the objective. This may be supplemented by some planting. Generally, planting alone is not preferred.

Planting

While direct seeding can be carried out in any part of the State, tree and shrub planting is most likely to be successful in those areas that experience reliable rainfall. This restricts planting without irrigation to the south-west corner of the State.

Where establishment of self-sustaining native vegetation is the aim, planting is generally used to supplement direct seeding. For example in some locations, tree species may be planted and the understorey layer direct seeded.

4.4.3. Site Preparation

4.4.3.1. Soil Preparation

In some areas, soil preparation will be required to produce loose, well drained and aerated soil ready for plant establishment. Various soil preparation techniques are described below.

Ripping

Ripping is recommended to assist root development by re-aerating clay-loams, clay soils, hardpans, or compacted soils. It aims to shatter dry subsoils, allowing easy and rapid root growth laterally and to depth, and to improve infiltration. Doing so will increase plant survival, vigour and stability. The alleviation of soil impedance can be critical for deep root development. Generally, ripping should be carried out to a depth between 300-400mm, and aim to minimise subsoil mixing with topsoil.

Ripping is best carried out when soils are dry to maximise effectiveness. Ripping should occur before the break of season, ideally with seeding following immediately afterwards, allowing sufficient time for some moisture to infiltrate the rip lines.

Mound Ploughing

Mound ploughing can also be utilised and involves surface cultivation that concentrates or builds up the surface of the land. Mound ploughing is generally used to raise the seed bed to reduce the effects of waterlogging. This technique of soil preparation is commonly used for heavy soils, waterlogged or saline soils. This technique tends to facilitate faster seedling establishment and growth and therefore reduce ongoing maintenance, particularly weed control.

Water harvesting

In low rainfall areas, water can be harvested to enhance plant establishment. Grading the surface of the soil at an angle along the contour and pushing it into a low embankment enables water to pool behind the bank. Seedlings can be planted into the rip lines on the slope, at the edge of the pooled water.

Furrow lining

Furrow lining is a technique which can be used in non-wetting sands. The process involves deep ripping and then creating a furrow which can be 300mm deep and up to one metre across. With the non-wetting sands removed from the soil surface, the rainfall can penetrate into the wettable soil below, where the seedling has been planted. To reduce erosion, create the furrow line across the direction of any potential damaging winds.

4.4.3.2. Soil Amendments

Most revegetation will use soil amendments. Soil amendments may be incorporated during site preparation. There can be considerable costs associated with soil amendments and the benefits should be justified. Amending soil can also alter native soils, potentially impeding the establishment of local native vegetation and encouraging the growth of weed species.

Fertiliser

Fertiliser can be applied to improve establishment of native plants, particularly in areas low in nutrients. However, fertilisers (in particular those that are nitrogen based) can promote weed growth and reduce native vegetation growth. Slow release fertiliser (i.e. low in phosphorus) is recommended. Some plant species, particular those of the Proteaceae family, can be harmed by phosphorus fertiliser (especially in sandy soils). Roots of seedlings can be damaged if fertiliser is placed too close to the plant.

The type of fertiliser and application rate will vary according to site, soil type and future landuse. Fertiliser requirements should be assessed on a project-by-project basis. The table below provides approximate usage information.

Revegetation Method	Previous Land Use	Suggested Fertiliser Usage
Topsoil regeneration only	Pastoral / native vegetation	Nil
Direct seeding	Native vegetation	100-200 kg/ha of slow release NPK with trace elements.
	Agriculture	Nil

Revegetation Method	Previous Land Use	Suggested Fertiliser Usage
Tree planting	Native vegetation	1 x 10-20g slow release NPK tablet per tree
	Agriculture	Nil

Mulch

Mulches can improve the micro-environment for seed germination and establishment, reduce evaporation and slows the movement of water across the soil surface. Examples of suitable materials include organic matter, wood chips, brush matting, and non-organic materials such as crushed brick, stone or gravel.

Although mulching can increase seedling survival through reduced evaporation, it can however inhibit germination, especially if the mulch application is too thick (e.g. >30mm). Generally, mulch will improve the establishment of plants from seed provided seeding is conducted prior to mulching and that mulch application is <30mm.

Gypsum

Gypsum can be used to improve the structure of sodic soils (i.e. soils with pH >8.5), reduce surface crusting or improve water filtration. It is normally incorporated into soil at approximately 5-10 tonnes/ha.

Lime

Lime can be used to increase the pH of acidic soils. Low pH (i.e. <5.5 when measured in water) can cause aluminium or manganese toxicity and reduce the availability of some nutrients. Some soils are naturally acidic, therefore, if local native plant species are used, amendment with lime should not be necessary. Application rates of lime are usually in the range of 2-5 tonnes/ha, but will vary according to soil type, pH, particle size and the source of the lime.

4.4.3.3. Erosion Control

Erosion can potentially damage a revegetation program and may require expensive remedial works.

Wind erosion can be controlled by:

- protecting the soil surface with mulching materials (mainly for smaller scale projects);
- maintaining the soil in an erosion resistant condition (e.g. moist, or with compacted surface crust); and
- reducing wind velocity across the site through establishment of wind breaks.

Water erosion can be controlled by:

- slowing the water flow across the soil surface (i.e. encouraging infiltration along the contour and building drainage structures);
- reducing the impact of rainfall on the soil surface (e.g. mulching); and
- maintaining the soil in an erosion resistant condition.

For more information regarding the types, impacts, legal requirements and recommended practices for controlling erosion, please refer to the Water Corporation Guideline: Erosion and Sediment Control at Construction Sites.

4.4.3.4. Weed Control

Planning for weed management prior to, during and following revegetation works is very important to the success of the revegetation program.

Weed infestation at a revegetation site can be difficult to manage so emphasis should be on prevention rather than cure. Hygiene measures (e.g. appropriate cleaning of vehicles and machinery upon entry to project sites) must be followed so that the risk of introduction and

spread of weeds is minimised. Care must also be taken to restrict introduction of weeds through movement of soils (as a store of seed can be retained in the topsoil) and spreading mulches at the revegetation site. For more information on weed management, please refer to the Water Corporation Guideline: *Weed Management*.

4.4.3.5. Disease Control

Revegetation will typically involve movement of soil, and can lead to the spread of soil-borne diseases and pathogens. 'Phytophthora dieback' is particularly important and has long been recognised as a serious threat to both flora and fauna in Western Australia, especially in the south-west of the state. The disease is caused primarily by a soil-borne pathogen, *Phytophthora cinnamomi*. The unintentional movement of pathogen-infested soil by vehicles and machinery travelling from infested areas into healthy areas is by far the most common means of dispersal of the organism.

There are a number of ways to reduce spread of the disease that should be considered by Water Corporation personnel and contractors who work on or visit sites in the south-west that are susceptible to Phytophthora dieback. For example when machinery and vehicles cross dieback boundaries, mud and soil should be removed from the vehicles, machinery, as well as footwear, tools and equipment. For further information in relation to Phytophthora dieback and its management, please refer to the Water Corporation Guideline: *Dieback Management*.

4.5. Monitoring and Maintenance

It is essential to monitor the success of a revegetation program, and be prepared to rework areas where revegetation has not been successful. Sufficient funding must be included within the project budget to account for monitoring, remedial works and ongoing maintenance activities.

4.5.1. Completion criteria

Revegetation projects should include completion criteria that adequately address the objectives of the project. These criteria should be defined and agreed to by relevant stakeholders and in accordance with any regulatory conditions set (e.g. set as part of the clearing approval or for larger projects subject to statutory assessment) prior to commencement of revegetation activities.

Development of completion criteria should be based on specific indicators linked to the objective of the project and must take into account factors such as the location of the project, vegetation type, soil type and climate etc.. As vegetation establishment occurs over a number of years, any targets set need to reflect the establishment stage of the revegetation program (e.g. plant density targets will vary from year to year).

The following are examples of completion criteria that may be set:

- Plants are healthy (possibly assessed against a scale);
- Foliage cover is greater than 75%;
- Plant density is at least 2 plants/m² (this will vary according to species used, site conditions, climate etc.)
- Species diversity is at least 75% of the species originally seeded/planted or 60-80% of surrounding local native vegetation community.
- Planted seedlings (tubestock) have a survival greater than 80%; and
- Weed foliage cover is less than 10% and/or not inhibiting plant survival and growth.

Generally, a revegetation program may be considered successful when the site is managed for its designated land use without any greater management inputs compared with adjacent areas with similar land use. Although the revegetated area may initially be different in structure compared with the surrounding native ecosystem, there should be confidence that over time, the area will change towards the make-up of the surrounding area. The revegetated area should be capable of withstanding normal natural disturbances.

4.5.2. Monitoring

Monitoring techniques must be designed to provide statistically valid results with a desired order of accuracy. The following are some of the key attributes that should be considered:

Sample size	The size and number of sample plots, must be adequate. The sample plot size should be appropriate to size and distribution of the units being measured.
Stratified sampling	It is critical to recognise distinctly different variables at the site and to design the monitoring program accordingly. For example, there may be differences in topography (slopes vs. flat areas), soil types, and revegetation treatments (e.g. seed mixes), each of which potentially produces different outcomes. Sampling should consider each of these individual areas with sample sizes in proportion to the size of the overall area. If this is correctly done, it will help identify the areas in which there are problems and distinguish them from other areas that are progressing satisfactorily.
Random sampling	All plots should be placed at random. This will remove any bias the sampler may have in selecting the location of sample plots

Monitoring (and maintenance) should be carried out over a number years (at least 3 years), and should be assessed against completion criteria set for the revegetation program. The table below details possible timings for monitoring activities.

Assessment	Timing	Components
Preliminary	Prior to revegetation works	<ul style="list-style-type: none"> • Weed assessment and maintenance
9 Month	Autumn (Feb-Apr)	<ul style="list-style-type: none"> • Success of seeding/planting • Weed monitoring and maintenance • <i>Recommendations for remedial works (including revegetation) and weed control</i>
15 months	Spring (Oct-Nov)	<ul style="list-style-type: none"> • Success criteria monitoring • Weed monitoring • <i>Recommendations for management</i>
	Autumn	<ul style="list-style-type: none"> • Weed monitoring and maintenance
27 months	Spring (Oct-Nov)	<ul style="list-style-type: none"> • Completion criteria monitoring • Weed monitoring • <i>Recommendations for management</i>
	Autumn	<ul style="list-style-type: none"> • Weed monitoring and maintenance
3 years	Spring (Oct-Nov)	<ul style="list-style-type: none"> • Completion criteria monitoring • Weed monitoring • <i>Recommendations for management</i>
*5 years	Spring (Oct-Nov)	<ul style="list-style-type: none"> • Completion criteria monitoring • Weed monitoring • <i>Recommendations for management</i>

* Monitoring and maintenance programs will typically apply for 3 years following the completion of the revegetation works. However, monitoring should be extended beyond this period if the allocated budget permits and/or if condition (e.g. ministerial or permit) require it.

4.5.3. Maintenance

Revegetated areas need to be monitored and managed following revegetation works. The success of revegetation may be reduced by a number of factors, including poor rainfall, poor planting technique, weeds and animals and other disturbances including human activities.

Maintenance activities will likely include:

- replanting failed or unsatisfactory areas (remedial works);

- weed and pest control;
- control of feral and native animal populations, including fencing;
- repairing any erosion problems;
- fertiliser application and other soil amendments; and
- watering of plants in drier areas, especially in the establishment phase.

Maintenance activities should typically be included as part of the revegetation works contract and/or monitoring and maintenance contract. Depending of the duration of these contracts (a minimum vegetation establishment period of at least three summers, following the completion of the revegetation works, is recommended for most projects), further maintenance may be required once contracts expire. Maintenance activities required are likely to be limited to weed control and possibly fencing. If remedial works are required, supplementary contracts may be needed. However, provisions for remedial works should be included in the original budget. It is common for a provision sum of 30% be included as part of a quote.

4.5.4. Responsibilities

Generally, the Project Manager will be responsible for coordinating the revegetation works and for monitoring and maintenance activities for at least the first year following the completion of the revegetation works. Following this period, responsibility will typically be handed over to Regional Manager and/or the Asset Manager. It is important that the terms of this hand-over are finalised prior to commencement of revegetation works. This may include the contract documents, warranties, any outstanding tasks to be completed, and a handover budget, which should include sufficient funding to carryout a monitoring and any maintenance and remedial works. Advice on revegetation works, monitoring and maintenance activities can be sought from the Environment Branch.

5. Records and Reporting

Any records produced in association with a revegetation (e.g. revegetation plan, monitoring reports etc.) must be maintained in AQUA.

Specific details of the site to be revegetated (including area (ha), location (GPS coordinates) and revegetation program progress (e.g. monitoring status)) must be entered into the *Vegetation Management* corporate database for record and auditing purposes. This database will be linked to AQUA.

Where revegetation works are a requirement of regulatory conditions (e.g. as part of a clearing permit or for larger projects subject to statutory assessment), the imposed conditions must be entered into Water Corporation's Regulatory Conditions Management System (RCMS). RCMS is used to monitor conditions of the approval, and the actions undertaken to substantiate compliance with each condition. For further information regarding the use of RCMS, refer to Water Corporation Guideline: *Using the Regulatory Conditions Management System (RCMS)*.

6. Related Documentation

Water Corporation Policy: Biodiversity Policy

Water Corporation Guideline: Dieback Management

Water Corporation Guideline: Erosion and Sediment Control at Construction Sites

Water Corporation Guideline: Using the Regulatory Conditions Management System (RCMS)

Water Corporation Guideline: Weed Management

Water Corporation Scope: Scope of Works Template - Revegetation Works

7. References

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Manager Environment
21 May 2009

Document Revision History	
21 Feb 2008	Original version
21 May 2009	Minor revisions

ANNEXURE 3

Drafting and Implementing Environmental Management Plans

1. Purpose

The Water Corporation is required to prepare Environmental Management Plans (EMPs) to meet its obligations for statutory environmental approvals. This guideline outlines the Water Corporation's expectations with regards to the drafting and implementation of EMPs.

Water Corporation Accountabilities Framework Process: Manage Environmental Compliance.

2. Scope

This Guideline applies to:

1. All Water Corporation staff preparing EMPs for the Water Corporation.
2. External consultants preparing EMPs for the Water Corporation.

3. References

The following references apply to this Guideline:

1. Policy: PCY254 Regulatory Compliance.
2. Policy: PCY289 Environmental Management and Coordination.
3. Standard: Environmental Approvals and Compliance Standard.
4. Guideline: Drafting Environmental Management Conditions.

4. Definitions

1. Condition – a legally binding requirement imposed by a regulator. Conditions also include Proponent Commitments made under Part IV of the *Environmental Protection Act 1986*.
2. EMP – a document that describes the actions to be undertaken by the Water Corporation regarding a specified number of environmental matters.
3. Statutory Approval – an authorisation under a written law to conduct a specified activity.
4. CEMS – The Water Corporation's Corporate Environmental Management System.

5. Action or Activity

The Water Corporation obtains statutory approvals under environmental legislation to develop and operate water, wastewater and drainage infrastructure. Examples of statutory environmental approvals include Licences, Permits, Works Approvals and Statements Issued by the Department of Environment.

Statutory approvals contain conditions to which the Water Corporation must comply. The conditions imposed often require the preparation of an EMP(s) for the management and/or monitoring of specified environmental matter(s). In most cases such EMPs are written and/or implemented by consultants on behalf of the Water Corporation.

Failure to comply with a condition (ie preparation and/or implementation of an EMP) is a criminal offence for which penalties apply. It is important that staff and consultants drafting and/or implementing EMPs understand the potential legal consequences related to the drafting and implementation of EMPs.

The following **Principles** apply to drafting EMPs:

1. An EMP must state the relevant statutory approval and condition(s) to which it applies. An EMP must address all requirements of the relevant condition(s), and should be limited to that scope.
2. An EMP should specify the actions to be undertaken (when, what, where, why, who and how) such that no further consideration is required for its implementation. EMPs should be concise and free of unnecessary detail.
3. An EMP should consider application of the following matters:
 - Element/issue.
 - Performance criteria and/or statutory requirement.
 - Actions to be undertaken.
 - Implementation strategy.
 - Monitoring/measurement of performance.
 - Timing of actions.
 - Contingency actions.
 - Decommissioning.
 - Stakeholder consultation.
 - Reporting & review.

Not all of the above matters will be relevant for all EMPs.

4. All EMPs shall contain the following text within the body of the EMP under the heading of *Specifications*:

The materials and methodology stated in this plan are correct as at the publication date. The materials and/or methodology may change during implementation of the project provided that those changes do not result in an additional or significant environmental impact. Changes to the materials or methodology that may cause an additional environmental impact will be referred to the relevant advisory agencies.

5. All EMPs shall contain the following text within the body of the EMP under the heading of *Changes to this Plan*:

The requirements of this plan may be reviewed from time to time. Any change to the requirements of this plan resulting from such reviews will be determined on advice of the relevant advisory agencies.

If the legal requirement is different to seeking the 'advice' of the relevant advisory/regulatory agencies, that different requirement should be inserted.

6. The EMP must not create requirements for additional EMPs to be prepared.

The following **Principles** apply to implementing EMPs:

1. An EMP must be implemented only as described in the EMP.
2. If there is a need to amend the manner of implementation, amendments must be approved by Manager Environment prior to a change to implementation. Manager Environment will assess whether such amendments require consideration/approval from the Department of Environment and/or specified advisory agencies.
3. Implementation of an EMP should be recorded where specified actions are required. For example, where inspections are required at a specified frequency, such inspections should be documented by way of an inspection log or checklist.
4. Reporting on the implementation of an EMP (if required) should be clear and concise. As a minimum, reports should contain:
 - a. A summary (1-2 pages) that includes

- i. Identification of the relevant statutory approval and condition(s).
 - ii. a description of the Infrastructure and its location (a map or aerial photograph may also be beneficial)
 - iii. a summary of results (including any variances to agreed standards or targets) related to any recorded environmental impacts or absence thereof.
- b. Results (not raw data) and a description of the results for each measured parameter. Where the results are at variance to an agreed standard or target, an explanation of why the variance occurred should be provided (where known).
 - c. Appendix containing raw data, laboratory analysis reports, chain of custody forms, specialist consultant reports, etc (as appropriate).

6. Responsibilities/Accountabilities

EMPs prepared by external consultants are to be submitted to the Water Corporation for review. The Water Corporation, as the client, has the final authority on any inclusions, exclusions or amendments to an EMP for Water Corporation's Infrastructure.

Manager Environment is responsible for submission of EMPs to the relevant regulators and/or advisory agencies on behalf of the Water Corporation. Manager Environment is responsible for ensuring that a copy of each EMP is added to the CEMS and the Corporate Document Management System.

7. Documentation

Nil

8. Appendix

Appendix 1 Document Administration

Hardcopy Distribution Record (locations of hard copies of this document)

Position	Location	Copy Number

Target Audience (Positions with specific responsibilities under this document)

Position	Position
Environmental Staff	External Consultants
Project Managers	

Document Amendment History (amendments to this document)

Version	Initiator	Reason	Section	Summary	Reference
17/01/07	Hawkins, S A	First Issue			

D. Luketina
 Manager, Environment
 17 January 2007

APPROVED BY:	MANAGER ENVIRONMENT, BUSINESS SERVICES DIVISION
REVIEW DATE:	January 2009

ANNEXURE 4

Weed Management Guideline

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Version Date 22 June 2009	Accountabilities Framework Level 1 – Manager Environment
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1. Purpose

The Water Corporation aims to protect and enhance biodiversity on land under its influence and is committed to avoiding or minimising adverse impacts on biodiversity. Biodiversity can be affected by the Corporation's activities, particularly through our management of land and asset development. The disturbance of biodiverse areas resulting from these activities can lead to the introduction and spread of weeds, which can lead to significant impacts on biodiversity.

This document provides guidance on the preparation and implementation of weed management measures. It is designed to guide land managers on aspects involved and is intended to support, but not replace, specialist advice on weed management activities.

2. Scope

This guideline addresses the following areas:

- o Definition of weeds and their impacts;
- o Key weed control methods; and
- o Monitoring and maintenance requirements.

Weed management may be required for standard on-going maintenance works (e.g. non-formal infrastructure maintenance), or for larger project related weed management activities (e.g. as part of revegetation works or under ministerial commitment).

3. Definitions

Annual Plant	A plant (weed) that usually germinates, grows, flowers, produces seed and dies within a single year (Tootill, 1984).
Environmental Weed	An introduced plant that establishes in natural ecosystems and adversely modifies natural processes, resulting in the decline of invaded communities (EPA, 2007).
Herbicide	Chemicals used to control weeds (Water and Rivers Commission, 2000)
Pesticide	A substance or compound used or intended to control, destroy or prevent the growth and development of, any fungus, virus, insect, mite, mollusc, nematode, plant or animal (Water and Rivers Commission, 2000).
Perennial Plant	A plant (weed) that lives for many years (Tootill, 1984).
Public Drinking Water Source Area	Includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> and the <i>Country Areas Water Supply Act 1947</i> (Water and Rivers Commission, 2000).
Weed	A plant that requires some form of action to reduce its harmful effects on the economy, the environment, human health and amenity, and can include plants from other countries or other regions in Australia of WA (EPA, 2007).
Annual Plant	A plant (weed) that usually germinates, grows, flowers, produces seed and dies within a single year (Tootill, 1984).

4. Weed Management Guideline

4.1. Introduction

4.1.1. What are weeds

Weeds are plants that are not considered native to Western Australia, and have the capacity to impact upon environmental, social and economic values (EPA, 2007). The Environmental Weed Strategy for Western Australia describes management priorities and general control measures, and monitoring of environmental weeds (also refer to Section 4.1.3.3). Weeds may include trees, shrubs, herbaceous plants, grasses, vines and aquatic plants. Western Australia has over 1200 recognised weed species.

For guidance identifying (and managing) common weeds, the tools and references listed below may be useful.

- o Department of Agriculture and Food (DoAF) (<http://www.agric.wa.gov.au/weeds.htm>) – the current list of declared plants, including descriptions and control methods. The DoAF can also be contacted for assistance with weed identification and for reporting serious weed matters.
- o FloraBase – a database that contains library catalogue of flora species collected and recorded formally across WA. FloraBase includes a search engine, which allows for a number of different search types (e.g. by family, genus, species, etc.) and also contains list of Western Australian weeds (listed alphabetically by family or genus); most with descriptions, supporting photos and recorded locations. The database currently has record of 1,320 alien taxa (weeds) that have been recorded within the state.
- o Weeds Australia website (www.weeds.org.au) - provides a useful weed identification tool (including a break down by regions) and other weed information.
- o Weeds CRC website (www.weedscrc.org.au) - provides a number of factsheets, guidelines and weed management guides relating to significant weeds of Australia (please note this site is no longer being updated).
- o Western Weeds (book) - describes about 1050 weeds, which includes 625 colour photos and 15 line drawings. Descriptions range from brief to detailed with sufficient information being given, along with the photograph, to enable identification. Diagrams to explain plant structures and to aid in identification are provided in the text (copy located at the Water Corporation Library and Environment Branch).
- o Southern Weeds and their control (booklet) – provides an easy identification of common weeds and methods of control using common cultural, biological and herbicidal control techniques (copy located at Environment Branch).

(For further guidance, including obtaining specific reference materials, please contact the Environment Branch).

4.1.2. Impacts of weeds

Weeds pose a significant threat to biodiversity and conservation values of Western Australia, as well as primary production, the economy, human health and amenity. Weeds also increase the risk of fire, increase costs to infrastructure maintenance and reduce the amenity of recreation areas. Weeds can also impact upon wetland ecology, potentially threatening irrigation channels and blocking waterways.

Generally, weeds grow faster and out-compete native plants for available nutrients, water, space and light. Native plants can be smothered by weeds that can then dominate ecosystems. As a result, native vertebrate and invertebrate fauna habitats and food sources may also be affected. Weeds can produce large numbers of seeds, increasing their ability to survive and dominate ecosystems. Weeds can rapidly invade land that has been disturbed through clearing and changed fire regimes. Early identification and management of weeds, however, will reduce their impact and make it easier and more economical to eradicate.

4.1.3. Relevant Legislation and Strategies

4.1.3.1. Declared Weeds

Weeds that pose a significant problem to agriculture or the environment may be 'declared' under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). If a plant is declared under the Bam Act, the Water Corporation is obliged to control that plant on its properties. Declarations specify a category, or categories, for each plant according to the control strategies or objectives that are appropriate in a particular place. A current list of declared plants, including descriptions and control methods, can be found on the Department of Agriculture and Food's web site (www.agric.wa.gov.au).

4.1.3.2. The Australian Weeds Strategy

At the Commonwealth level, the *Australian Weeds Strategy: A National Strategy for Weed Management in Australia, 2007* provides a national framework for weed control, identifying priorities for weed management and specifically focusing on 'Weeds of National Significance' (WONS). A list of WONS is located on the [Weeds of National Significance website](#).

4.1.3.3. Weed Plan for Western Australia

A Weed Plan for Western Australia (referred to as the 'State Weed Plan'), released in 2001 by the then Department of Agriculture (now Department of Agriculture and Food), aims to achieve coordinated, collaborative and effective weed management throughout Western Australia. Implementation of the State Weed Plan coincides with implementation of the *Environmental Weed Strategy for Western Australia* developed in 1999.

4.2. Weed Prevention and Control Methods

4.2.1. Preventative Measures

Prevention, early detection and rapid intervention are the best strategies, and in many cases the only effective strategies, that can be used to avoid long-term weed management costs and impacts. Water Corporation properties should be regularly assessed for weeds and potential weeds. Preventing new invasions of weeds is cost effective and more successful than eradicating weeds once established. The invasion of weeds can be prevented by:

- o minimising disturbance of soil and avoiding importation of foreign soil;
- o following general hygiene measures (refer to [Section 4.5](#));
- o excluding stock and stock feed from bushland;
- o avoiding fertiliser use in or near bushland;
- o planting only local native species and avoiding potential environmental weeds; and
- o educating and communicating with Operation, Asset and Project Managers about the threat and problem of weeds.

4.2.2. Chemical Control (Herbicides)

Chemical control is generally the most common method of weed control. Herbicides are an attractive option because of their effectiveness and practicality in a wide variety of weed control situations. Herbicides alone or integrated with other control methods can prove to be the most economical means of control, requiring less labour, fuel and equipment than other methods.

Chemical control methods involve the spraying of plants with a herbicide solution to kill or slow the growth of the vegetation. Key herbicide types are summarised below.

Contact	Kills only plant tissue to which it has been applied. Old or well-established annual plants may grow back after such treatments.
Systemic herbicide	Penetrates plant cells and moves through the plant from shoots to roots.
Broad spectrum	Kills a wide range of plants.
Selective	Kills only a particular type of plant, e.g. grasses.
Non-residual (knockdown)	Kills existing plants but has no effect on subsequent germinant.
Residual	Remains active in soil for some time (may kill germinating seeds, pre-

Pre-emergent	emergent and susceptible plants). Applied to the soil before the weed emerges, killing emerging seedlings (pre-emergent herbicides will also kill susceptible native seedlings).
Post-emergent	Applied directly to established plants and/or soil.

Generally, herbicide selection should take place once the key weed species have been identified. Most grass species can be specifically targeted through blanket applications of *Fusilade*, which is recommended where possible as it is a grass specific herbicide and will keep off target damage to a minimum. There are also herbicides that are more effective at controlling specific species, such as *Metsulfuron-methyl* which is very effective against species that have bulbs, corms, or tubers (e.g. Bridal Creeper).

Where weed management is required as part of a revegetation program, a combination of knockdown and residual herbicides may give the best results. However, the time of herbicide application is critical (refer to [Section 4.2.6](#)).

Selection and application of herbicides requires experienced knowledge and advice. Rates of application, safety directions and precautions on the Material Safety Data Sheets (MSDS) supplied with all herbicides should be strictly adhered to.

For information relating to decision making on the use of herbicides (and pesticides) and reducing the risks to the environment when using herbicides, refer to the Water Corporation Guideline: [Use of Pesticides \(Herbicides and Insecticides\)](#).

4.2.3. Physical Control

Physical weed control includes the use of manual or mechanical methods to pull out, cut or otherwise damage or remove plant tissue or wood. Some common physical control methods are detailed below.

Cultivating

Annual weeds can be controlled through repeated cultivation of weed-affected soils. This method is less effective for perennial weeds. Implements range from large tractors and ploughs down to hand tools and chipping hoes. However, a lead time of at least one year is required prior to revegetation. Cultivation alone, however, is generally not recommended and needs to be used in conjunction with herbicides. For effective control by cultivation, weeds should be controlled before flowering and under reasonably dry conditions.

Slashing

Slashing involves mowing down or brushcutting aboveground biomass. It can be used to prevent tall growing weeds from flowering and setting seed, however, may not be useful on its own. Slashing is not effective in eradicating a weed, but can help with temporary control of a plant until it re-shoots. Slashing is generally cheaper than cultivation and preserves the ground cover, thus reducing soil erosion and improving access in wet weather.

Scalping

Scalping is a technique where the top layer of soil is graded or scraped away, effectively removing the weed seedbank, roots, rhizomes, bulbs etc.. However, many native seeds may also be removed. This is a method that needs to be used with caution and usually only suitable for heavily degraded and weed infested sites with little native material remaining. This method also creates very high disturbance and is best suited to sites that will undergo complete rehabilitation.

Mulching

Mulching involves the use of physical barriers to exclude sunlight and so prevent weed establishment. Natural mulches include sawdust, timber chips, straw, manures and grass clippings. Natural mulches have other beneficial effects by adding organic matter and nutrients to the soil. Artificial barriers such as black plastic sheeting, woven paper products or woven cloth can also be used. Mulches are however, awkward and time-consuming to apply and, in

some cases, may introduce weed seeds. Most perennial weeds will also penetrate mulches such as sawdust and wood chips.

Nutrient Manipulation

High nutrient levels often give weeds an advantage over native vegetation. By removing a nutrient source (often associated with water), the balance can be tipped back in favour of the native vegetation.

Hand Pulling

Hand pulling aims to remove the entire weed including its roots from the soil. This method is useful for small scale infestations, or with a team of workers. It is not appropriate for all weed species, such as those with underground bulbs. It is best to hand pull weeds after rain when soil is moist. Hand tools such as broad knives and trowels can be used to remove underground parts of weeds (such as bulbs) that may re-shoot. In some cases it is necessary to dig out the crown of the weed. This requires the growing part of the plant to be cut beneath the ground using a knife. It is easiest to remove the crown from moist soil.

Smothering (out-competing weeds)

Planting native colonising species, at medium to high plant densities will allow the natives to out-compete some weed species. Once the native vegetation is taller than the weeds it reduces light and space available for the lower growing weeds, which reduces their vigour and population.

Topping/Felling

Woody weeds and tree weeds can be pushed with bulldozers or felled by chainsaw and snigged (dragged away). These methods are only suitable in certain contexts, as they create high levels of soil and vegetation disturbance.

4.2.4. Biological Control

Biological control involves the use of a plant's natural enemies such as insects, mites and diseases to control its population. It is an economical, effective and environmentally sound method of weed control. However, this method is a long-term technique and requires extensive development and establishment phases. Biological controls may not eradicate a weed completely, but if successful, can reduce it to an acceptable level where it can be controlled by other means. There are two main types of weed biological control: inundative (use of mycoherbicides) and classical (the release of control agents such as insects etc.).

4.2.5. Weeds in Waterways and Wetlands

Prevention is the best control measure. However, if this is not possible, early removal of any new arrivals, before a major infestation can form, is the next best measure. Removal of weed infestations on wetlands should start from the edge of the infestation, working around towards the centre. On waterways, work should begin from the upstream end moving downstream, taking care to minimise the spread of cuttings which could take root downstream.

For further information on waterway and wetland weed management, refer to the Department of Water Website (www.water.wa.gov.au).

(Use of pesticides in or near waterways and wetlands is generally restricted and extra care must be taken (refer to [Section 4.3.](#)).

4.2.6. Timing

Weed management controls should be designed to exploit the characteristics of the weed species concerned. For example, prior to setting control requirements for particular species, information should be established on the:

- o life cycle (annual or perennial);
- o dormant and active growing periods;
- o time of flowering and seed set;
- o timing of seed germination;
- o degree of hardseededness (i.e. impermeability of seed coat); and
- o most cost-effective time to apply control.

For herbicide use, application should be after most weed seed has germinated, but before the early germinants can flower and seed again. Chemical control is most effective at the seedling stage of growth for most weed species. For annual weeds, control is only effective if seed set is prevented. For perennial grass weeds, grass-selective herbicides are only effective if applied just before flowering. For weeds that die down to bulbs each year, chemical control must be systematic and take place just before flowering when the bulb is exhausted. For some woody weeds, seasonal conditions will affect the uptake of stem-injected herbicides.

As weed seeds can persist in the soil over a number of years (due to hardseededness), with only a portion of the seed bank germinating in any year, weed management programs may need to extend over a number of seasons. In the case of a revegetation program, depending on the extent of weed cover, weed control measures may need to commence at least two seasons prior to revegetation works. More than one pre-sowing or planting application may be necessary. The lead time required prior to revegetation works may vary. The type of weeds present and densities should be determined during the preliminary assessment of the project area. This will assist in developing a weed management plan.

4.3. Herbicide Usage in Water Catchment or Source Areas, Wetlands and Rivers

If herbicides are applied in or near Water Catchment and Source Areas, Wetlands or Rivers, there are a number of government policy and guidance documents that need to be followed.

The Department of Health's (DoH) publication Management of Pesticide in WA - An Information Resource provides a short summary of pesticide use, the legislation and responsibilities of the government departments that govern the use of herbicides (pesticides) in WA.

The DoH's Policy Circular No. PSC 88 must be adhered to when using herbicides in 'water catchment areas'. This circular defines 'water catchment areas' as public drinking water source areas that are proclaimed under the *Country Areas Water Supply Act 1947* or the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and provides details in relation to approved herbicides and herbicide application and storage instructions.

The Department of Water's (DoW) (formerly Water and Rivers Commission) Statewide Policy No.2 Pesticide Use in Public Drinking Water Source Areas (2000) applies to herbicide (pesticide) usage in Public Drinking Water Source Areas (PDWSAs). The policy applies to the transportation, approval for use, application, storage, mixing, disposal and monitoring of pesticides within PDWSAs in Western Australia. Herbicide use in PDWSAs requires approval of the DoW (except the herbicides listed in PSC88) and is governed by by-laws under the *Metropolitan Water Supply Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*.

There are several key points to consider prior to applying a herbicide in a PDWSA:

- Herbicide should only be used when no other means are suitable for the control of weeds;
- Blanket area spraying is not acceptable in a PDWSA (for definition refer to Circular No. PSC 88);
- No herbicides should be applied in a reservoir protection zone (2 km radius around reservoir) and wellhead protection zone (P1 - 500 m radius, P2 and P3 - 300 m radius) without the Department of Water's approval (refer to Statewide Policy No.2 Pesticide Use in Public Drinking Water Source Areas (2000));
- Herbicides used to control weeds in a PDWSA should be approved by the DoW (if not listed in PSC88) and be applied according to the relevant guidelines and best management practices, including the most appropriate methods at the time;
- Care should be taken to avoid herbicides being washed or transported into reservoirs, water courses, or wetlands (applications should be in dry conditions); and

- Records of the type, amount and dates of use of the herbicide in the PDWSA are to be retained.

There are a number of information sheets available that are related to herbicide usage near water including the DoW's [Water Notes No. 22 – Herbicide use in wetlands](#) and Weed CRC's [Herbicides: guidelines for use in and around water](#). These sheets provide information related to issues associated with herbicide use in wetlands (e.g. frog friendly herbicides) and recommendations regarding its use.

4.4. Disposal of weeds

It is important to thoroughly dispose of weeds once they have been removed to ensure the waste material doesn't become a further weed problem. The seed heads of many plants remain intact while they are attached to a living plant but once a seed head is cut off or pulled out the plant material will quickly dry out and release seeds. All plant material should be removed from the site the same day and disposed of correctly to landfill.

4.5. General Weed Hygiene Measures

When undertaking any clearing, revegetation and rehabilitation or weed control, it is important that hygiene measures are followed. The risk of introduction and spread of weeds must be minimised, and should include (but not be limited to) the following steps:

- clean soil and vegetation from earth-moving machinery and other vehicles prior to entering and leaving the area to be cleared;
- ensure that no weed-affected construction materials, mulch, fill or other material is brought into the area; and
- restrict the movement of machinery and other vehicles to the project area.

4.6. Engagement of Contractors and Consultants

For standard maintenance works (e.g. ongoing infrastructure weed spraying), local herbicide (pest control) contractors should be engaged to carry out the required works in accordance with a scope of works.

For larger project related weed management (e.g. revegetation works or works required under ministerial commitment), pre-qualified environmental consulting service providers can be engaged via the Environmental Consultants Panel (refer [Panel for the Provision of Environmental Consulting Services](#) located on the Procurement Branch's website).

It is important to note that all persons engaged in spraying herbicides require a current pesticide (herbicide) operator's licence issued by the DoH (Pesticide Safety Branch). Also, as with Water Corporation staff, contractors are required to comply with the Water Corporation's Environmental Management System.

4.7. Weed Management Plan

For standard ongoing maintenance works, it may not be necessary to develop formal detailed weed management plan. However, weed management measures should follow a scope of works or be integrated as part of *Local Environmental Improvement Plans* developed prior to control measures being administered. The scope of works should not only include management control requirements, but also monitoring requirements to determine whether controls are successful and whether additional maintenance is required.

For larger projects (e.g. revegetation works or management required under formal commitments), it is important that weed control is integrated with an overall plan of management. A specialised contractor should be engaged to coordinate and/or carryout a weed management program. A scope of works should be developed and include the

appropriate aspects of the weed management program. There are a number of key considerations for developing a weed management plan. These are provided below:

1. Assessment of weed infestation:
 - a) Determine weed species
 - b) Scope and size of the infestation
 - c) Map weed infestations
2. Plan the implementation of the control measures:
 - a) Control measures suitable for the infestation(s) to be selected
 - b) Develop success criteria (e.g. <5% weed cover)
 - c) Implementation Plan (inc. schedules in relation to different species and time-frames)
 - d) Suitable safety equipment and personal protective equipment advised
3. Monitoring and maintenance:
 - a) Devise monitoring Plan (inc. schedule and time-frames)
 - b) Monitor weed control measures as per designated schedule
 - c) Assess for maintenance requirements (e.g. supplementary weed control)
 - d) Schedule follow-up control program if required.
4. Recording and Reporting:
 - a) Records of weed control and monitoring activities should be maintained
 - b) Performance reports should be produced annually or following supplementary assessments.

4.8. Monitoring and Evaluation

Monitoring is integral to the success of a weed management program and along with maintenance provisions, should be considered in the design and funding of a project. Monitoring can be crucial for successful weed management and can result in early weed detection. All weed control treatments should be monitored accurately and records kept for future review and audit purposes.

It will be critical to monitor the project site during the initial stages of weed control for reinvasion of weeds and control them as they appear. Generally, monitoring should be conducted within eight weeks of the initial control program (preferably after rainfall) and should include an evaluation of the success (performance) or the control measures. Follow-up monitoring should be scheduled at least annually and should coincide with revegetation monitoring if the weed management forms part of a revegetation program. It should be noted, a detailed monitoring program may be more appropriate for larger weed management programs. For standard maintenance works, monitoring and maintenance requirements set out in the scope of works may be sufficient. In this latter case, annual contractor performance reviews may be necessary. This should be coordinated by the Region, Asset Owner/Manager, Project Manager or Operations Manager.

Depending on the finding of these monitoring activities, follow-up weed control may be necessary. It is important that sufficient provisions for both monitoring and maintenance activities are included within project cost estimates and budgets.

For more formal weed management programs (e.g. revegetation works or weed management under ministerial conditions), records of the assessment should be maintained and should include qualitative observations and quantitative measurements where relevant. These observations/measurements may include, but are not necessarily limited to, the following:

- o effectiveness of control measures;
- o size, scale and distribution (e.g. estimate of number, cover or density) of the infestation area;
- o comparison with size and distribution prior to treatment;
- o other observations of relevance to the control of weed species; and
- o schedule for further treatments and/or inspections if required.

5. Related Documentation

Water Corporation Guideline: *Use of Pesticides (Herbicides and Insecticides)*

6. References

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Manager Environment
22 June 2009

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ANNEXURE 5

Dieback Management Guideline

Doc ID xxxx-v1	Custodian Steve Wilke (14237)
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Purpose

The Water Corporation is required to manage and minimise the risk of introduction and spread of the plant pathogen, *Phytophthora cinnamomi*. This guideline describes the pathogen and how to minimise the risk of introduction into unaffected areas and to avoid spreading the pathogen in areas where it is or may be present.

Currently the Department of Environment and Conservation is developing new protocols and signage for the management of *Phytophthora dieback*. This Guideline will be reviewed as these become available.

Scope

This Guideline applies to all staff and contractors involved with the construction and/or maintenance of the Water Corporation's assets, particularly in the south-west of Western Australia.

Definitions

- **Accreditation** means a person officially recognised by an authorised body as being able to undertake specified tasks to a guaranteed standard. For example, the detection, diagnosis, mapping and field demarcation of disease caused by *Phytophthora cinnamomi* in native vegetation, or the training and/or certification of interpreters.
- **Adaptive management** means a process of responding positively to change. The term adaptive management is used to describe an approach to managing complex natural systems that builds on common sense and learning from experience, experimenting, monitoring, and adjusting practices based on what was learned.
- **Autonomous** means independent. For example, *Phytophthora cinnamomi* can move independently through suitable habitat by way of zoospores (swimming or washed) and mycelium growth.
- **Disease** means a combination of a pathogen, host and correct environmental conditions, which results in disease symptoms or death of a host.
- **Host** means a plant that supports the growth and development of the parasite that has infected it.
- **Interpreter** means a person who undertakes the tasks associated with the detection, diagnosis, mapping and field demarcation of disease caused by *Phytophthora cinnamomi* in native vegetation.
- **Pathogen** means any organism (e.g. *Phytophthora cinnamomi*) or factor that causes disease in a plant.
- **Phosphite** means an aqueous solution of mono-potassium phosphite and dipotassium phosphite.
- **Qualified** means a person who meets the training and experience conditions required before the right to act in a specified role. For example, a disease interpreter.

- **Sporulation** means the developmental process by which a fungal cell becomes a spore. It is sometimes taken to include release of spores into the environment.
- **Susceptible** means influenced or harmed by a parasite. For example, *Phytophthora cinnamomi*.
- **Threat** means an indication that serious or irreversible environmental damage may occur. For example, a process is defined as a threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.
- **Uninfested** means an area that an accredited person has determined may be free of plant disease symptoms that indicate the presence of *Phytophthora cinnamomi*.
- **Vector** means a living agent that transmits a pathogen from an infected plant to an uninfected one. For example, feral and native animals, humans.
- **Vulnerable** means susceptible to physical injury.
- **Vulnerable zone** means that part of the South West Land Division and the areas adjoining it to the north west and the south east that receives mean annual rainfall greater than 400 mm in which susceptible native plants occur in conjunction with the environmental factors required for *Phytophthora cinnamomi* to establish and persist.

References

The following references apply to this guideline:

1. Best Practice Guidelines for the Management of *Phytophthora cinnamomi*; CALM (now DEC) 2004
2. Managing *Phytophthora Dieback* – Guidelines for Local Government; Dieback Working Group (DWG) 2000
3. Arresting *Phytophthora Dieback* – The Biological Bulldozer; WWF-Australia (WWF) & the Dieback Consultative Council (DCC) 2004
4. *Phytophthora Dieback Atlas* – From the bush to your back fence: What you need to know; DEC 2006
5. The ecological impact of *Phytophthora cinnamomi* in the Stirling Range National Park, Western Australia. *Australian Journal of Ecology*, 18: 145-159; R.T. Wills, 1993.

Guideline

What is *Phytophthora dieback* and where does it occur?

The disease previously known as "jarrah dieback" or "dieback disease" has long been recognised as a serious threat to the conservation of both flora and fauna in Western Australia, especially in the south-west of the state where the greatest diversity of plants is found. The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* lists *Phytophthora dieback* as a 'key threatening process'. The disease is caused by a soil-borne pathogen (technically classified as a water mould, not a fungus), *Phytophthora cinnamomi*.

The unintentional movement of pathogen-infested mud by vehicles travelling from infested into healthy areas is by far the most common means of dispersal of the organism, although movement of the pathogen in mud carried along trails by both bushwalkers and animals can also have an impact. Spread is much faster downslope.

The scientific name "*Phytophthora*" (pronounced "fy-tof-thor-a") is derived from the Greek "phyton" meaning "plant" and "phthora" meaning "destruction". Many plant species are killed by this water mould, and important families of plants from Western Australia contain a large number of susceptible species.

Although it is not known how many species of plants might be susceptible, it is estimated as many as 2300 of the 5700 species in the south west may be susceptible to *Phytophthora dieback* (Wills 1993).

Phytophthora dieback disease generally affects woody shrubs. Grasses, sedges, rushes, and orchids have rarely been recorded as hosts and have usually been regarded as resistant to infection. The water mould invades the conducting elements of the plant and causes the failure of root conductance, and so plants which are killed die largely as a result of "drought".

The four most important woody plant families in Western Australia are the *Myrtaceae* (eucalypts, paperbarks, bottlebrushes etc.), the *Papilionaceae* (pea-flowered plants), the *Proteaceae* (e.g. *Banksia*, *Grevillea*, *Dryandra*, *Hakea* etc.), and the *Mimosaceae* (wattles).

Variation in annual rainfall has a significant influence on populations of *Phytophthora cinnamomi* due to its affect on soil moisture. Any rainfall pattern promoting moist soil conditions over summer will allow rapid growth of the water mould within the host and thus may cause significant disease expression. However, the most severe impact of the pathogen may well occur after the combination of autumn and summer rains. Autumn rains would contribute to the early recharge of soil moisture after summer and allow an increase in population size of the water mould before growth becomes limited by winter temperatures. As temperatures begin to rise in spring, populations of the water mould that had built up in autumn would continue to expand as long as moisture is available. Substantial rainfall in summer would then create ideal conditions for the growth and sporulation of *Phytophthora cinnamomi*.

Phytophthora cinnamomi has infested many of those habitats which provided a suitable food-base and year-round moist conditions for the water mould. However, areas with seasonally dry soils and dominated by species susceptible to the pathogen are also being invaded in years when above average rainfall produces high soil moisture conditions. Variability of summer rainfall is particularly important since, every few years, heavy summer rains occur, generating free soil water in the warmest months. These circumstances not only provide ideal conditions for the growth of this tropical organism but also favour the initiation and growth of fine roots which are an important avenue of invasion for the pathogen.

Phytophthora dieback now extends from Eneabba to Esperance. It has the greatest potential to occur in the south-west above the 600mm isohyet, although infestations have been recorded between the 400mm and the 600mm isohyets. The DEC has produced the *Phytophthora Dieback Atlas*. This has involved the mapping of more than 700,000 ha of land in the south-west and southern coastal areas. This extensive mapping has been carried out for strategic planning and is NOT suitable for designing hygiene management actions at particular sites.

How to stop the spread of *Phytophthora dieback*

Phytophthora dieback is most rapidly spread through human activity resulting in the movement of infested soil on vehicles, equipment & footwear. Therefore, this risk of spread of the disease can create a significant problem for construction projects. It is also an important issue for recreational bushland users such as four-wheel-drive vehicles, off-road motor bikes, mountain bikes and bush walkers.

To prevent the spread of Phytophthora dieback into an uninfested area or within an area, the Water Corporation and its contractors need to adopt strict hygiene measures. These hygiene measures don't need to be a hindrance, but they do require some forward planning. During the planning stage it is important to determine the risks associated with the operation. The table below outlines examples of activities that are high risk or low risk.

High Risk Sites	Low Risk Sites
<i>operation over large area</i>	<i>operation over small area</i>
<i>complex operation</i>	<i>simple operation</i>
<i>much machinery</i>	<i>few machines</i>
<i>much soil movement</i>	<i>little soil movement</i>
<i>untrained personnel</i>	<i>well trained / experienced personnel</i>
<i>wet conditions</i>	<i>dry conditions</i>
<i>sticky soils</i>	<i>non-sticking soils</i>
<i>low lying site</i>	<i>elevated site</i>
<i>dieback known nearby</i>	<i>dieback not known nearby</i>

Prior to the commencement of activities on a site in the south-west of Western Australia (that may be susceptible to Phytophthora dieback) it is essential to arrange a survey by an accredited Phytophthora dieback interpreter to determine the distribution of the pathogen across the proposed area of the operation. (The DEC or the Water Corporation's Environment Branch can provide a list of accredited interpreters). The results of the Phytophthora dieback survey may indicate one of the following scenarios:

- The area is entirely infested with Phytophthora dieback.
- The area is entirely free from Phytophthora dieback.
- The area is partially infested and partially uninfested with Phytophthora dieback.
- The area is uninterpretable due to absence of indicator species or recent disturbance.

An accredited Phytophthora dieback interpreter may recommend that a Dieback (hygiene) Management Plan (DMP) be prepared. The DMP may need to be approved by the DEC if it is a condition of approval. The DMP should include best practice management methods including:

- Demarcation showing clearly infected, uninfected and uninterpretable areas;
- Hygiene measures to be taken when machinery and vehicles have to cross dieback boundaries;
- Monitoring and reporting;
- Measures to be taken if a hygiene breach occurs; and
- Recommending that the works be carried out under dry-soil conditions, or ceasing work while moist soil conditions prevail.

It should be noted that dieback surveys are normally only current for a period of 12 months from the time that a survey is conducted. If the proposed works are not carried out within this period, then a resurvey may be necessary.

The management strategy will vary according to the relevant scenario. However, the greatest effort is required to ensure that sites that are currently uninfested remain free of the disease. The hygiene protocols for these four scenarios are shown in the table below.

Scenario	Hygiene Protocol
<i>Site is fully infested</i>	<ul style="list-style-type: none"> ▪ <i>Clean on exit</i>
<i>Site is dieback-free</i>	<ul style="list-style-type: none"> ▪ <i>Clean on entry</i>
<i>Site is only partially infested</i>	<ul style="list-style-type: none"> ▪ <i>Clean on entry to dieback-free areas.</i> ▪ <i>Clean on exit from infested areas.</i>
<i>Uninterpretable</i>	<ul style="list-style-type: none"> ▪ <i>Precautionary principle: clean on entry, clean on exit</i>

Below are a number of well-established *Phytophthora dieback* control measures that are an integral part of most DMPs. These should also be applied in the absence of a DMP.

- Where practical, schedule activities that involve soil disturbance for the (normally) dry summer months (November – March).
- Minimise the number of tracks that pass through native vegetation and ensure that the tracks are well drained (*Phytophthora dieback* impact is greatest in wet sites).
- Plan or alter tracks so they do not pass through the uninfested sections of native vegetation.
- If the location of the infestation is known, plan activities so they are completed in the uninfested parts of the native vegetation first, then move to the infested parts.
- Have the infection boundary marked with bright (survey) marking tape when undertaking works or activities, so the dieback free area is clearly demarcated.
- Avoid importing soil/sand/gravel. If it must be brought in, it should be tested for the presence of *Phytophthora cinnamomi*, or sourced from a supplier who provides *Phytophthora dieback* free materials, and transports and stores the materials hygienically (soil suppliers accredited by the Nursery Industry Association maintain high standards of hygiene).
- Do not move soil/sand/gravel in from the infested part of the bushland.
- During moist soil conditions, prevent vehicles and machinery from entering unless they are free of soil and mud. They should be restricted to hard, dry surfaces.
- Footwear should be free of mud and soil when entering native vegetation.
- Any water used in for construction (eg earthworks, water-binding, dust suppression) should be from a mains supply or sterilised with sodium hypochlorite.

While the DEC has developed a treatment regime involving phosphite (stem injection or aerial spraying of foliage), this is only suitable for relatively small areas involving susceptible threatened species, threatened ecological communities and threatened native fauna. The use of phosphite should not be regarded as a panacea for large areas.

Document Revision History	

ANNEXURE 6

Guide to Assessment: Clearing of Native Vegetation under the *Environmental Protection Act 1986*

GUIDE TO ASSESSMENT CLEARING OF NATIVE VEGETATION

under the Environmental Protection Act 1986

Purpose of these guidelines

Under the Part V Division 2 of the *Environmental Protection Act 1986 (EP Act)* clearing of native vegetation must be done under the authority of a clearing permit, unless subject to an exemption. The Chief Executive Officer of the Department of Environment and Conservation (CEO) must have regard to the clearing principles outlined in Schedule 5 of the *EP Act*, approved policies, planning instruments, and other matters, that the CEO considers are relevant in deciding whether or not to issue a permit.

This guideline has been prepared to provide guidance regarding how to assess clearing of native vegetation against the clearing principles and to take into account any other relevant information. It is intended to assist proponents, consultants and assessors to:

- understand how assessment occurs;
- plan to undertake appropriate studies for projects that involve clearing; and
- provide advice and recommendations to the CEO.

Persons who intend to undertake activities that may involve clearing are advised to consult the actual legislation and seek advice, including legal advice, where necessary. Whilst the Department has endeavoured to ensure the accuracy of the contents of this document, it accepts no responsibility for any inaccuracies and persons relying on this document do so at their own risk.

Process to assess the environmental impacts of clearing of native vegetation

1 Assessment Methodology

Native vegetation in Western Australia cannot be cleared unless a permit has been granted, or the activity is subject to an exemption. Further details on exemptions are provided in Guidelines.

Clearing applications are assessed against a number of factors including principles outlined in Schedule 5 of the *EP Act*. If a proposal is also likely to have a significant environmental impact, the proposal could be subject to assessment by the Environmental Protection Authority (EPA). The Department of Environment and Conservation (DEC) would then provide specialist advice to the Environmental Protection Authority on the impacts of the clearing.

The CEO makes decisions on clearing applications and must consider a range of factors in making the decision. In practice, the CEO will use advice and recommendations from assessors in reaching a decision.

It is recognised that some of the principles are difficult to address through desktop study and brief site visit only, especially where existing information for the area is limited. Guidance is therefore given as to which principles can reasonably be addressed through desktop study and site visit alone, and those principles for which additional studies may be required to determine whether the principles apply.

The assessor should consider each of the principles, and note the extent to which they have been addressed, including methodologies used; the limitations that apply to the assessment; and the relevance of the principle to the current clearing proposal. Other factors and planning matters also need to be considered. The results of the assessment should be documented in an assessment report. A proforma assessment report is provided which outlines the form and content expected of this report.

Assessment techniques should take into account EPA standards and policies for environmental impact assessment as outlined in Guidance Statements and Position Statements. Relevant Guidance Statements and Position Statements are detailed in relation to each principle.

The assessment is a judgement against the principles and other matters. These guidelines and listed tools are intended to assist assessors in making that judgement.

Firstly, assessments should be conducted at the level of a desktop study.

A desktop study involves a literature review, including a map-based information search of all current and relevant literature sources and databases.

In some circumstances further work may be required, such as a site visit by qualified personnel to:

verify desktop survey information;

- (a) delineate key flora, fauna, soil, and groundwater and surface water values and potential sensitivity to impact; and
- (b) undertake broad-scale vegetation and vegetation condition mapping based on selected sites rather than regular gridding.

Note that a site visit may involve more than one agency to identify the multiple environmental values of an area.

A secondary assessment may be required whenever there is insufficient information to make an informed decision on an application.

The methodology of this handbook is designed to make recommendations according to the best available information.

2 Clearing Principles and Guidelines

- (a) **Native vegetation should not be cleared if it comprises a high level of biological diversity.**

Guidelines

This principle protects areas of outstanding biodiversity. This principle also protects intact natural systems with naturally occurring species diversity, ecosystem diversity or genetic diversity and natural systems that may be degraded but contain high levels of species diversity, ecosystem diversity or genetic diversity compared with the remaining native vegetation of that ecological community.

Measures of plant species diversity include:

- total vascular plant taxa (species, subspecies and varieties) diversity; and
- vascular plant taxa diversity for each ecological community.

Measures of fauna species diversity include:

- total vertebrate and invertebrate fauna taxa (genera, species and subspecies) diversity.

Measures of ecosystem diversity include:

- number of ecological communities (plant communities);
- number of ecological communities (fauna communities (assemblages));
- macrohabitat diversity;
- microhabitat diversity in each macro-habitat;
- a variety of soil types or geological formations; and
- micro topographical diversity and edaphic variation.

Assessment of biodiversity is complex because of the huge number of species, genetic variation within species and associations of species that exist within Western Australian ecosystems. In general, there are only reasonable data on the diversity and distribution of vertebrates, limited data on the diversity and distribution of vascular plants, few data on invertebrates and negligible information on micro-organism diversity.

It is recognised that this principle may concentrate on vascular flora as information on vascular plant biodiversity is relatively easy to collect and there are sufficient regional datasets available to allow for the comparisons that are inherent in the principle. This focus does not exclude other measures of biological diversity.

The EPA has noted that ecosystem diversity is harder to measure than species or genetic diversity because the boundaries of communities (i.e. variety of unique assemblages of plants and animals and ecosystems) are hard to define. As long as a consistent set of criteria is used to define communities and ecosystems, their number and distribution can be measured. Even using a relatively simplified measure, any given area contributes to biodiversity in at least two different ways: through its richness in numbers of species and through the endemism (geographical uniqueness) of these species. The relative importance of these two factors changes at different geographical scales (EPA Position Statement No.3).

It is recognised that genetic diversity is poorly understood and that adequate information to assess this aspect is difficult to obtain. Taxon diversity (species, subspecies, variety and forms) should be used to address this issue where data is not available.

An adequate assessment of this principle is possible as part of a desktop assessment and the assessor should use existing site and regional studies for comparative purposes. The assessor will need to have skills in assessing vegetation condition, and in determining floral species diversity and plant ecological community diversity to enable such comparisons to be made.

Tools used by proponents and assessors

EPA Position Statement No.3 outlines the EPA's principles in respect of environmental impact assessment of biodiversity. The EPA sees the proper understanding of the requirements of adequate surveys as central to achieving a sound assessment of biodiversity.

Some key factors in using surveys to assess biodiversity include:

- The methodology used should be consistent with the approaches recommended in the EPA Guidance Statement;
- The timing and time allocated should be determined by the natural cycles of the region (such as growth and flowering);
- The intensity of the sampling (number of sites, their spacing, and their area) should be based on the complexity of the flora, vegetation and faunal assemblages of the permit application area;
- The level of effort should be commensurate with the existing data for that area (i.e. where less existing information is available, a greater survey effort would be required).

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Guidelines

This principle aims to maintain indigenous fauna species and assemblages of species in their local natural habitat and to ensure that fauna are not further threatened.

Fauna plays an important role in maintaining ecosystems and the life-supporting services provided by ecosystems by:

- cycling of material, through the browsing of flora, predation, digging, the consumption of organic matter generally, excretion, death and decay;
- the pollination, fertilisation and germination of plants; and
- maintaining the dynamic "balance" in ecosystems. The balance between assemblages of plants, animals and diseases, and environmental elements such as fire, soil structure and chemistry, can be destabilised by changes to any of the ecosystem components.

The ecological relationships between fauna, vegetation and their physical environment are affected by habitat decline and a consequent loss of ecological functions and processes. These may include:

- increasing edge to area ratios of native vegetation, which reduce the width of a remnant and increase its perimeter;
- loss of corridors, stepping stones (ecological linkages) and buffering vegetation;
- loss of large intact areas of native vegetation capable of supporting breeding populations of species with limited dispersal;
- loss of vegetation areas that support meta-populations;
- the loss of key habitat requirements, e.g. loss of tree hollows and fallen trees and branches that may be used for breeding or sheltering sites, the loss of proximity of the required combination of habitat types, e.g. Carnaby's Cockatoo is threatened because it requires a combination of woodland for breeding and heath habitat for feeding (both habitat types have been extensively cleared);
- increased probability of weed invasion due to external influences such as nutrient enrichment, drainage water or wind blown material;
- increased risk of disease entry and subsequent reduction in habitat values; and
- adjacent land uses which may impact adversely on habitat values.

In extensively cleared landscapes habitat specialist fauna species have declined as a result of habitat loss and in many cases are declining further as a result of natural attrition and an inability to recruit. For example, specialist bird species of heathlands and specialist bird species of woodlands in the wheatbelt and Swan Coastal Plain have declined at least in proportion to the loss of those habitats.

Fauna species may be resource-limited, dispersal-limited or area-limited. Significant habitat is habitat which provides resources (breeding, sheltering and feeding), connectivity or habitat area for a species or community that is critical for its survival.

It may be necessary to identify, from the total pool of faunal species present, the species that would become more vulnerable if a habitat was lost. For example, in the fragmented habitats of the WA wheatbelt Lambeck (1997) found that birds were useful indicators of habitats.

To identify which species or communities may be vulnerable to local extinction, consideration should include whether:

- the breeding, sheltering and feeding sites within the subject land were lost or reduced;
- the subject land provided an important linkage; or
- the habitat area was reduced so that a breeding pair or functioning social group could not survive.

Tools used by proponents and assessors

To determine the likelihood of significant fauna species, populations, ecological communities or their habitat within the site or its vicinity, the following considerations should be addressed.

1. Consult fauna references and/or key agencies (DEC, WA Museum) to determine whether any Threatened Fauna, Other Specially Protected Fauna, Priority-listed Fauna or fauna otherwise of significance occurs within the geographic range of the land. Compile a field list of each of these species, and their habitat requirements.
2. Note the presence or absence of each of the specific habitat elements required by field list species. Identify relevant areas on the property map.
3. Determine if any of the following habitats are present in the area where significant fauna species or populations may exist:
 - foraging areas (food sources). Studies need to record species that may be only present on a seasonal basis and rely on the vegetation in that season, eg nest hollows or an autumn food source;
 - trees with hollows;
 - abundance of ground cover and/or fallen trees;
 - caves, rock outcrops, overhangs or crevices;
 - permanent or intermittent waterways or water bodies; and/or
 - other (describe).
4. Is the habitat part of either an ecological linkage or does it form a large area of intact vegetation which may support meta-populations of fauna?
5. Note any signs of fauna presence, including distinctive scratches, nests, diggings, scats, pellets, calls, burrows, bones, etc. Record any sightings of fauna, including the habitat in which they were seen.

The scope of the assessment will be determined on a case-by-case basis, but would be consistent with EPA Guidance Statement No. 56. In marine environments, EPA Guidance Statement No. 29, *Benthic Primary Producer Habitat Protection for Western Australia's Marine Environments*, provides a set of principles to be applied when considering proposals that may result in removal or destruction of, or damage to, marine benthic primary producer communities or the habitats which support them.

- (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Guidelines

This principle aims to provide for the continuing *in situ* existence of Declared Rare Flora (DRF), other significant flora and significant habitat for priority-listed flora. The intent is to also protect habitat necessary for the maintenance of DRF and significant flora.

The assessment should consider the flora themselves and the buffer necessary to protect the flora from deleterious impacts by maintaining ecological processes and functions within the habitat of the DRF and significant flora. Buffer areas are measured from location of the flora, or in the case of more than one individual, from the outermost individual(s). To ensure an ongoing and viable area remains to protect the flora and ecological processes and functions, the minimum buffer radius recommended is 200m. This should be ideally determined on a case by case basis and is related to the characteristics of the species being protected, and the surrounding land uses.

Significant flora may include habitats of rare, uncommon or restricted flora species and/or species outside of or at the limit of their range.

Studies must be undertaken by suitably qualified people of a timing, duration and extent necessary for the adequate identification of rare flora, other significant flora and priority flora species.

Note that DRF are protected under the *Wildlife Conservation Act 1950* and may not be taken except with the written permission of the Minister for the Environment. Taking includes "includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means" and includes activities such as burning and grazing.

Flora listed as other significant flora such as rare, uncommon or restricted flora species and/or species outside of or at the limit of their range may not be cleared under these criteria.

Buffers necessary to maintain ecological processes and functions for DRF and significant flora may not be cleared under these criteria. The value of the subject land for the ongoing maintenance of Declared Rare, significant and priority flora species should be determined.

Tools used by proponents and assessors

The highest level of knowledge should be used.

1. Refer to DEC databases for the presence of known populations of DRF, and priority flora species. Refer to DEC database for the presence of known populations of other significant flora.
2. Refer to FloraBase website and any appropriate region or area-specific studies to determine whether habitats likely to support DRF, significant or priority-listed flora are present.

If the results of the assessment show the potential for DRF, a more detailed assessment of flora habitats and values may need to be undertaken.

GIS themes

DEC DRF and priority-listed flora

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Guidelines

An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat.

The aim of this principle is to provide for the continuing *in situ* existence of threatened ecological communities (TECs) under the *Environment Protection and Biodiversity Conservation Act 1999*, priority ecological communities (PECs) and other significant ecological communities as listed by DEC. This principle also aims to protect habitat necessary for the maintenance of these communities.

Vegetation that has a bioregional conservation status of depleted or worse (<50% representation) is more likely to contain TECs or other significant ecological communities.

The assessment should consider the ecological communities themselves and the buffer necessary to protect the communities from deleterious impacts by maintaining ecological processes and functions within these habitats. Buffer areas are measured from the outermost edge of the community. To ensure an ongoing and viable area remains to protect the ecological communities and ecological processes and functions, the minimum buffer radius recommended is 200m. This should be ideally determined on a case-by-case basis and is related to the characteristics of the communities being protected, and the surrounding land uses.

Tools used by proponents and assessors

The highest level of knowledge should be used.

- 1) Refer to DEC database for known sites of TECs listed in the *Environment Protection and Biodiversity Conservation Act 1999*.
- 2) Refer to DEC database for known sites of PECs or other significant ecological communities.
- 3) Refer to any appropriate region or area-specific studies to determine whether areas likely to support TECs, PECs or other significant ecological communities are present.

GIS Themes

DEC TECs / PECs

- (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Guidelines

This principle aims to maintain sufficient native vegetation in the landscape for the maintenance of ecological values. It also recognises the need to protect ecological communities that have been extensively cleared and to retain a representation of each ecological community in local areas throughout its pre-European range.

The *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001a) recognise that the retention of 30%, or more, of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. This level of recognition is in keeping with the targets recommended in the review of the *National Strategy for the Conservation of Australia's Biological Diversity* (ANZECC 2000) and in the EPA's Position Statement No.2 on environmental protection of native vegetation in Western Australia (EPA 2000).

A typical pattern of vegetation clearing in highly fragmented landscapes (e.g. from analysis of vegetation in the Greater Bunbury Scheme study area) shows that relatively few large remnants remain, and the vast majority of remnant areas are small, mostly less than 5 ha. In these fragmented landscapes, larger remnants should be retained as a priority as they provide core habitat areas necessary to support populations of species that are unable to survive in smaller areas of native vegetation.

The best available knowledge should be used in determining the ecological communities in an area. In terms of these criteria, vegetation complexes, which are mapped for the entire extent of the Swan Coastal Plain in the System 6 and System 1 Region (Heddle *et al.* 1980; Mattiske and Havel 1998) and the area covered by the Regional Forest Agreement, which includes the Jarrah Forest Bioregion within System 6 (Mattiske and Havel 1998; Havel 2000), are used as the base mapping of ecological communities. On the Swan Coastal Plain this should be supplemented by information on floristic community types (Gibson *et al.*, 1994, Department of Environmental Protection, 1996). Outside of these areas, vegetation types as defined by Beard (1990) are used as the base mapping of ecological communities.

In considering ecological values consider the vegetation type/complex and floristic community type at IBRA region, subregion scale and the local area of that type.

In recognition of past land use planning decisions, constrained areas have been identified on the Swan Coastal Plain of the Greater Bunbury Region Scheme and within the Bush Forever study. Within these constrained areas, criteria may be varied to "at least 10%". However, other principles and criteria do apply within these constrained areas, subject to exemptions for assessed schemes and deemed works of subdivisions under Schedule 6. This includes the need to recognise locally significant bushland.

Tools used by proponents and assessors

Percentage remaining criteria provide absolute minimum figures but reliable statistics may be difficult to obtain.

1. Determine the ecological communities on the subject land. The highest level of knowledge should be used, i.e. regional studies and/or area-specific studies.

2. Determine the percentage remaining of these types within the bioregion, subregion (Arc View tables) and local area (DEP_CAT).
3. Determine if the area is constrained land (including urban, urban deferred or industrial) within the Bush Forever study area or the Great Bunbury Region Scheme. Apply a benchmark of at least 10% for these areas. For other areas, consider planning instruments and other factors to achieve a greater percentage of protection of remnant vegetation.

GIS themes and tools

NLWRA (Beard/Hopkins) vegetation mapping
 NLWRA remnant vegetation extent
 Heddle
 RFA
 IBRA regions and subregions
 DEP_CAT (calculates representation at local area scale)
 Vegetation trends 88-00

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Guidelines

This principle aims to conserve all vegetated watercourses and wetlands.

The principle must consider both the area identified as watercourse or wetland and an appropriate buffer required to maintain the hydrological and ecological values of the watercourse or wetland. The watercourse or wetland buffer is defined in an area outside of vegetation dependent on waterlogged soil.

Under this principle, vegetation dependent on waterlogged soils would be protected e.g. damplands and floodplains.

Watercourses are an integral part of our heritage, have diverse ecological functions and support a wide range of activities including agriculture and tourism. In our predominantly dry landscape, watercourses are a focus for recreational activities such as swimming, boating, picnicking and bushwalking. Watercourses provide important linkages between landforms.

Wetlands are widely recognised as important wildlife habitats and as being among the most biologically productive and biologically diverse habitats on the planet. They directly and indirectly supply food to a broad range of animals including microorganisms, invertebrates, fish, birds, mammals and reptiles. Wetlands also serve to purify water by removing suspended matter (settling of particles), reducing numbers of faecal microorganisms and using dissolved nitrogen and phosphorus for plant growth.

Buffers are designed to protect watercourse and wetland vegetation from potential deleterious impacts from adjacent or surrounding land uses and associated impacts. For wetland and watercourse ecosystems, the buffers are measured from the edge of the boundary, which encompasses both waterlogged and inundated areas and the wetland-dependant vegetation, to the outside edge of any proposed development or activity.

EPA Position Statement No.4 *Environmental Protection of Wetlands* has as a goal no net loss of wetland values and functions. The EPA has noted that a lack of understanding of or interest in wetlands in the past has contributed to a focus on their economic benefits rather on a broader understanding of all their environmental values.

Tools used by proponents and assessors

- 1) Identify watercourses and wetlands including their associated riparian zones, wetland dependent vegetation and appropriate buffers.
- 2) Determine whether the watercourse or wetland is listed as significant.

Sources of information that will aid in the identification of significant watercourses and wetlands include:

- Swan Coastal Plain wetland mapping north of Bunbury is available through the Geomorphic Wetlands Database; and
- Swan Coastal Plain wetland mapping south of Bunbury is available in Hill *et al.*, (1996) *Wetlands of the Swan Coastal Plain Volume 2B: Wetland Mapping, Classification and Evaluation. Wetland Atlas.*

Significant watercourses and wetlands include those listed as:

- Environmental Protection Authority (1992). *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*. Western Australian Government Gazette, 24 December, 1992, pp 6287-93;
- Environmental Protection Authority (1998). *Environmental Protection (South West Wetlands) Policy 1998*;
- Conservation Category Wetlands as identified by the Water and Rivers Commission;
- Significant wetlands of the South Coast Region;
- RAMSAR wetlands;
- A Directory of Important Wetlands in Australia (ANCA);
- Freshwater wetlands in the Agricultural Zone;
- Wild rivers;
- Significant watercourses and wetlands as identified by the Water and Rivers Commission; and
- Watercourses and wetlands listed in EPA Systems 1-12.

- 3) Determine appropriate buffers (where necessary) for watercourses and wetlands.

Additional information that may aid in the application of buffers to watercourses and wetlands:

- Water and Rivers Commission (2001) *Determining Foreshore Reserves*. Water and Rivers Commission River Restoration Report No. RR16, Perth;
- Water and Rivers Commission Position Statement: Wetlands; and
- Guide to Water and Rivers Commission Foreshore Policy 1: Identifying the Foreshore Area.

For a guide to the Commission's wetland buffer requirements for a range of land uses on the Swan Coastal Plain (Davies and Lane 1995) refer to the table in Position Statement No.4.

GIS Themes

Geomorphic Wetlands Dataset (includes conservation category wetlands)
 South Coast Wetlands
 Rivers at 1:250,000
 Rivers at 1:1,000,000
 Hydrography, Linear Features
 ANCA wetlands
 Wild rivers
 Lakes at 1:1,000,000
 EPP Lakes
 South west Wetlands EPP when available
 Ramsar wetlands

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Guidelines

Native vegetation should not be cleared if it is likely to cause land degradation. This includes soil erosion, salinity, nutrient export, acidification, waterlogging and flooding that affects the present or future use of land.

The assessment of land degradation risk takes into consideration a number of often interacting factors including soil type, landform and slopes, rainfall zone and intended land use. Low pH soils are usually those below 4 while high pH soils are those above 9.

Salinity risk assessment is site specific taking into account site and catchment information and the intended use of the land post clearing. Assessment of salinity risk should consider the average annual rainfall soil types, landform, underlying geology and hydrology of the site and its subcatchment. Clearing is unlikely to be approved where the clearing and subsequent use of the land is likely to increase ground water recharge resulting in rising saline ground water tables.

Tools used by proponents and assessors

Land evaluation Standards for Land Resource Mapping. Department of Agriculture, Technical Report 181.

Rapid Catchment Appraisal process - estimates current and predicted areas of secondary salinity in catchments.

AgMaps (CD)

Land degradation is assessed with reference to the Land Capability Class of the area where applicable.

Soil landscape mapping and land degradation quality data - contact Dennis Van Gool Department of Agriculture.

The Department of Agriculture has developed land capability classes. In general, Classes IV and V should not be cleared.

Land capability classes

Capability Class	General Description
I	Very high capability for the proposed activity or use. Very few physical limitations present which are easily overcome. Risk of land degradation is negligible.
II	High capability. Some physical limitations affecting either productive land use or risk of land degradation. Limitations overcome by careful planning.
III	Fair capability. Moderate physical limitations significantly affecting productive land use or risk of land degradation. Careful planning and conservation measures required.
IV	Low capability. High degree of physical limitations not easily overcome by standard development techniques and/or resulting in a high risk of land degradation. Extensive conservation requirements.
V	Very low capability. Severity of physical limitations is such that its use is usually prohibitive in terms of either development costs or the associated risk of land degradation.

Guidelines developed by the Department of Agriculture are used to assess the likelihood of other land degradation hazards occurring as a result of clearing. These guidelines are summarised in the tables below.

Soil erosion - determine land capability classes for water and wind-generated soil erosion.

Water erosion

Agricultural region	Soil surface texture	Land Capability Class				
		I	II	III	IV	V
		% slope				
South West	Sand	0-2	3-4	5-8	9-15	>15
	Sandy Loam and Loams	0-2	3-5	6-8	9-20	>20
	Clay Loams and heavier	0-1	2	3-8	9-25	>25
Northern	Sand	0-2	3-4	5-8	9-15	>15
	Sandy Loams	0-2	3-5	6-8	9-20	>15
	Clay Loams and heavier	0-1	2	3-8	9	>9
South Coast	Sand	0-2	3-4	5-8	9	>9
	Sandy Loam and Loams	0-2	3-5	6-8	9-15	>15
	Clay Loams and heavier	0-1	2	3-8	9	>12
Great Southern	Sand	0-2	3-4	5-8	9	>9
	Sandy Loam and Loams	0-1	2	3-8	9-15	>15
	Clay Loams and heavier	0-1	2	3-8	9	>9
Central	Sand	0-2	3-4	5-8	9	>9
	Sandy Loam and Loams	0-1	2	3-8	9	>15
	Clay Loams and heavier	0-1	2	3-8	9	>9

Class IV and V lands should generally not be cleared.

Wind erosion

The process to follow for the assessment of wind erosion hazard is as follows:

1. Determine the strength of the soil in terms of consistency (McDonald *et al.* Australia Soil and Land Survey - Field Handbook p. 115-116). Strength is determined by the force just sufficient to break or deform a 20mm diameter piece of dry soil when a compressive shearing force is applied between thumb and forefinger.

Force	Description		Hazard "rating"
0	Loose	No force required. Separate particles as found in loose sands	6
1	Very weak	Very small forces, almost nil	5
2	Moderately weak	Small but significant force	4
3	Moderately firm	Moderate to firm force	2
	Very firm to rigid	Disregard as wind erosion hazard, if particles are >2mm	1

2. Determine the particle or ped size: if the majority of sizes are less than 2 mm it should be regarded as a wind erosion hazard.

Particle or ped size	Hazard rating
< 1 mm	6*
1-2 mm	5
2-5 mm	3

3. Relief and aspect is also important. This can be combined to give ratings on the following landforms:

Landform	Hazard rating
Dune system	6
Exposed flat plain	5
Undulating country	4
Hilly terrain	2
Depressions	1

4. Add totals from 1-3 to determine the land capability class for wind erosion hazard.

Added points	Land capability class	Comments
18	V	No clearing
16-16	IV	Clearing with wind protection left
<16	1-III	Normal district practice

Determine soil pH and heavy metal levels.

Soil acidity

(Central and Northern agricultural regions only)

Soil acidity should be tested on yellow or pale yellow sandplain supporting Wodgil vegetation (*Acacia* spp.) or where naturally acidic soils are suspected.

1. Identify areas of uniform vegetation (sandplain vegetation).
2. Soil sampling (subsoil 15-20 cm). Take one sample per hectare systematically across the unit, with a minimum of 30 samples within a sandplain unit. Then bulk each 30 samples and take a subsample for soil testing.

3. pH test on subsample (1:5 0.01M CaCl₂)

pH ≥ 4.5 Not highly acidic, no clearing restrictions
 pH < 4.5 Proceed to 4

4. Al test on subsample (1:5 0.05M KCl extract)

<20 μmol Al Not highly acidic, no clearing restrictions
 ≥20 μmol Al Do not clear

These levels of Aluminium significantly reduce plant growth resulting in an increased wind erosion risk and increased groundwater recharge.

Determine land capability class for water logging.

Waterlogging

Agricultural region	Soil surface texture	Land Capability Class				
		I	II	III	IV	V
% slope						
South West	Drainage	Well-drained	Moderately drained	Imperfectly drained	Poorly drained	V. poorly drained
	Landform element	Undulating	Undulating	Plain	Valley floor	Swamp
	Soil type	S	SL	SCL duplex soils	C	C
	Soil depth	>1.0 m	0.5-1.0 m	0.2-0.5 m	<0.2 m	<0.2 m
	Mottling	0-10%	10-20%	20-30%	30-70%	30-70%
	Inundation risk	Nil	Low	Medium	High	Very high
Northern	Drainage	Well-drained	Moderately drained	Imperfectly drained	Poorly drained	V. poorly drained
	Landform element	Undulating	Undulating	Plain	Valley floor	Swamp
	Soil type	S	SL	SCL duplex soils	C	C
	Soil depth	>1.0 m	0.5-1.0 m	0.2-0.5 m	<0.2 m	<0.2 m
	Mottling	0-10%	10-20%	20-30%	30-70%	30-70%
	Inundation risk	Nil	Low	Medium	High	Very high
South Coast	Drainage	Well-drained	Moderately drained	Imperfectly drained	Poorly drained	V. poorly drained
	Landform element	Undulating	Undulating	Plain	Valley floor	Swamp
	Soil type	S	SL	SCL duplex soils	C	C
	Soil depth	>1.0 m	0.5-1.0 m	0.2-0.5 m	<0.2 m	<0.2 m
	Mottling	0-10%	10-20%	20-30%	30-70%	30-70%
	Inundation risk	Nil	Low	Medium	High	Very high
Note: low-lying depressions with poorly drained soils should not be cleared						
Great Southern	Slope	>5%	5-3%	3-1%	1-0.1%	0%
	Depth to clay	>1 m	> 1m	0.5-1.0 m	0.5-0.15 m	<0.15 m
	Soil type	deep S	SL	SC	LC	HC
	% gleyed	0-10%	10-20%	20-30%	30-70%	>70%
	Site drainage	1	2	3	4	5
	Landform			plain/plateau	valley floor	swamps
	Drainage capacity			capable	uneven	incapable
Central	Drainage	Well-drained	Moderately drained	Imperfectly drained	Poorly drained	V. poorly drained
	Landform element	Undulating	Undulating	Plain	Valley floor	Swamp
	Soil type	S	SL	SCL duplex soils	C	C
	Soil depth	>1.0 m	0.5-1.0 m	0.2-0.5 m	<0.2 m	<0.2 m
	Mottling	0-10%	10-20%	20-30%	30-70%	30-70%
	Inundation risk	Nil	Low	Medium	High	Very high

Soils classified as Class IV or V should generally not be cleared.

Determine if water logging is a problem on adjacent land and whether clearing is likely to increase the problem.

Determine the status of salinity on the land and in the region, determine the current rate of water table rise. Determine if the rate of rise is likely to be increased and if this is likely to lead to increased salinisation or earlier onset of salinisation.

GIS themes

Salinity Mapping (Land Monitor)
 Salinity Monitoring (Land Monitor)
 Salinity Risk (Land Monitor)
 Groundwater Salinity, Confined Aquifers
 Groundwater Salinity, Superficial Aquifers
 Acid sulphate soil risk on Swan Coastal Plain

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Guidelines

Habitat fragmentation poses one of the greatest threats to biodiversity. When core habitat reserves are isolated from one another by human land uses, the diversity of native species generally declines and the probability of species extinction increases. This process of ecosystem decay has been well-documented in fragmented landscapes throughout the world.

Ecological linkages and buffers in the context of this principle contribute to the functioning and viability of existing conservation estate by:

- establishing connectivity between conservation areas and other areas of native vegetation;
- contributing to the maintenance or restorability of one or more key ecological processes required to sustain the conservation areas; and
- expanding the functional size of an existing conservation area or partially compensating for less than ideal shape.

The only way in which many of the basic ecological functions of smaller, remnant natural areas can be maintained is by maintaining connectivity with the broader natural landscape.

Native vegetation adjacent to or near conservation reserves improves the viability and conservation values of the reserve by providing larger core areas, buffering the reserve from edge effects, consolidating boundaries or adding plant communities and habitats not represented or under represented in the reserve. The size of an effective buffer will depend on the vegetation types present and their resilience.

Ecological linkages of vegetation between larger areas of conservation value are important for enabling fauna to continue to move through the landscape and between reserves. This is vital both for species that are nomadic and for maintaining populations of less mobile species that may otherwise become locally extinct in individual reserves.

Remnant patches within the vicinity of large contiguous areas of native vegetation (outliers) are more likely to support wildlife than more isolated patches - with greater separation distances fewer and fewer species will have the mobility necessary to maintain access.

Tools used by proponents and assessors

Determine if land held or managed for conservation is present. Need to refer to:

- land status maps for existing reserves and DEC region plans / EPA System 1-12 reports and Bush Forever for proposed reserves and protected areas;
- may need to access DOLA data for reserves that have a dual purpose (e.g. recreation and conservation) and are not managed by DEC;
- check with LGA for Shire reserves that may have a dual purpose;
- check with DEC for covenants, Land for Wildlife sites, World Heritage areas, biosphere reserves;
- check with National Trust of Australia (WA) for covenanted and Bush bank sites;
- check with World Wildlife Fund for Woodland Watch sites;
- wetlands identified under principle (f); and
- Perth Biodiversity Project Local Biodiversity Guidelines and subsequent Local Biodiversity Plans for regional and local ecological linkages and Local Biodiversity Areas with high priority for retention and protection (i.e. Local Conservation Areas).

Determine whether the land provides a buffer, ecological linkage or outlier to a conservation area. These may include areas that provide large, regional connections to conservation areas to facilitate animal movements and other essential flows between different sections of the landscape, and buffer the conservation area from adverse impacts. Alternatively, a narrow, disjunct, impacted, or otherwise tenuous habitat linkage connecting to conservation areas may exist. These are essential to maintain landscape-level connectivity, but are particularly in danger of losing connectivity function. An example is a narrow peninsula of habitat, surrounded by human-dominated land uses, that connects larger habitat blocks. See South Coast Region Macrocorridor project.

Factors to consider in determining whether an area has a function as an ecological linkage or buffer, or contributes significantly to the environmental values of a conservation area, include:

- distance to the conservation area and between other possible ecological linkages;
- size and shape of the ecological linkage or buffer;
- types of habitats (riparian, coastal, woodland, etc.) present within the linkage or buffer and key focal species and ecological processes that may be present that would indicate connectivity;
- types of land cover (eg. natural vegetation, pastoral/grazing, cropland/irrigated agricultural, low density residential, etc.) within and immediately adjacent to the linkage;
- primary barriers that are impediments to faunal movement, gene flow and ecological processes, and features that facilitate these within linkage. For example, watercourse, riparian habitat, dirt road, continual habitat coverage, underpasses/bridges, agriculture, urban areas; and
- any studies that exist to demonstrate the use and functions of the linkage or buffer, including any anecdotal evidence or field studies conducted on this particular linkage or buffer.

GIS themes

DEC-managed Estate
 WRC Estate
 EPA System boundaries and areas
 Bush Forever areas
 Register of the National Estate

- (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.**

Guidelines

This principle considers biological, chemical and physical parameters, and water quantity as far as these affect overall environmental quality.

This principle aims to ensure that the quality of water supplies are not reduced, that levels of nutrients in water bodies and discharge water, salinity or pH levels are not significantly altered by land clearing, and that water regimes and environmental water provisions are not adversely affected.

The assessment should consider both onsite and offsite impacts, so that problems are not transferred from the cleared site to another part of the catchment or aquifer.

Native vegetation should be retained if clearing is likely to lead to sedimentation entering water bodies.

Native vegetation should be retained if impacts on it are likely to contribute to increased nutrient levels in the catchment. Soils with low and very low phosphorous retention ability should not be cleared.

Native vegetation should be retained if there is potential for low pH waters and/or acid sulphate soils to form as a result of clearing.

Within the north-west of the State, mangrove areas and tidal flats provide the main indicator of conditions that may potentially result in acid sulfate soils and low pH waters.

Acid sulfate potential has been mapped for the Swan Coastal Plain but not for the remainder of the southwest. The Acid Sulfate Soils Guideline Series provide further information on this issue.

Within Public Drinking Water Supply Catchments (PDWSA), the impacts of the land use and clearing must be compatible with the PDWSA guidelines and Water Source Protection Plans.

On Water Reserves under the Country Areas Water Supply Act (CAWS), clearing controls are in place. In these areas, the CAWS Clearing Guidelines should be consulted to identify additional water quality considerations. Clearing may be restricted through compensation payments or due to location in the catchment and salinity risk.

Biological communities associated with groundwater dependent ecosystems (GDEs), such as wetlands, groundwater-dependent terrestrial vegetation, cave streams and springs, have adapted to existing water regimes. Clearing of relatively substantial areas of vegetation can alter these regimes and cause degradation of existing biological communities. On the Swan Coastal Plain, GDEs most likely to be affected by a rising water table are those in areas with a depth to groundwater of 0 to 6 metres.

Native vegetation should be retained if clearing is likely to lead to changes in water regimes of GDEs on or off site and subsequent degradation of the biological communities associated with these systems. Degradation could entail local extinction of vegetation species, loss of diversity of fauna, loss of habitat diversity, etc.

In areas where Environmental Water Provisions (EWPs) have been set for groundwater-dependent ecosystems, the clearing of native vegetation should not result in breaches of EWPs.

Tools used by proponents and assessors

General

- Environmental Geology Series (Department of Industry and Resources) - identifies soil types, land use suitability and geomorphology.

Groundwater

- Estimate depth to water table and identify existing water quality readings from Water Information Network (WIN) sites and drilling project reports.
- Consult salinity risk mapping series to identify if salinity (electrical conductivity) is rising in the area (south west only). If it is, then obtain all water quality monitoring parameters from WIN and look at the long term trend, focusing on pH and electrical conductivity.
- On Swan Coastal Plain, consult the acid sulphate soil GIS data to identify whether the area is in area of moderate or high risk.
- In other areas, determine whether soil types have the potential to generate acid sulphate soils. Consult the Acid Sulfate Soils Guideline Series for information on this. Consider any previous studies carried out in the area.
- Any increase in rate of water table rise in catchments affected by or likely to be affected by salinity or changes in pH of discharge groundwater is unacceptable.
- Hydrogeologic modelling and assessment to determine the likely spatial and temporal extent and magnitude of impact on the water table of clearing, particularly where large areas of vegetation are proposed to be cleared.
- Where GDEs are likely to be affected by water table rises, assessment of the Ecological Water Requirements (EWRs) of groundwater-dependent ecosystems and setting of maximum water level criteria (generally by qualified ecologists) may be required. Hydrogeologic modelling can then be employed to ensure that the proposed clearing of native vegetation does not breach the water level criteria.

Surface water

- Identify the nearest gauging station and view historical pH, electrical conductivity and nitrogen and phosphorus readings. The Phosphorus Retention Index (PRI) may be useful to determine the nutrient capacity of the soils. If there is a trend then obtain all WIN readings for the area and consider long term trends.
- Determine nutrient trends for wetlands in the catchment. Determine soils in the catchment and their risk of erosion and nutrient holding capacity.

- Determine likely impact of clearing on nutrient levels from leaching of nutrients or from erosion carrying nutrient rich soil particles. No increase in nutrient levels is acceptable in systems with a trend towards elevated nutrient levels.

GIS Themes

Salinity Risk (SW only)

Salinity Mapping (SW only)

Salinity Monitoring (SW only)

PDWSA Policy Area

Acid Sulphate Soil Potential for Swan Coastal Plain

Soil Mapping Series - show PRI - but don't cover much of the state.

WIN database - provides water quality information from monitoring bores and gauging stations throughout WA

- (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.**

Guidelines

Consideration of this principle may require extensive modelling of the whole catchment and should only be considered for large clearing proposals.

For smaller proposals, clearing should not cause water logging (localised flooding). This is already considered under principle (g) (land degradation). Flooding and/or water logging may also exacerbate criteria under principle (i) such as salinity, sedimentation, low pH waters or eutrophication or result in unacceptable changes in water regimes or environmental water provisions, both on and offsite.

Tools used by proponents and assessors

Hydrological modelling may be required.

Indicators of possible water logging problems:

- soil compaction and infiltration
- soil profile depth
- soil drainage/recharge rates
- perched water tables - groundwater contours and monitoring well water levels could be considered
- water logging observed on adjacent properties

Floodplain mapping for major towns (1 in 100 year flood levels).

GIS themes

Perth Basin Hydrogeology, Base Superficial formation

Aquifer theme from DWAI

3 Planning Instruments

The *EP Act* requires that the CEO shall have regard to the clearing principles, so far as they are relevant to the matter under consideration. The *EP Act* also prescribes that in considering a clearing matter the CEO shall have regard to any planning instrument, or other matter that the CEO considers relevant.

Planning instruments are defined in the *EP Act* as:

- (a) a scheme or a strategy, policy or plan made or adopted under a scheme;
- (b) a State planning policy approved under section 29 of the *Planning and Development Act 2005* and published in the *Gazette*; or
- (c) a local planning strategy made under the *Planning and Development Act 2005*.

Local and regional level planning strategies, by-laws and policies should be considered as part of the recommendations to the CEO and decision-making. Examples of these include Local Biodiversity Guidelines and related Local Biodiversity Plans prepared by Local Government, or regional planning strategies dealing with public infrastructure.

4 Other Matters

The other factors which can be taken into account by the CEO in considering a clearing application are not defined in the *EP Act*, and consequently are any matters the CEO considers relevant. As a matter of policy, these matters should be detailed in the assessment and decision reports. Generally, other factors could include such matters as:

- research undertakings;
- social inputs;
- community infrastructure needs;
- transportation requirements;
- listing of property and provisions undertakings; and
- matters of public interest.

These matters should be considered in the context of discussions with proponents, through submissions related to application advertising, or in response to direct interest letters.

Any other matters for consideration in decision-making should be detailed in that section of the assessment and decision reports.

Glossary

Biological diversity

The variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. It is also referred to as *biodiversity*.

Bioregion

IBRA regions represent a landscape-based approach to classifying the land surface. Specialist ecological knowledge, combined with regional and continental scale data on climate, geomorphology, landform, lithology and characteristic flora and fauna were interpreted to describe these patterns. The resulting integrated regions were ascribed the term biogeographic regions. The Interim Biogeographic Regionalisation for Australia (IBRA) was developed in 1993-94 under the coordination of Environment Australia by the States and Territories as a basis for developing priorities for the Commonwealth in funding additions to the reserve system under the National Reserve System Cooperative Program. It has been subsequently revised in the light of new knowledge.

Bioregional Conservation Status of Ecological Vegetation Classes

Presumed extinct	Probably no longer present in the bioregion
Endangered*	<10% of pre-European extent remains
Vulnerable*	10-30% of pre-European extent exists
Depleted*	>30% and up to 50% of pre-European extent exists
Least concern	>50% pre-European extent exists and subject to little or no degradation over a majority of this area

* or a combination of depletion, loss of quality, current threats and rarity gives a comparable status (Department of Natural Resources and Environment 2002)

Buffer

Area designed to protect significant environmental values, including significant flora, significant ecological communities, and wetlands and watercourses, from deleterious impacts by maintaining ecological processes and functions in the habitat.

Clearing

(a) the killing or destruction of;

(b) the removal of;

(c) the severing or ringbarking of trunks or stems of; or

(d) the doing of any other substantial damage to,

some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity that causes -

(e) the killing or destruction of;

(f) the severing of trunks or stems of; or

(g) any other substantial damage to,

some or all of the native vegetation in the area.

Condition

Condition is a rating given to vegetation to categorise disturbance related to human activities. This rating refers to the degree of change in the structure, density and species present in vegetation in relation to undisturbed vegetation of the same type.

The most widely used condition system is that of Keighery (1994):

1. Pristine: no obvious signs of disturbance.
2. Excellent: vegetation structure intact; disturbance affecting individual species and weeds are non-aggressive.
3. Very Good: vegetation structure altered; obvious signs of disturbance.
4. Good: Vegetation structure significantly altered by obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it.
5. Degraded: Basic vegetation structure severely impacted by disturbance. Scope for regeneration of vegetation structure, but not to a state approaching good condition without intensive management.
6. Completely Degraded: The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

Other condition ratings used commonly are described in Government of WA 2000.

Conservation area

A conservation park, national park, nature reserve, marine nature reserve, marine park or marine management area within the meaning of the *Conservation and Land Management Act 1984* or any other land or waters reserved or managed for the purpose of, or purposes including, nature conservation.

Constrained Area

An identified area within the Swan Coastal Plain portion of the Greater Bunbury Region Scheme and the Bush Forever Study area where there is a reasonable expectation that development will be able to proceed. This may include areas zoned urban, urban deferred or industrial zoned land or land with existing development approvals.

Declared Rare Flora

Species protected under the *Wildlife Conservation Act 1950* as identified in the current listing.

Depleted

Refer to Bioregional Conservation Status of Ecological Vegetation Classes.

Ecological community

A naturally occurring biological assemblage that occurs in a particular type of habitat (English and Blythe, 1997; 1999). The scale at which ecological communities are defined will depend on the level of detail in the information source, therefore no particular scale is specified.

Ecological linkage

Are a network of native vegetation that maintain some ecological functions of natural areas and counter the effects of habitat fragmentation.

Ecosystem Diversity

Ecosystems are the critical biological/ecological operating units in nature. Ecosystem diversity is the diversity of all living organisms and non-living components within a given area and their relationships. Ecosystems include abiotic components, being partly determined by soil, parent material and climate. Ecological system diversity is the variety of habitats, biotic communities and ecological processes in a given area.

Ecological processes are the interactions, changes or evolutionary development processes of the ecosystem over time.

Fauna that is otherwise significant

These are defined as:

- Threatened fauna as endorsed by the Minister;
- fauna species that are habitat specialists;
- wide-ranging fauna species with reduced populations in the Bioregion;
- short-range endemic species;
- fauna species that have few populations in the Bioregion;
- fauna species which have reduced ranges or few recent records in the Bioregion; and
- internationally-listed migratory species.

Foreshore reserve

Where the foreshore area or watercourse buffer is to be set aside as a reserve under planning legislation, it is generally known as a foreshore reserve.

Fringing or riparian vegetation

Vegetation adjacent to the water body and directly dependent on the proximity of the watercourse or wetland. Riparian vegetation may include both wetland and dryland vegetation. Wetland vegetation can tolerate some period of inundation and is typically found below the high water mark or within the floodway, for example flooded gums and paperbarks, and submerged and emergent species like rushes. Dryland vegetation is not tolerant of permanently or seasonally waterlogged conditions. Riparian vegetation provides many important functions including habitat for many aquatic and terrestrial species, stabilisation of the banks, energy dissipation, ecological linkages, and sediment and nutrient retention; it assists in maintaining the integrity of the watercourse or wetland in a number of ways.

Genetic Diversity

Variation of genes/genetic information contained in all individual plants, animals and microorganisms both within and between populations of organisms that comprise individual species as well as between species. Genetic diversity represents the heritable variation within and between populations of organisms. There are so many genes and different possible combinations of genes that for most types of organism every individual, population and species is genetically distinct.

Landscape

Made up of basic elements - climate, geology, topography, vegetation, fauna and humans - biophysical characteristics that can be used to identify differences between different landscapes.

Local area

Varies with region and indicates the distance across which there is little change in a vegetation community. For example in the mallee region of the south-west a local area is typically a radius of 15 km from the subject land. For ecological communities where there is rapid change over distance such as the Lesueur and Fitzgerald River areas a distance of 5 km is more appropriate. In the Eremaean Province a distance of 50km is recommended. This will need to be determined on a region and vegetation specific basis.

Meta-population

A population of populations. A defined set of geographically separate populations with at least some exchange of individuals between the separate populations - in other words, systems of local populations connected by dispersing individuals.

Native vegetation

Indigenous aquatic or terrestrial vegetation but does not include vegetation that was intentionally sown, planted or propagated unless:

- (a) that vegetation was sown, planted or propagated as required under this Act or another written law; or
- (b) that vegetation is of a class declared by regulation to be included in this definition, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded.

Note that this includes non-vascular plants (e.g. mosses, fungi, algae) and marine plants (seagrass, macroalgae/seaweed).

Priority Flora

Plant taxa, lists of which are maintained by the Department of Conservation and Land Management, that are either under consideration as threatened flora but are in need of further survey to adequately determine their status, are adequately known but require ongoing monitoring to ensure their security does not decline, or are conservation dependent, that is they require active management to maintain their status.

Priority Fauna

Conservation significant animal species listed by DEC's Threatened Species Consultative Committee but which are not currently listed under Section 14(2)(ba) of the *Wildlife Conservation Act 1950* as Specially Protected Fauna.

Protected area

An area of land especially dedicated to the protection and maintenance of biological diversity and managed through legal and other effective means (ICUN 1994).

Representativeness

The extent to which areas selected for inclusion in the national reserves system are capable of reflecting the known biological diversity and ecological patterns and processes of the ecological community or ecosystem concerned (Commonwealth of Australia 1996).

Significant ecological community

- DEC threatened ecological communities (TECs) as listed through an existing Ministerial approval process;
- Priority ecological communities as listed by DEC - under consideration as TECs but need further survey; and
- Geographically Restricted Ecological Communities.

Significant flora

- Species that are confined to a specific area (ie endemic to the Bioregion) or otherwise geographically restricted;
- distinctive local forms that have not been recognised taxonomically (not a species, subspecies or variety);
- populations that are outside the main geographic range (ie disjunct populations)
- populations at the end of the plant's geographic range;
- populations that represent a significant number of the known individuals of the taxon in the bioregion; and
- Priority one to four flora as listed by DEC - taxa that are under consideration as DRF but are in need of further survey or continued monitoring.

Significant habitat

Habitat that provides resources (breeding, resting and feeding), connectivity or habitat area for a species or community that is critical for its survival.

Specially Protected Fauna

Species protected under the Wildlife Conservation Act 1950. The latest listing is Wildlife Conservation (Specially Protected Fauna) Notice 2001 (Government of Western Australia 2001b).

Species Diversity

This can be considered as the variety of individual species within a given area, such as a region. While such diversity can be measured in many ways, the number of species (species richness) is most often used. A more precise measurement of taxonomic diversity also considers the relationship of species to each other. The greater the difference between one species and another species, the greater its contribution to any overall measure of biological diversity. The ecological importance of a species can have a direct effect on community structure and thus on overall biodiversity. The variety of species increases with genetic change and evolutionary processes.

Threatened ecological communities

Those (ecological communities) that have been assessed through a procedure (coordinated by DEC) and assigned to one of the following categories related to the status of the threat to the community. The categories are "Presumed Totally Destroyed", "Critically Endangered", "Endangered" or "Vulnerable" (English and Blyth 1997, 1999). One of the criteria used to determine the categories is an estimate of the geographic range and/or the total area occupied and/or the number of discrete occurrences reduced since European settlement, where $\leq 10\%$ is Critically Endangered and $\leq 30\%$ is Endangered.

Vegetation complex

As defined by Heddle et al. (1980) and Mattiske and Havel (1998). The vegetation complexes are based on the pattern of vegetation at a regional scale as it reflects the underlying key determining factors of landforms, soils and climate.

Vegetation Type

Vegetation types as defined by Beard (1990) are based on three principal characteristics of vegetation.

1. Floristic Composition: the species of plants which comprise vegetation.
2. Vegetation Structure: the height of plants in layers, their shape and their spacing
3. Growth-form: the morphological characteristics of the component plants, such as woody or herbaceous, annual or perennial, thorny or succulent, evergreen or deciduous, and leaves of a certain texture, size and shape.
4. Plant Association: the component species, with particular dominants, of a given area. If the vegetation of another area has the same dominants it is in the same association. The association is the basic unit of vegetation.
5. Plant Formation: a vegetation unit that considers plant associations that have a similar physiognomy (a combination of vegetation structure and growth-form), independent of specific floristic composition.

Watercourse

- (a) Any river, creek, stream or brook in which water flows;
- (b) any collection of water (including a reservoir) into, through or out of which any thing coming within paragraph (a) flows;
- (c) any place where water flows that is prescribed by local by-laws to be a watercourse, and includes the bed and banks of any thing referred to in paragraph (a), (b) or (c).

For the purposes of the definition: a flow or collection of water comes within that definition even though it is only intermittent or occasional; a river, creek, stream or brook includes a conduit that wholly or partially diverts it from its natural course and forms part of the river, creek, stream or brook; and it is immaterial that a river, creek, stream or brook or a natural collection of water may have been artificially improved or altered.

Watercourse or wetland buffer

Land adjoining, or directly influencing a watercourse or wetland that is managed to protect watercourse and wetland values, including any riparian areas. It is basically an area outside a watercourse or wetland where clearing and certain activities are inappropriate. The size of the buffer area should take into account watercourse or wetland values, condition, pressures and responses to pressures.

Wetland

Areas of seasonally, intermittently or permanently waterlogged soils or inundated land whether natural or otherwise, including lakes, swamps, marshes, springs, damplands, intertidal flats, mangroves and estuaries.

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Water and Rivers Commission Position Statement: Wetlands

Western Australian *Wildlife Conservation Act 1950*

ADVICE

1. Monitoring by the CEO

The CEO may monitor the implementation of clearing and other activities done under this Permit in order to determine whether the permit holder is complying with the conditions of this Permit. In the event that the CEO determines that the permit holder is not complying with one or more conditions of this Permit, the CEO may amend, suspend or revoke this Permit as the CEO considers necessary.

2. Reports

Reports provided by the permit holder to the CEO under Part VI of this Permit may be made publicly available.

3. Clearing likely to have a significant impact on the environment

The permit holder must ensure that it complies with any obligation under section 38(5) of the *EP Act* to refer to the *EPA* a *proposal* that appears to the permit holder to be likely, if implemented, to have a significant effect on the environment.

4. Cumulative impacts of clearing

In accordance with the intent of the *clearing principles* in Schedule 5 of the *EP Act*, the permit holder must consider the cumulative *impacts* of clearing of native vegetation done under this Permit and other clearing done in that *bioregion*. The cumulative *impacts* of clearing done under this Permit will be considered by the CEO annually upon receipt of the permit holder's reports pursuant to Part VI of this Permit, and this Permit may be amended as necessary.

5. Temporary clearing

The permit holder must ensure that, wherever possible, new *temporary works*, *camps* and rest areas are located in areas that have already been cleared of native vegetation.

6. Review of Assessment Procedure

If the permit holder amends its *Preliminary Environmental Impact Assessment Procedure – Clearing of Native Vegetation* in a manner that affects the assessment of the proposed clearing against the *clearing principles* in accordance with condition 6 of this Permit, the permit holder must provide a copy of that amended document to the CEO within 1 month of finalising the amendments. The CEO will consider whether the amended document is sufficient to meet the requirements of this Permit and, if so, the CEO may amend this Permit in accordance with section 51K of the *EP Act*.

7. Review of Environmental Guidelines

If the permit holder amends its *Revegetation Guideline – Techniques and Monitoring* in a manner that affects the *revegetation* and *rehabilitation* of areas in accordance with condition 12 of this Permit, the permit holder must provide a copy of that amended document to the CEO within 1 month of finalising the amendments. The CEO will consider whether the amended document is sufficient to meet the requirements of this Permit and, if so, the CEO may amend this Permit in accordance with section 51K of the *EP Act*.

8. Offset Principles

The offset principle set out in condition 15 of this Permit are based on the *EPA's* Preliminary Position Statement No.9, Version 2, "Environmental Offsets", June 2005.

9. External Audit

When conducting an *external audit* under condition 21 of this Permit, the *lead environmental auditor* will determine which conditions of this Permit in respect of which he or she will conduct the audit.