



Green Star SA - Multi Unit Residential v1

LAND USE & ECOLOGY - CONDITIONAL REQUIREMENT & ECO-4 CALCULATOR GUIDE Version 1.0



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1 Introduction

The Land Use & Ecology – Conditional Requirement & Eco-4 Calculator Guide contains all necessary Additional Guidance to determining compliance with the Eco-0 Conditional Requirement, and using the Eco-4 Change of Ecological Value calculator.

Unlike previous Green Star SA rating tools, this information has been extracted from the Green Star SA – Multi Unit Residential v1 Technical Manual to allow the information to be distributed freely to those professionals or consultants engaged for the purposes of either the Eco-0 or Eco-4 credits.

2 Eco-0 Conditional Requirement Guide

The following information is essential information which should be reviewed when determining compliance with the Eco-0 Conditional Requirement.

2.1 Eco-0 Conditional Requirement Criteria

The Eco-0 Conditional Requirement is met where the project development footprint satisfies the following criterion:

- 1) Is not located on prime agricultural land;
AND
- 2) Is not located on vegetation of high ecological value or within a 100 metre buffer of vegetation of high ecological value;
AND
- 3) Is not located on land with confirmed presence or high probability of threatened red listed species, or within a defined buffer relevant to the specific threatened red listed species or habitat found;
AND
- 4) Is not located within the required buffer zones of watercourses as defined as:
 - a. The project development footprint must not fall within the 100 year floodplain;
OR
 - b. Watercourses of 'high ecological value': A project's development footprint can be located on land within 100 metres of a watercourse of 'high ecological value' only if the project is a refurbishment/redevelopment that remains within the existing development footprint and the existing hardscape is not exceeded and the Watercourse Protection Measures are completed;
OR
 - c. Watercourses NOT of 'high ecological value': A project's development footprint can be located on land within 100 metres of a watercourse that is NOT of 'high ecological value' only if the Watercourse Protection Measures are completed

Refurbishments/redevelopments that remain within the existing development footprint and the existing hardscape is not exceeded are exempt from criteria 1, 2, 3, 4a and 4c, however must ensure compliance with criterion 4b.

Watercourse Protection Measures

The Water Course Protection Measures required to be complied with for applicable developments are as follows:

- A site-specific Watercourse Management Plan is produced, exhibited and, for an As Built submission, implemented;
- AND
- All points are achieved in Emi-5 'Watercourse Pollution' and in Emi-7 'Light Pollution'.

The Conditional Requirement requires that there is an official and appropriately dated report from a suitably qualified registered ecologist confirming that none of the above Conditional Requirement criteria applies, or applied at the time of purchase, to the site. In addition (where applicable), the project must abide by all measures in the Environmental Impact Assessment (EIA) for the project if one is required.

The GBCSA reserves the right to provide the final ruling on a project's compliance with this Conditional Requirement.

2.2 Eco-0 Conditional Requirement Guidance

Suitably qualified registered ecologist

A suitably qualified registered ecologist is defined as a Professional Natural Scientist currently registered with the South African Council for Natural Scientific Professions (SACNSP) in accordance with the Natural Scientific Professions Act, 2003 (Act 27 of 2003). The SACNSP practitioner may have other specialists produce components of work under his or her guidance, but he/she must sign off the final report.

How to determine compliance to conditional requirement

The project team must determine whether an environmental impact assessment was carried out for the site and, if so, refer to the findings of the ecological specialist report. Where there is no such report, the project team must engage a suitably qualified recognised ecologist to undertake an ecological site scan or professional opinion to determine if any of the prohibited land types apply to the site.

Where there is no recent report on watercourses, wetlands and riparian habitats on the site, the project team must engage a suitably qualified wetland specialist to provide a professional opinion to determine whether any watercourses, wetlands or riparian habitats occur on the site.

All specialist ecological assessments must be done by a Professional Natural Scientist currently registered with the South African Council for Natural Scientific Professions (SACNASP) in accordance with the Natural Scientific Professions Act, 2003 (Act 27 of 2003).

Where the project is a building extension it will not automatically meet the Conditional Requirement, as the extension may encroach onto prohibited land types.

Prime agricultural land

Prime agricultural land is synonymous with the term 'high potential soils for agricultural use'. Prime agriculture land is to be assessed in a stepped approach by a registered agricultural/soil

scientist (as required by the Natural Scientific Professions Act (No. 27 of 2003) through the South African Council for Natural Scientific Professions (SACNSP)):

Step 1:

The specialist is to do a visual inspection of the site and top soil, and prepare a short report of his/her findings that either:

- Describes the findings that highlight that the site is not of high agricultural potential including reasons for this conclusion (in this case projects will not need to continue with 'Step 2' of this assessment);

OR

- Describes the findings that highlight that the inspection and basic assessment was not sufficient to determine whether the site was of high agricultural potential, requiring a more detailed study (in this case the project will need to continue with 'Step 2' of this assessment).

Step 2:

A detailed study and report must be prepared by the registered agricultural scientist to assess whether the site is of prime agricultural potential. The study must address all criteria of the soil classification relevant to the definition of prime agricultural land, as described below. The report must be conclusive in determining the classification of the site in this regard.

Definition of prime agricultural land

Prime agricultural land is classified for the purposes of this Green Star SA conditional requirement as soils of either Class I or II as defined in the 'Development and Application of a Land Classification for South Africa' report dated April 2002 prepared for the National Department of Agriculture, available for download from the AGIS website (www.agis.agric.za under AGIS: Natural Resources: Assessments: Land Capability: e-Library).

Vegetation of high ecological value

Vegetation of high ecological value is defined as indigenous natural vegetation that is in its untransformed state. For the purposes of Green Star SA this would include any vegetation identified as a 'Critical Biodiversity Area' in a fine-scale systematic conservation plan. The project team must secure a recent site-specific vegetation sensitivity study that confirms or refutes the presence of vegetation of high ecological value on the site. Where present, the vegetation of high ecological value is to be delineated on the site plan. Vegetation of high ecological value would typically be included with the environmental impact assessment report. Where there is no such report, a suitably qualified registered ecologist should be commissioned to provide a report.

Threatened red listed/threatened species

Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to extinction in the near future. Threatened species are also referred to as a threatened red listed species, as they are listed in the IUCN Red List of Threatened Species as per the IUCN Red List Categories & Criteria (Version 3.1-2000) which defines "threatened" species as those within the subcategories of "Critically Endangered (CR)", "Endangered (EN)" or "Vulnerable (VU)" only. Species which are not included within the aforementioned subcategories are not considered "threatened" for the purposes of Green Star SA.

Threatened red listed species are protected through national legislation, the *National Environmental Management: Biodiversity Act 10, 2004* and at a provincial level through policy by the provincial authorities mandated to enforce the *National Environmental Management Act, Act 107 of 1998*.

Threatened and protected species lists may be obtained from the local Provincial and National conservation authorities. More information can be found at <http://www.iucnredlist.org>.

In determining compliance with the Conditional Requirement Criteria, a registered ecologist qualified according to currently accepted standards for the threatened red listed species expected to occur on site should apply relevant methodologies as specified in recent guideline documents and available literature.

Watercourses

The following definitions from the *National Water Act, 1998 (Act No. 36 of 1998)* (NWA) are to be used to determine the presence of a watercourse on or within 100 metres of the site.

The NWA includes wetlands and rivers into the definition of the term watercourse as follows:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and,
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.

A reference to a watercourse includes, where relevant, its bed and banks.

Man-made drainage features such as stormwater channels and swales are not included in the National Water Act, 1998 (Act No. 36 of 1998) definition of a watercourse and are therefore not considered to qualify as watercourses in terms of the Eco-Conditional Requirement.

However, care should be taken in the interpretation of this definition due to the fact that natural streams, wetlands and rivers may in some instances become transformed so as to resemble artificial features over many years of human disturbance. Similarly, over time, man-made systems may resemble natural systems. A suitably qualified specialist should be engaged to determine the status of these systems according to the National Water Act should any doubt arise based on soil moisture, position in the landscape or vegetation characteristics present on the site.

How to determine the buffer from a watercourse

For the purposes of determining the 100 metre buffer from a watercourse, the edge of a watercourse is defined as the outer edge of the combined footprint encompassing the riparian habitat and/or the temporary zone of a wetland/s on or adjacent to the site.

- The edge of the watercourse must be delineated by a wetland specialist. The 100m buffer is then measured from this line; and,
- In addition, the development footprint must not fall within the 100 year flood plain.

Riparian habitat is the accepted indicator used to delineate the extent of a river's footprint (DWAF, 2005). The NWA defines a riparian habitat as follows:

"riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse, which are commonly characterised by alluvial soils, and which

are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas."

The **temporary zone of a wetland** is the outer recognisable edge of a wetland which the National Water Act, 1998 (Act 36 of 1998) defines as:

"land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Local government policies require that protective river buffer zones be calculated from the outer edge of the riparian zone and that protective wetland buffer zones be calculated from the outer edge of the temporary zone of a wetland (KZN DAEA, 2002; CoCT, 2008; GDACE, 2009).

High Ecological Value Watercourses

For the purposes of this conditional requirement, a watercourse is considered to be a 'high ecological value watercourse' if it is:

- Deemed significant under a local, provincial or national register;
- A listed wetland under the Ramsar Convention on Wetlands; or,
- Rated with a Present Ecological State (PES) of 60% or greater.

How to determine the ecological value of a watercourse

The Ecologist's site assessment must be based on:

- Local, provincial and national watercourse mapping where available;
- The Ramsar Convention on Wetlands;
- Aerial photography;
- Topographic mapping (to identify catchment areas and drainage patterns); and,
- A site survey including an assessment of the 'present ecological state' of watercourses in terms of the vegetation, soil and hydrological regime, against the definitions of watercourses of 'high ecological value' using recognised South African functional assessment methodologies.

How to determine the Present Ecological State (PES) of a watercourse

A suitably qualified and experienced wetland ecologist must apply the appropriate methodologies to assess the ecological integrity of the watercourse/s on or adjacent to the site to determine their PES or equivalent DWAF ecological category.

Several assessment methodologies have been developed in recent years which describe the relative integrity of wetlands and rivers. In deciding which rating system is the most appropriate at a given time, it is important to take into consideration the following:

- The particular type of wetland or river conditions present on the site will determine which methodology is best suited for an evaluation;
- Methodologies developed for South African biophysical conditions should take preference to non-South African methodologies;
- Where possible, recent, updated methodologies should be followed;
- Methodologies should be generally accepted by specialists in the field; and,

- They should be rugged and scientifically defensible.

The following methodologies have been developed for the assessment of the ecological state and by implication the value of watercourses according to their hydro-geomorphic categories:

- The Riparian Vegetation Response Assessment Index (VEGRAI) (Kleynhans et al, 2007);
- The Wetland Index of Habitat Integrity (WETLAND-IHI) developed by DWAF (2007);
- The WET-Health tool designed to assess the health or integrity of a wetland; and,
- The WET-EcoServices tool designed to assess the ecological functionality of a wetland.

Watercourse protection measures

The watercourse management plan must be incorporated on the project for the areas within the owner's control. The owner must remain responsible for implementing the watercourse management plan for 5 years from project completion, regardless of whether the land will be donated or handed over to another entity.

All points in Emi-5 'Watercourse Pollution' and in Emi-7 'Light Pollution' must be achieved, regardless of the areas of the watercourse under the owner's control.

3 Eco-4 Change in Ecological Value Calculator Guide

The following information is essential information which should be reviewed when using the Eco-4 Change of Ecological Value calculator within the Green Star SA Multi Unit Residential v1 rating tool.

3.1 Eco-4 Change in Ecological Value Credit Criteria

Up to four points are awarded where:

- The outcome of the ecological assessment the site indicates that;
 - For greenfield sites, the site has no threatened or vulnerable species or sensitive ecological units;
 - OR
 - For reused (i.e. brownfield) sites, threatened or vulnerable species or sensitive ecological units are to be adequately protected if present.
- AND
- There is no net reduction of native vegetation (where present);
- AND
- There is no change in sensitivity class through transformation of, or reduction in extent of, threatened vegetation types;
- AND
- The ecological value of the site is either not diminished, or is enhanced beyond its previously existing state.

The points awarded are determined using the Green Star SA Multi Unit Residential Change of Ecological Value Calculator.

3.2 Eco-4 Change in Ecological Value Calculator Guidance

The Change of Ecological Value Calculator compares the relative ecological value of land at the time of site purchase and after development.

The following information is required to use the Calculator:

- Whether the site contains threatened or vulnerable species;
- The bio-region in which the site is located;
- The vegetation type in which the site is located;
- The area of each different ecological land type on the site before development; and,
- The area of each different ecological land type on the site after development.

How the Calculator works

The Change of Ecological Value Calculator is used to assess the different types of vegetative and non-vegetative cover on a proposed development site using the following:

- The different ecological land types have been assigned relative Ecological Weightings by qualified ecologists for comparative purposes only (refer to information following for further advice);
- The area of each land type is multiplied by the Ecological Weighting, for the site both before and after development, to give an Ecological Score for each;
- For existing natural indigenous land types, wetlands and waterways the Ecological Score is multiplied by a Bioregion Reservation Importance Factor;
- Where the vegetation type is unknown ('Don't know' option selected), the opportunity to score points is severely diminished;
- For certain existing natural land types, wetlands and waterways/riparian zone the Ecological Score after development is limited and cannot exceed the before development score (this is based on the understanding that truly natural systems cannot be created in the relatively short term of a design implementation and therefore the existing natural land types cannot increase in extent);
- For a brownfield site with the 'Brownfield Site' vegetation type selected, the Ecological Weighting Score of certain man-made vegetated land types are multiplied by 2 (resulting in the doubling of the score) while certain indigenous natural vegetation land types are multiplied by 0 (resulting in a zero score – refer to information following for further advice);
- A total Ecological Score for the site both before and after development is determined by then adding the Ecological Scores for each land type;
- A comparative Ecological Diversity Index for the site before and after development is calculated by dividing the Total Ecological Score by the site area;
- The Change in Ecological Value is calculated by subtracting the Ecological Diversity Index (before) from the Ecological Diversity Index (after); and
- Points are then awarded based on the Change in Ecological Value achieved.

Except for the selection from the drop down lists and the data entered into the 'Before' and 'After' columns, the scores and final points are calculated automatically. There are many national and provincial threatened species and ecosystems. The presence or absence on site of either must be verified by a suitably qualified and registered ecologist.

Weightings for greenfield versus brownfield sites

The Change of Ecological Value Calculator is structured in a way so as to acknowledge the stark difference in baseline ecological value between an undeveloped greenfield site and a previously developed brownfield site.

On a greenfield site the ecological value is predominantly dictated by the climate, geology & soils and the living systems that inhabit it. Where the site is cultivated, the agricultural management practices will affect the ecological value. A greenfield site is located within a much larger regional area of vegetated land types.

The ecological value of a brownfield site is predominantly dictated by the extent of hard surface land types and disturbance through human activities on and surrounding the site. A brownfield site is located within an urban area with little to no ecological habitat.

Due to the much higher land cost in urban areas, the doubling of the weighting on brownfield sites for man-made vegetated land types encourages the project team to consider enhancing the ecological value of the site despite the limited area that can viably be allocated to vegetated or wetland land types.

Since the brownfield site is isolated by urban development from the regional natural and agricultural landscape, areas of regenerated indigenous habitats cannot be integrated with broader natural landscape and are unlikely to be self-sustaining. They are therefore zero weighted.

Using the Change of Ecological Value Calculator

This involves four steps:

- 1) Determining if the site is a greenfield or brownfield site;
- 2) Where the site is a greenfield site, determining the bioregion and vegetation type in which the site occurs;
- 3) Determining whether rare, threatened or vulnerable flora or fauna occur on site; and,
- 4) Entering the land type data to determine the Ecological Diversity Index of the site 'Before' and 'After' design.

How to select a brownfield site

A brownfield site is one that has been previously developed and typically occurs within a fully developed urban environment. It could include existing structures that may be derelict. It can include sites where previous structures have been demolished and where the site is in a neglected condition. It may or may not be contaminated. A brownfield site will be separated on all sides by fully developed sites, covered by buildings and paved surfaces, either immediately adjacent to it or on the opposite side of the street. The surrounding developed sites essentially isolate the site from the regional open space system or any large defined open space. Previously cleared or previously tilled agricultural land is not considered a brownfield site.

- 1) Where the site is determined to be a brownfield site then;
- 2) Using the Change of Ecological Value Calculator sheet answer the first question 'Does the site contain any rare, threatened or vulnerable flora or fauna that are not adequately protected?', answer 'Y' or 'N';
- 3) If the answer is 'Y' no points are awarded and no further input is required for the calculator;

- 4) If the answer is 'No' then select the 'Urban Area and Unallocated' option from the bioregion type;

The 'Brownfield Site' option must then be selected from the list of vegetation types.

On a brownfield site the ecological value of non-natural land types are doubled while the indigenous natural land types have zero values. This increases the reward for enhancing the ecological value in urban areas where there was little to no ecological value to start with.

Determine the bioregion and vegetation types

To acknowledge that biodiversity importance varies across different regions of South Africa, a Bioregion Reservation Importance Factor has been included in the Change in Ecological Value Credit Calculator. Using a Bioregion Reservation Importance Factor results in an increased Ecological Score being given to the indigenous vegetation, wetlands and waterways in areas where the vegetation is less abundant and ecosystems are threatened.

The ecological weightings allocated to the calculator are based on the IUCN Red List categories used to describe the conservation status of the vegetation types in The vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006). These categories have been assigned a numerical rating between 0.25 and 2.

Where the vegetation type is unknown, the 'Don't know' option can be selected; however the ecological weightings of this option are punitive.

In all scenarios other than the brownfield scenario, the site is considered to be a greenfield site and the ecological weightings of the land types are influenced by the ecosystem status/sensitivity of the vegetation type in which the site occurs.

The most recent atlas of vegetation types in South Africa documented in Vegetation map of South Africa, Lesotho and Swaziland 1:1 000 000 scale sheet maps is referred to in the calculator. The ecosystem status of each vegetation type is provided in the book supporting the vegetation maps. Four categories of ecosystem status are used:

- Critically Endangered (CE);
- Endangered (EN);
- Vulnerable (VU); and,
- Least Threatened (LT).

Where:

Sensitivity Category	Importance Factor
CE	2
EN	1
VU	0.5
LT	0.25

Table 1. Bioregion importance factors

To determine the relevant bioregion and vegetation type for the site the project team can either obtain a copy of the Vegetation map of South Africa, Lesotho and Swaziland 1:1 000 000 scale sheet maps or consult a suitably qualified registered ecologist. The vegetation maps are available for purchase from the SANBI bookshop in Pretoria and the Botanical Society bookshop at Kirstenbosch National Botanical Garden in Cape Town. Reference must be made to:

Mucina, L., Rutherford, M.C. & Powrie, L.W. (eds) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 scale sheet maps. South African National Biodiversity Institute, Pretoria.

Establish the presence of rare, threatened or vulnerable flora or fauna

The presence of rare, threatened or vulnerable flora or fauna on the site must be determined by a suitably qualified registered ecologist. If the answer is positive no points will be awarded. Select the 'Yes' option from the first drop down list adjacent to the question 'Does the site contain any protected, rare, threatened or vulnerable flora or fauna?'. No further input is required in the calculator.

Where there is no protected, rare, threatened or vulnerable flora or fauna on site, continue to use the calculator to determine the change in the Ecological Diversity Index as discussed in the following text.

Land Type and Ecological Diversity Index

The instructions below will enable the project team to enter the 'Before' and 'After' land type data and complete the Change of Ecological Value Calculator. The Calculator determines the number of points achieved based on the following:

- The area (m²) entered into one or more of the land types in the 'Before' column;
- The area (m²) entered into one or more of the land types in the 'After' column based on the project design;
- The default ecological value of each land type;
- Whether the site is a brownfield or greenfield site; and,
- The ecosystem status of the selected vegetation type.

The project team needs to define the land types and their extent for the entire area of the site before any construction or clearing activities take place and complete the 'Before' column of the calculator according to one or more of the land types in Table Eco 4.

The system of ecological weightings to fulfil this requirement was established in consultation with local ecologists to reflect South African conditions.

Land Type	Ecological Value
Building	0
Impermeable/concreted Area	0
Bare Ground	1
Weed Infestations	2
Exotic Garden	5
Indigenous Garden	10
Indigenous Roof Garden	10
Exotic Grazing	5
Existing Natural Grazing*	25
Crop Farming	5
Existing Natural Waterway/Riparian Zone*	75
Existing Natural Wetland*	100
Rehabilitation/Creation of Wetland/Riparian	50
Exotic Plantation Forest	5
Indigenous Plantation Forest	20
Regenerated Indigenous Habitat(< 10 years old)*	50
Indigenous Habitat (> 10 years old)*	75
Indigenous Habitat (> 20 years old)*	100

Items with an asterisk * are affected by the ecosystem status weighting of the vegetation type.

Table 2. Relative ecological weightings for different land types

Permeable pavers are classified as 'bare ground' for the purposes of this credit. Gravel must be inputted as 'bare ground'. Traditional water features with underlying impermeable brick or concrete structures are classified as 'impermeable/concrete area' for the purposes of this credit. Lawn areas are classified as 'bare ground' for the purposes of this credit.

Non-permanent landscape, such as potted plants, planter boxes, or other non-insitu landscape features, which can be removed or relocated, are not considered part of the 'site' and are therefore not within the scope of the Eco-4 credit. The area of, and ecological contribution to, the site for such non-permanent landscape are to be excluded from calculations to demonstrate compliance with the Credit Criteria.

The Calculator automatically adjusts and in specific circumstances overrides the default ecological value of each land type for both the 'Before' and 'After' columns based on the selected option under the bioregion and vegetation type lists.

Landscape enclosed within the building such as enclosed atria gardens, vertical gardens or water features, are deemed not to serve the full ecological function as equivalent external landscape within the scope of this credit. This is due to the disconnection of enclosed landscapes to broader ecosystems external to the building, limiting the contribution to biodiversity. Such areas are to be excluded from calculations to demonstrate compliance with the Credit Criteria.

Only the soil surface of roof gardens contributes towards recognition in this credit (i.e. in vertical or roof gardens only the amount of soil/substrate in which the plants are rooted is

recognised, not the total area covered by the plants). For example, a project with a building area of 10,000 m² and a roof garden of 2,000 m² (soil planted area) comprising indigenous garden would be entered into the Calculator as: building area of 8,000 m²; and an indigenous roof garden area of 2,000 m².

Vertical gardens are to be included as follows:

- Only outdoor vertical gardens can be included in this Calculator;
- Only the soil/substrate area of the vertical garden can count;
- The Ecological Land Type is determined by the associated vegetation; and,
- The substrate area of the vertical garden can offset impervious horizontal areas at the ratio of 2-to-1 (e.g. two square meters of a vertical garden offsets one square meter of pavement). The area of pavement offset by the vertical garden must be added to either the Exotic or Indigenous Garden land type depending on the plant species used.

The table over page provides the accepted description of each land type. It is acknowledged that in certain instances a design may include a land type that does not fit neatly into one of these descriptions. In these instances the project team needs to provide a motivation for using either one land type or dividing the area across two or more of the specified land types.

The Calculator checks that the cumulative area in the two columns match. Where the cumulative areas do not match no points are awarded. The Ecological Diversity Index for both the 'Before' and 'After' states is determined by dividing the overall ecological score by the cumulative value of each state.

The change in ecological diversity index is calculated by subtracting the value of the 'Before' state from that of the 'After' state. The result is used to look up the number of points to award based on the degree of change in the ecological diversity index. Up to 4 points can be awarded with each additional point requiring a proportionally larger change in the ecological diversity index.

The calculations will be executed automatically once the areas of the appropriate land types have been entered in both the 'Before' and 'After' columns.

Land Type	Description
Building	All built structures with a roof or cover either fully or partially enclosed.
Impermeable/concreted Area	All horizontal surfaces in contact with the soil which are largely impervious to water infiltration either of natural or man-made materials.
Bare Ground	Soil that is not covered by either impermeable or vegetative material. Lawns and permeable pavers are included in this type.
Weed Infestations	Soil that is predominantly covered by plants considered to be weeds or invasive species.
Exotic Garden	Landscaped areas comprised predominantly of an equal mix in area of exotic plant species: trees, shrubs, ground covers, perennials, grasses; with few if any indigenous species.
Indigenous Garden	Landscape areas comprised of an equal mix in area of indigenous preferably locally occurring plant species: trees, shrubs, ground covers, perennials, grasses. Landscapes dominated by mowed lawn areas even if comprised of indigenous grass species would be considered to be Exotic Gardens.
Indigenous Roof Garden	As described in the Indigenous Garden but occurring in planters or soil substrate on the roof of the building.
Exotic Grazing	Land that has either specifically been cultivated or has been invaded by exotic grasses and is used for grazing of domesticated animals.
Existing Natural Grazing*	Land that has not been cultivated and where the vegetation is used for grazing of domesticated animals.
Crop Farming	Land that is being or has been cultivated in the last ten years.
Existing Natural Waterway/Riparian Zone*	Waterways that have naturally formed along the drainage line in a catchment area and are largely unmodified by man. This includes the vegetation associated with the waterway and that would be described as the riparian zone.
Existing Natural Wetland*	As defined under Eco – Conditional Requirement.
Rehabilitation/Creation of Wetland/Riparian	The rehabilitation of once natural wetlands that have been degraded through past human activities, the creation of new man-made wetlands or riparian zones that provide some or all of the ecological functions typically provided by a natural wetland.
Exotic Plantation Forest	Land planted with exotic trees for commercial use or other purpose whether actively managed or neglected.
Indigenous Plantation Forest	Land planted with indigenous trees for commercial use or other purpose. Where the project team wishes to enhance the ecological value of the site using an indigenous plantation forest this must include a management plan that address the sustainable harvesting of trees and prevents the degradation of the forest over time.
Regenerated Indigenous Habitat(< 10 years old)*	Land that has naturally or through a managed process been repopulated by the diversity of plant species that make up the habitat associated with the vegetation type of that area and which includes mature plant specimens.
Indigenous Habitat (> 10 years old)*	Land that has naturally or through a managed process been repopulated over a period of not less than ten years by the diversity of plant species that make up the habitat associated with the vegetation type of that area and includes mature plant species or communities ten years or more in age.
Indigenous Habitat (> 20 years old)*	Land that has naturally or through a managed process been repopulated over a period of not less than twenty years by the diversity of plant species that make up the habitat associated with the vegetation type of that area and includes mature plant species or communities twenty years or more in age.

Table 3. Description of land types

3.3 Eco-4 Change in Ecological Value Calculator Worked Example

An existing building development is to be redeveloped. The existing site land uses, and associated areas, are as follows:

- Existing Building: 500m²
- Impermeable car park area: 250m²
- Concreted walkway: 50m²
- Bare ground: 500m²
- Weeds: 500m²
- Exotic Garden: 200m²
- Indigenous habitat which has not been disturbed for at least 10 years: 1,000m²

The site does not include any rare, threatened or vulnerable flora or fauna

After the redevelopment, the site will consist of:

- Proposed building: 1,500m² less area of green roof (500m²) = 1,000m²
- Indigenous roof garden: 500m²
- Created wetland area: 500m²
- Indigenous habitat is not disturbed and remains at 1,000m²

The output from the Ecology Calculator is contained within the table over page.

In which bio-region is the site located?

Highveld Grassland

In which vegetation type is the site located?

Egoli Granite Grassland

Land Type	BEFORE	AFTER
	Land Types Before Construction (m ²)	Land Types After Construction (m ²)
Building	500	1,000
Impermeable/concreted Area	300	
Bare Ground	500	
Weed Infestations	500	
Exotic Garden	200	
Indigenous Garden		
Indigenous Roof Garden		500
Exotic Grazing		
Existing Natural Grazing*		
Crop Farming		
Existing Natural Waterway/Riparian Zone*		
Existing Natural Wetland*		
Rehabilitation/Creation of Wetland/Riparian		500
Exotic Plantation Forest		
Indigenous Plantation Forest		
Regenerated Indigenous Habitat (< 10 years old)*		
Indigenous Habitat (> 10 years old)*		
Indigenous Habitat (> 20 years old)*	1,000	1,000
TOTAL	3,000	3,000
ECOLOGICAL DIVERSITY INDEX:	34.67	43.33
CHANGE IN ECOLOGICAL DIVERSITY INDEX	8.67	
Points Achieved	2	

* = affected by Bioregion Reservation Importance Factor

Table 4. Example of results using Ecology Calculator

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