CHAPTER SEVEN: SPECIALIST AQUATIC IMPACT ASSESSMENT

7.1 INTRODUCTION

This Chapter of the report presents the findings of the specialist aquatic impact assessment conducted by Dr Brian Colloty of Scherman Colloty & Associates (SC&A). This Chapter provides an overview of the aquatic environment on the affected properties as well as providing an assessment of the potential impacts the proposed development may have on these resources.

The provisional development proposal entails the development of an additional approximately 300 hectares on the Remainder of Farm 82 Wolve Kop (~908 ha), Portion 1 of Farm 77 Wellshaven (~22ha) and Portion 3 of Farm 77 Honeyvale (~128ha) for agricultural purposes. The expansion of the agricultural infrastructure of the farm will include the clearing of indigenous vegetation, landscaping and levelling the site for citrus orchards, installation of water reticulation and irrigation infrastructure, construction of a balancing dam, the establishment of unpaved access roads and the establishment of windbreaks (Detail in Chapter 2).

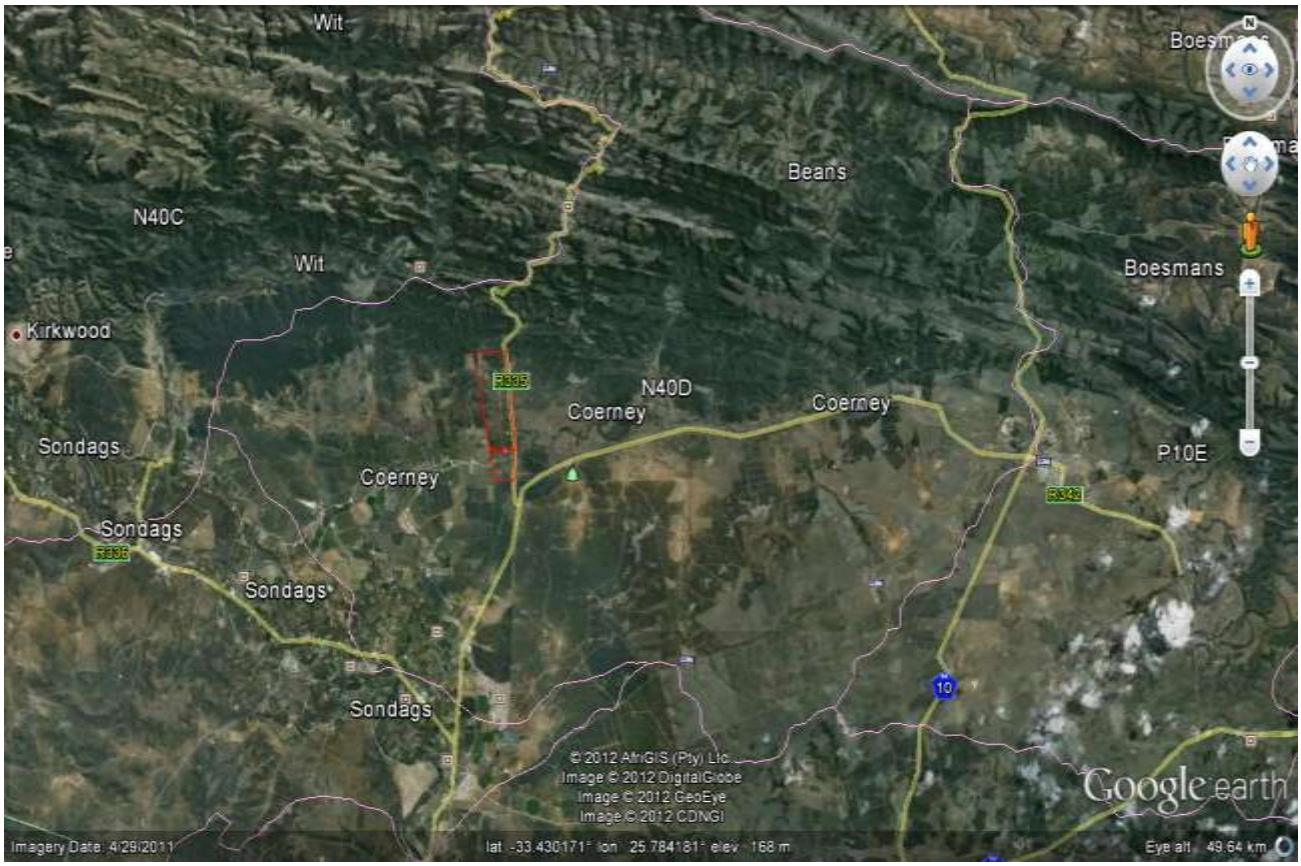

Figure 7.1: Google Earth image of the study area indicating study locality in red and regional quaternary catchments

Several terms and definitions are used in this report and the reader is referred to the box below for additional detail.

Definition Box

Present Ecological State is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

Ecoregions are geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. • NOTE: For purposes of the classification system, the 'Level I Ecoregions' for South Africa, Lesotho and Swaziland (Kleynhans *et al.* 2005), which have been specifically developed by the Department of Water Affairs (DWA) for rivers but are used for the management of inland aquatic ecosystems more generally, are applied at Level 2A of the classification system. These Ecoregions are based on physiography, climate, geology, soils and potential natural vegetation.

7.2 METHODOLOGY AND APPROACH

This assessment was initiated with a survey of the pertinent literature and past reports that exist for the study region. Maps and Geographical Information Systems (GIS) were then employed to ascertain, which portions of the proposed development, could have the greatest impact on the water courses and associated habitats.

A site visit was then conducted to ground-truth the above findings, thus allowing critical comment of the proposed project. Information was also collected to determine the PES and Ecological Importance and Sensitivity (EIS) of the site. These analyses were based on the models developed by the Department of Water Affairs, with the results producing a ratings (A – F), summarised in Table 1.

Aquatic areas (Figure 7.2) were then assessed on the following basis:

- Vegetation type – verification of type and its state or condition supported by species identification using Germishuizen and Meyer (2003), Vegmap (Mucina and Rutherford, 2006 as amended) and the South African Biodiversity Information Facility (SABIF) database. The SABIF database contains older species records for areas, thus allowing a comparison of present versus past states.
- Plant species were further categorised as follows:
    - Terrestrial: species are not directly related to any surface or groundwater base-flows and persist solely on rainfall
    - Facultative: species usually found in wetlands (inclusive of riparian systems) (67 – 99% of occurrences), but occasionally found in terrestrial systems (DWAF, 2005)
    - Obligate: species that are only found within rivers and wetlands (>99% of occurrences) (DWAF, 2005)
- Mitigation measures or recommendations required

Table 7.1: Description of A – F ecological categories based on Kleynhans et al., (1999).

ECOLOGICAL CATEGORY	ECOLOGICAL DESCRIPTION	MANAGEMENT PERSPECTIVE
A	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	**Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation**
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	**Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality**
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	

7.2.1 Terms of Reference

SC&A was asked to prepare a report on the following scope of work:

- Identify and delineate wetlands and drainage lines
- Identify and rate potential environmental impacts in terms of acceptable EIA methodology provided by Public Process Consultants
- Identify mitigations for negative and positive impacts
- Make recommendations for the Environmental Management Programme Report
- Submit the required Water Use License Applications to Department of Water Affairs (DWA) once this assessment has been completed.

Based on our understanding of these requirements, SC&A has thus produced the following:

- Riparian and wetland area delineation supplied together with an analysis of the potential aquatic sensitivity.
- This report section detailing the Present Ecological State (PES) of each watercourse and wetland after a short site visit has been conducted, which is also required as part of the water use license application. Examples of the typical water use applications may include, but are not limited to Section 21 use:
    - Abstraction of water. Even though water will be sourced from a water board, this new use must be registered with the DWA.
    - Section 21 (c) and (i) use – construction within a water course or 500m from a wetland.
    - Storage. Any person or body storing water for any purpose in excess of

10 000 cubic meters or where the water area at full supply level exceeds 1 hectare in total on land owned or occupied by that person or body and not in possession of a permit or permission, i.e. irrigation balancing dams, if required.

7.2.2 Assumptions and Limitations

In order to obtain a comprehensive understanding of the dynamics of the terrestrial and aquatic environment within the study area, as well as the status of endemic, rare or threatened species, investigations should consider sampling strategies at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies are not always feasible and are mostly based on instantaneous sampling.

Therefore, due to the scope of the work presented in this report, a detailed investigation of all, or part of, the proposed sites were not possible and are not perceived as part of the Terms of Reference for this type of exercise due to the nature of the aquatic environments. It should be emphasised that information, as presented in this document, only has reference to the study area(s) as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

Furthermore, additional information may come to light during a later stage of the process or development. This company, the consultants and/or specialist investigators do not accept any responsibility for conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from the surveys or requests made to them at the time of this report.

7.2.3 Information Sources

Various sources of information were consulted and these included the following:

- National Biodiversity Assessment (May 2012), National Wetland Inventory (Wetland Inventory III) and the VegMap (Mucina & Rutherford, 2006) all found in the BGIS database site of the South African National Biodiversity Institute. This database also includes the mapping layers and metadata contained in the regional Biodiversity Conservation Plan maps that span the study area (http://bgis.sanbi.org).
- National Freshwater Ecosystems Priority Areas (NEFPA) study conducted by the CSIR (2011)
- Updated river and wetland Present Ecological State and Ecological Importance, Sensitivity ratings for the respective provinces, being conducted by Scherman Colloty & Associates for the Eastern Cape Province.

7.3 DESCRIPTION OF THE AQUATIC FEATURES OF THE SITE

The study area hydrology was characterised by typical Zuurberg foothill water courses found to the north of the Coerney River (Figure 7.2). The Coerney drains in a westerly direction and then flows into the Sundays River. The site is found in the N40D quaternary catchment. Surface flows in the proposed development site would be limited to periods with high rainfall only.

Based on the National Wetland Classification System, level 1 to 6, the systems observed within the site are typical of Inland Systems (Level 1), with no direct connection to the sea, within the South Eastern Coastal Belt Ecoregion (Level 2). All these riparian and wetland areas were found either on a plain or within valley floor landscape units (Level 3), corresponding to the depression (pan)

and the un-channelled valley bottoms hydrogeomorphic units (Level 4). With regard to the wetland areas (pans), due to their position within very small catchment basins, surface water run-off volumes as also limited and no permanent riparian (vegetation) zones were observed (Level 5).

Figure 7.2 below maps the respective natural and near natural water bodies found within the study area.

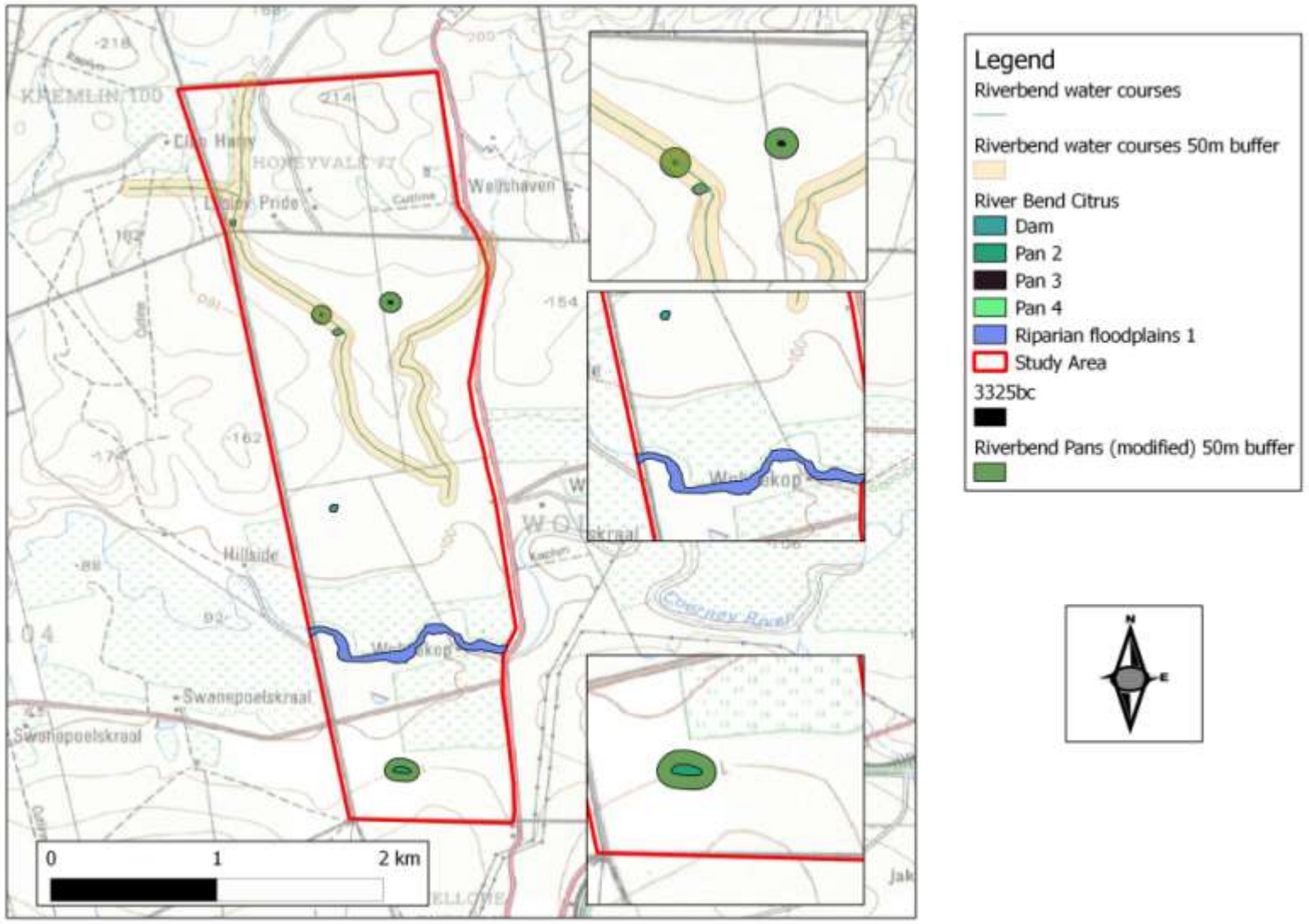

Figure 7.2: The respective natural and near natural water bodies found within the study area

7.3.1 Riparian and wetland Identification & Delineation

Past and to a lesser extent, present land use activities have disrupted the natural flow of the water along the two water courses within the proposed development area. Firstly it would seem from the aerial photos that there are broad floodplain areas, with typical wetland or hydrophilic plant components. These areas (Photo 7.1 below) were in actual fact, past lands used to cultivate wheat and the water courses were diverted into channels so as to avoid these areas. Secondly the channels have been modified to such an extent that shortly after the confluence of the two systems, the channel or water course area is no longer definable and was confirmed by the Chief Surveys and Mapping data (Figure 7.2).

This together with the channel form limits the formation of permanent riparian / obligate riparian zones being found within the development area. Plant species recorded (Appendix 1), were mostly associated with the 2 local thicket types and are thus not dependent on sources of water.

Photo 7.1: Example of cleared areas historically used for the cultivation of wheat.

Photo 7.2: The typical scenario within the region, where the natural depression has been altered by increasing its catchment depth, through excavation of the pan floor.

Several invasive or encroaching species such as *Acacia karroo* (Sweet thorn Acacia) and Black Jacks (*Bidens pilosa*) and Prickly Pear (*Opuntia ficus-indica*) were also common within the study area, and were mostly associated with the so called floodplain / cultivated areas, that now contained secondary grasses and forbs.

With regards to the observed wetlands, these six areas (Figure 7.2) were defined as endorheic pans, of which only three remain partly functional as pans / depressions. These pans can further be defined by the National Wetland Classification system as endorheic systems based on the following definitions:

Endorheic pans:

"At Level 4C of the National Wetland Classification System, depressions (i.e. the primary HGM Unit captured at Level 4A) are categorised according to their outflow drainage. Depressions can be classified as 'exorheic' (i.e. outward-draining) or 'endorheic' (i.e. inward-draining) in terms of their surface outflow drainage, with the additional option to categorise depressions that occur as a primary HGM Unit in a valley floor setting or on a slope as 'dammed'. The reason that the surface drainage has been used as the basis for distinguishing between "exorheic" and "endorheic" depressions, as opposed to surface and/or subsurface drainage (which would be more technically correct), is that it is often not immediately apparent whether downstream subsurface drainage is present (especially on the basis of remote sources of information such as maps and aerial photography). At Level 4D, depressions can be further subdivided on the basis of their inflow drainage characteristics, into those 'with channelled inflow' and those 'without channelled inflow'. This is a very important distinction for management purposes because the water quality and other characteristics of "depressions with channelled inflow" will be directly related to that of the inflowing channels, which implies that management of these types of depressions will require management and monitoring of the inflowing channels" (from SANBI 2009)

Photo 7.2 indicates the typical scenario within the region, where the natural depression has been altered by increasing its catchment depth, through excavation of the pan floor. The area however still functions as a pan and several wetland plant and animals species still make use of the available habitat. Therefore although modified these three pans would be considered wetlands due to the functional role they play within the landscape.

7.3.2 Riparian and Wetland Types and Condition

The overall condition or Present Ecological State (PES) of the riparian vegetation for this study area could thus not be assessed using accepted methodologies as these apply only to well defined zones. The Department of Water Affairs did however present a desktop analysis of the Coerney River in 1999 (Kleynhans, *et al*. 1999), in which the overall PES for the river reach within the study area was rated as C (Moderately modified – Table 7.1).

The PES system, using an updated DWA method is presently being revised by SC&A on a province wide scale. Due to the overall degradation of the site, the current riparian vegetation PES would be lower i.e. D when compared to the 1999 rating. This is due to the lack of riparian zone continuity due to removal or disturbance of the river bank vegetation and the disturbed nature of the floodplain / channel environment.

Similarly the PES rating systems have only been developed for those palustrine or riparian associated wetland areas. Therefore using a modified Wetland Integrated Habitat Assessment Approach, the endorheic pans, although mostly disturbed, would have a low PES score of D.

7.3.3 Wetland and Riparian Conservation Value

Rivers and the associated riparian zones are protected by several sections of national legislation. This together with the associated flood risk associated with "flashy ephemeral" systems should preclude any development along these rivers, regardless of their conservation value. The Environmental Importance and Sensitivity or EIS is a measure of the conservation value. Due to the current disturbances within the study area the EIS would be rated as **LOW**, due to the lack of any important riparian vegetation or sensitive plant species associated with the water courses. This was further emphasised by the lack of riparian plant diversity (1 opportunistic species *A. karroo*). Also no protected or species of special concern were observed within or adjacent to the water courses due to the degree of past disturbance.

Of interest is the National Freshwater Ecosystems Priority Areas project (CSIR, 2011), several important catchments (sub-quaternaries or SQ) have been earmarked, based either on the presence of important biota (e.g. rare or endemic fish species) or the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas or FEPAs. None of these FEPAs occur within the study region.

With regard the wetland areas, only two facultative hydrophilic plants species were evident namely *Juncus effuses* and *Cyperus spp* (grazed, thus no identification could be made). These species were found in areas with permanent inundation. Therefore these area form unique habitats within the landscape and the EIS of the three remaining pans (Figure 7.2) would be rated as **MODERATE**.

7.3.4 Identification of Issues/Risks Posed by the Development

The following issues and risks have been assessed in the impact assessment section of this report:

Construction phase – Direct impacts

1. Loss of riparian vegetation or habitat
2. Loss of wetland vegetation or habitat
3. Loss of species of special concern

Operational phase – Direct impacts

1. Changes to local hydrology, with possible increases in surface water flows
2. Changes to local sediment transport regimes with an increase in downstream erosion
3. Changes to local water quality due to the return agricultural run-off

As there is limited run-off from the present site, and it is assumed that no or little flow would be released from the site during irrigation, the indirect or cumulative impacts would be low, as there is no direct link with downstream systems (Figure 7.2). Similarly the wetlands areas are endorheic and thus have no outflow, but in any event these should not receive any irrigation run-off or be used for water storage.

7.4 PERMIT AND LEGAL REQUIRMENTS

Locally the South African Constitution, seven (7) Acts and one (1) international treaty allow for the protection of rivers and water courses. These systems are thus protected from destruction or pollution by the following:

- Section 24 of The Constitution of the Republic of South Africa;
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act, 2004 (Act 10 of 2004);
- National Water Act, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- Nature and Environmental Conservation Ordinance (No. 19 of 1974);
- National Forest Act (No. 84 of 1998); and
- National Heritage Resources Act (No. 25 of 1999).

Apart from NEMA, the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) will also apply to this project. The CARA has categorised a large number of invasive plants together with associated obligations of the land owner. A number of Category 1 & 3 plants were found on the site investigated, thus any land owner and contractors must take extreme care to limit further spread of these plants.

This report will be used as per the relevant submissions to the Department of Water Affairs in terms of the required licenses. It should be noted that any development that would take place within 500m of the three remaining pans would therefore require a Water Use Licence (WULA)

Provincial legislation and policy

Various guidelines on aquatic buffers have been issued in a number of the provinces, including the Eastern Cape Province and those stated in this report are based on accepted provincial guidelines as stated in the Eastern Cape Biodiversity Conservation Plan or ECBCP (Table 7.2). These are stated below so that the engineers and contractors are aware of these buffers during the planning phase. Although construction **may** have to take place within the water courses, the associated batch plants, stockpiles, lay down areas and construction camps should avoid these buffer areas.

Until national guidelines for wetland buffers are established, the guidelines set out in the Eastern Cape Biodiversity Conservation Plan documentation should be applied (Berliner & Desmet, 2007) and it is thus recommended that a 50 m buffer be set for all wetlands.

With regard protected flora, which includes wetland / riparian associates, the Eastern Cape Provincial Nature Conservation Ordinance (PNCO) includes a list of protected flora. Any plants found within the sites will be described in this report. Should any species that are listed in the ordinance be found, the relevant permits should be obtained by the proponent either for their relocation or destruction, as required.

Table 7.2: Recommended buffers for rivers highlighted in blue and the required buffers in grey adapted from Berliner & Desmet (2007).

River criterion used	Buffer width (m)	Rationale
Mountain streams and upper foothills of all 1:500 000 rivers	50	These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices.
Lower foothills and lowland rivers of all 1:500 000 rivers	100	These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by development practices.
All remaining 1:50 000 streams	32	Generally smaller upland streams corresponding to mountain streams and upper foothills, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation.

7.5 IDENTIFICATION AND ASSESSMENT OF IMPACTS

The section below outlines the potential impact that the proposed development may have on the aquatic ecological attributes of the site. Appropriate mitigation measures for each impact are suggested, and the impacts are rated with and without mitigation. Impacts are separated into direct and indirect impacts, as well as those associated with the construction and operational phase of the project.

7.5.1 Construction Phase Impacts

The following section of the report identifies direct impacts that may be associated with the construction phase of the development. The construction phase mitigatory measures proposed apply to the construction of vehicle tracks and service roads as well as the clearing of vegetation for the establishment of irrigation infrastructure and citrus orchards.

7.5.1.1 Destruction of riparian vegetation and associated habitat

Nature of the Impact	Should the project proceed it is proposed that the natural vegetation is removed and replaced with citrus orchards. This will also require the construction of vehicle tracks to service the citrus orchards, which may cross watercourses on the site. Without mitigation this could result in the destruction of riparian habitat.
Extent	**Site specific –** The impact will be limited to very small areas associated with any drainage line / water course crossings that may be required for the internal roads to service the citrus orchards; however due to the lack of riparian vegetation any possible clearing of these habitats would be minimal.
Duration	**Permanent -** Should riparian vegetation be removed it will be replaced by infrastructure e.g. road crossings with associated stormwater management features / erosion protection.
Intensity	**Medium -** The development footprint will be completely altered.
Probability	**Improbable -** The clearing of riparian vegetation will be unlikely due to the current state of the water courses and lack of remaining riparian habitat associated with the systems.
Reversibility	**Irreversible** – Once riparian vegetation has been cleared this impact cannot be reversed.
Degree of Confidence	**High**
Status and Significance of Impact (no mitigation)	**Medium Negative (-)** – The study area water courses are highly transformed and thus are not representative of any important natural habitat for riparian species.
Mitigation	• Figure 7.2 indicates the proposed 50 m buffer along the respective drainage lines. The water courses with the 50 meter buffer should be excluded from the area proposed for the establishment of the citrus orchards. • Clearly demarcate the no-go areas for development prior to construction commencing, i.e. wetlands and water courses.
Significance and Status (with mitigation)	**Low (-)**

7.5.1.2 Destruction of wetland vegetation and habitat

Nature of the Impact	Should the project proceed it is proposed that the natural vegetation will be removed and replaced with citrus orchards. Without mitigation this could result in the destruction of wetland vegetation and habitat
Extent	**Site specific (footprint) -** The impact will be limited to several small remaining depression wetland areas, however the proponent will not clear areas of indigenous vegetation within any of the drainage lines and pans outside the development footprint.
Duration	**Permanent -** The vegetation cleared for the establishment of the citrus orchards will be permanent. The vegetation will be replaced by internal road infrastructure and orchards.
Intensity	**Medium -** The development footprint will be completely altered, although only small areas of wetland vegetation and habitat have remained.
Probability	**Improbable -** The clearing of vegetation for the development footprints will definitely occur.
Reversibility	**Irreversible** – Once wetland vegetation has been cleared from the development footprint this impact cannot be reversed.
Degree of Confidence	**High**
Status and Significance of Impact (no mitigation)	**High Negative (-)** – The few remaining wetlands areas (pans) represent a unique habitat type within the study region
Mitigation	• It is proposed that 50 m buffers are established around the respective pans and this area is excluded from the area proposed for the establishment of the citrus orchards or any associated infrastructure. • The required Water Use License Applications will also be required, i.e. any development within 500m of a wetland area. • Clearly demarcate the no-go areas for development prior to construction commencing, i.e. wetlands and water courses
Significance and Status (with mitigation)	**Low (-)**

7.5.1.3 Loss of species of special concern

Nature of the Impact	Should the project proceed it is proposed natural vegetation will be removed and replaced with citrus orchards. Without mitigation this could result in the potential loss of species of special concern associated with the riparian / wetland areas and or the habitat / vegetation type associated with the surrounding alluvial systems.
Extent	**Site specific (footprint) -** The impact will be limited to several wetland and water course areas, however the proponent will not clear areas of indigenous vegetation within any of the drainage lines and pans outside the development footprint.
Duration	**Permanent -** The vegetation cleared for the establishment of the citrus orchards, irrigation infrastructure and vehicle tracks will be permanent.
Intensity	**High -** The development footprint will be completely altered.
Probability	**Improbable -** The clearing of species of special concern direct from the pans of the demarcated riparian zones is unlikely.
Reversibility	**Irreversible** – Once vegetation has been cleared from the riparian zones or wetlands this impact cannot be reversed.
Degree of Confidence	**High**

Status and Significance of Impact (no mitigation)	**High Negative (-)** - The study area water courses are highly transformed and thus are not representative of any important natural habitat for riparian species, however the wetlands could contain important species of special concern.
Mitigation	• A 50 m buffer is proposed around the respective pans and these areas are excluded from the development footprint. • The required Water Use License Applications will also be required, i.e. any development within 500m of a wetland area. • Clearly demarcate the no-go areas for development prior to construction commencing, i.e. wetlands and water courses. • A plant search and rescue operation is initiated prior to construction, which would then confirm if any rare or protected species do occur in the wetland areas
Significance and Status (with mitigation)	**Low (-)**

7.5.2 Operational Phase Impacts

The following activities on site during the operational phase of the project may result in direct impacts to the environment.

7.5.2.1 Changes to the local hydrological regime, with possible increases in surface flows

Nature of the Impact	Once the footprint area has been cleared, and the citrus orchards are established, the trees will require irrigation. The proponent will use drip irrigation methods, which delivers the exact water requirements directly to the trees. This method also ensures that no run-off is created, i.e. water is wasted during irrigation process. Any surface water flows as a result of rainfall will be contained within the orchards, which are then used to supplement the irrigation needs of the farm.
Extent	**Local –** Any additional runoff would leave the footprint area and then enter the nearby water courses / wetlands if uncontained or the trees are over irrigated.
Duration	**Permanent –** It is anticipated the orchards would need regular irrigation.
Intensity	**Medium –** the local water courses are not adapted to increased or sustained volumes in flow and this would alter the natural functioning of these aquatic ecosystems.
Probability	**Improbable –** The proponent will strictly monitor the required irrigation needs of the trees, while using drip irrigation techniques.
Reversibility	**Reversible** – the amount of run-off from the irrigation process or from rainfall can be managed or prevented
Degree of Confidence	**High**
Status and Significance of Impact (no mitigation)	**Medium Negative (-)** – The water courses and associated vegetation are not accustomed to large volumes of water and thus changes in soils and plant community structures are likely to occur.
Mitigation	• Figure 7.2 indicates the proposed 50 m buffer along the respective drainage lines, which is considered a no-go area for the establishment of the citrus orchards • No run-off from storm water (rain fall) or irrigated areas should be allowed to leave the site directly. The areas should be contained using small berms or swales. These areas will then attenuate the flows, while reducing any surface water flows into the natural aquatic waterbodies downstream.

	• The minimum amount of water should be used for irrigation to prevent any increase in surface flows
Significance and Status (with mitigation)	**Low (-)**

7.5.2.2 Changes to the local sediment transport regimes with an increase in downstream erosion and sedimentation (suspended solids)

Nature of the Impact	Any additional runoff would leave the footprint area and then enter the nearby water courses / wetlands. The increased volumes with increased velocities and usually sediment hungry (low suspended sediment loads) increase the potential for downstream erosion and sedimentation. Sedimentation results from a decrease in flow velocities and sediments then settle out downstream of the site.
Extent	**Local –** This could impact on systems such as the Coerney River and possibly the Sundays River
Duration	**Permanent –** It is anticipated that the orchards would need regular irrigation.
Intensity	**Medium –** the local water courses are not adapted to increased or sustained volumes in flow and this would alter the natural functioning of the aquatic ecosystems due to erosion and or sedimentation.
Probability	**Improbable –** The proponent will strictly monitor the required irrigation needs of the trees, while using drip irrigation techniques.
Reversibility	**Reversible** – the amount of run-off from the irrigation process or from rainfall can be managed or prevented
Degree of Confidence	**High**
Status and Significance of Impact (no mitigation)	**Medium Negative (-)** – The water courses and associated vegetation are not accustomed to large volumes of water and thus changes in soils and plant community structures are likely to occur.
Mitigation	• Figure 7.2 indicates the proposed 50 m buffer along the respective drainage lines, which is considered a no-go area for the establishment of the citrus orchards • No run-off from storm water (rain fall) or irrigated areas should be allowed to leave the site directly. The area should be contained using small berms or swales, which will then attenuate the flows, while reducing any surface water flows into the natural aquatic waterbodies downstream. • The minimum amount of water should be used for irrigation to prevent any increase in surface flows, which could result in erosion or sedimentation
Significance and Status (with mitigation)	**Low (-)**

7.5.2.3 Changes to the local water quality due to return agricultural run-off high in nutrients or insecticides, herbicides / pesticides

Nature of the Impact	Any additional runoff would leave the footprint area and then enter the nearby water courses / wetlands. Should the runoff contain remnants of any fertiliser or pesticide products, nutrient and carbonate levels within the receiving waters may occur. This then typically results in eutrophication within downstream systems
Extent	**Local –** This could impact on systems such as the Coerney River and possibly the Sundays River
Duration	**Permanent –** It is anticipated that the orchards would need regular fertiliser and herbicide applications.
Intensity	**Medium –** the local water courses are not adapted to increased levels of nutrients, while the herbicides / pesticides may be detrimental to aquatic organisms.
Probability	**Probable –** There is a need for the addition of Nitrates, Phosphates, Potassium, Calcium and Magnesium in the form of various agricultural products to the soils to sustain the long-term growth of the citrus. Seasonal applications of various herbicides / pesticides will be required.
Reversibility	**Reversible** – This amounts of chemicals required will be monitored in order to minimise the amount applied thus reducing the potential for over applications.
Degree of Confidence	**High**
Status and Significance of Impact (no mitigation)	**High Negative (-)** – The water courses and associated vegetation are not accustomed to large volumes of nutrients and thus changes to plant community structures are likely to occur, while leading to eutrophication. Similarly, the herbicides / pesticides will restrict the growth of aquatic / riparian plants, while resulting in increased mortality rates amongst the aquatic organisms (fish and invertebrates).
Mitigation	• Figure 7.2 indicates the proposed 50 m buffer along the respective drainage lines, which is considered a no-go area for the establishment of the citrus orchards • No run-off from storm water or irrigated areas should be allowed to leave the site directly • The minimum amount of chemicals should be applied so that excess amounts don't leave the site. • All hazardous chemicals and fertlisers must be stored away from any water course within bermed / bunded areas, together with the applicable spill contingency mechanisms in place.
Significance and Status (with mitigation)	**Low (-)**

7.5.5 Decommissioning phase

No decommissioning phase is envisaged for the foreseeable future. Should certain of the project components be decommissioned in future, the environmental and other relevant legislation applicable to those activities at that time will need to be complied with.

Note: This is only applicable should the water courses and wetland areas are excluded from the development footprint.

7.6 GENERAL CONCLUSIONS & RECOMMENDATIONS

From a catchment management perspective, this study assessed a number of water courses and ephemeral pans. The pans in particular perform an important role in attenuating surface water flows, while providing a series of differing wetland habitats, which form part of a wetland network within the region.

However no wetland related protected or species of special concern were observed within the wetland areas during the site visit.

Six potential impacts were identified, during this assessment. The significance of the impacts was assessed with and without mitigation, as well as the level of impact reversibility and the degree of irreplaceable loss of resources. All impacts based on the authors knowledge of the project and the surrounding environment were assessed with a HIGH degree of confidence.

It would therefore seem based on the site visit and information, that impacts assessed for wetlands after mitigation, would all be **Low (negative)**. This is dependent on the proposed recommendations, contained in this study being upheld. With regard loss of irreplaceable resources, all the potential impacts were low.

The potential impact of increased water use by the farm, was not assessed, as it was assumed that sufficient water together with the required water use allocation, is available from the local irrigation board.

National and provincial authorities have recommended that a 50m buffer be used for any wetland, and as recommended by the Eastern Cape Biodiversity Conservation Plan (Berliner & Desmet, 2007) and this buffer distance is also recommended for the water courses. To reiterate, the 50 m buffer is proposed due to the need to provide adequate ecological buffers.

Further recommendations and monitoring guidelines include:

- Stormwater should be managed using suitable structures such as swales, gabions and rock rip-wrap so that any run-off from the orchards site is attenuated prior to discharge. Silt and sedimentation should be kept to a minimum, through the use of the above mentioned structures and by also ensuring that all structures don't create any form of erosion.
- Areas susceptible to erosion must be protected by appropriate measures and repair of any damage caused by erosion due to construction activities must be undertaken as soon as possible.
- Minimise erosion and sedimentation into water courses through effective stabilisation (gabions and reno mattresses) and re-vegetation of disturbed river banks (Refer to rehabilitation specifications and erosion control measures below).
- Stabilisation of sandy, dispersive slopes or slopes steeper than 1:3 will be required. The following methods may be required:
    - Topsoil covered with a geotextile and a grass seed mixture (see Rehabilitation Specifications).
    - Logging or stepping following the contours of the slope.

  - Earth or rock-pack cut-off berms.
  - Packed branches.
  - Benches (sand bags).
- Stabilisation of near vertical slopes (1:1 – 1:2), if created during construction, will be required using hard structures that have a natural look. The following methods may be required:
  - Gabions (preferred method).
  - Retaining walls.
  - Stone pitching.
- Vegetation clearing should occur in parallel with the developments progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination into wetlands or rivers. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. These sites must be re-vegetated after construction has been completed. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any river channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any storage areas should be more than 50m from any demarcated wetland or riverine area.
- Similarly during the operations phase, fuels, herbicides and insecticides must be stored within demarcated, bermed areas, with the necessary hazardous materials spill contingency systems in place.
- It is also advised that an Environmental Control Officer, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this and the terrestrial vegetation report. All alien plant re-growth must be monitored and should it occur these plants should be eradicated. Where any works (e.g. storm water control measures) near a wetland or river is required specific attention should be paid to the immediate re-vegetation of cleared areas to prevent future erosion of sedimentation issues.

7.7 APPENDICES

Plant species checklist and site observations **PROJECT: San Miguel's River Bend Orange Farm Orchard Expansion**		
Sundays River		
Site visit 02/08/2012		
Aza 6 Albany Alluvial Vegetation (Mucina and Rutherford 2006)		
NOTE: The site visit undertaken by the botanical specialist revealed that the portion of the site which has been identified in the NSBA mapping resources as Albany Alluvial Vegetation is more likely degraded thicket vegetation. See Chapter 6 for a detailed explanation of this conclusion.		
Species	**Brackish conditions**	**Observed at site**
Riparian thickets		
Acacia caffra		?
Acacia natalitia		X
Aloe africana		
Aloe ferox		
Amphiglossa callunoides		
Asparagus striatus		X
Asparagus suaveolens		X
Azima tetracantha		X
Cadaba aphylla		X
Carissa bispinosa		X
Digitaria eriantha		?
Eragrostis curvula		?
Eragrostis obtusa		?
Lycium cinereum		X
Pentzia incana		X
Salix mucronata subsp. *mucronata*		
Schotia afra var. *afra*		X
Searsia longispina		X
Sporobolus nitens		?
Secondary grasslands on "floodplains"		
Cotyledon campanulata	X	
Cynodon dactylon	X	X
Glottiphyllum longum	X	
Haworthia sordida var. *sordida*	X	
Malephora lutea	X	
Malephora uitenhagensis	X	
Orbea pulchella	X	
Rorippa fluviatilis var. *fluviatilis*		
Thesium junceum	X	
Key		

X = definitely		

AT 6 Sundays Thicket Endemic Taxa (Mucina and Rutherford 2006)		
Species	**Brackish conditions**	**Observed at site**
Aloe bowiea		
Aloe gracilis		
Aptenia haeckeliana		
Arctotis hispidula		
Argyrolobium crassifolium		
Bergeranthus addoensis		
Brachystelma cummingii		
Brachystelma schoenlandianum		
Brachystelma tabularium		
Ceropegia dubia		
Encephalartos horridus		
Glottiphyllum grandiflorum		
Haworthia arachnoidea var. *xiphiophylla*		
Haworthia aristata		
Huernia longii subsp. *longii*		
Lessertia carnosa		
Lotononis monophylla		
Orthopterum coegana		
Pelargonium ochroleucum		
Ruschia aristata		
Senecio scaposus var. *addoensis*		
Strelitzia juncea		
Trichodiadema rupicola		
Tritonia dubia		? (possible, leaves without flowers)
Wahlenbergia oocarpa		
Key		
X = definitely		
? = species level id not possible either due to disturbance, grazing or outside of flower season		

Other species observed at site and confirmed conservation status		
Species	**Wetland associated**	**Red List of South African Plants**
Acacia karroo	riverbeds	LC
Aizoon rigidum		LC
Ammocharis coranica		LC

Asparagus africanus		LC
Asparagus striatus		LC
Asparagus suaveolens		LC
Azima tetracantha		LC
Barleria irritans		LC
Bulbine narcissifolia	damp	LC
Cadaba aphylla		LC
Capparis sepiaria var. *citrifolia*		LC
Carissa bispinosa		LC
Centella asiatica	damp	LC
Ceratiosicyos laevis	damp/shade	LC
Cineraria lobata	damp/shade	LC
Cotyledon orbiculata		LC
Crassula expansa		LC
Crassula mesembryanthoides subsp. *hispida*		LC
Crassula tetragona		LC
Crassula vaginata		LC
Curio radicans		LC
Drimia altissima		Declining
Drimia exuviata		LC
Eriocephalus africanus		LC
Eriospermum brevipes		LC
Euphorbia mauritanica		LC
Euphorbia triangularis		LC
Felicia filifolia		LC
Galenia pubescens		LC
Grewia robusta		LC
Jamesbrittenia argentea		LC
Jamesbrittenia pinnatifida		LC
Kalanchoe rotundifolia		LC
Ledebouria ensifolia		LC
Lycium ferocissimum		LC
Massonia echinata		LC
Nemesia fruticans		LC
Olea europaea subsp. *africana*		LC
Oxalis punctata		LC
Panicum maximum		LC
Pelargonium alchemilloides		LC
Pelargonium odoratissimum		LC
Pentzia incana		LC
Ruschia rigens		LC
Sansevieria aethiopica		LC
Schotia afra var. *afra*		LC

Searsia longispina		LC
Senecio ilicifolius		LC
Trachyandra hirsuta		LC

7.8 REFERENCES

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