R300 TOLL ROAD

ASSESSMENT OF IMPACTS ON AQUATIC ECOSYSTEMS INTERSECTED BY THE ROUTE

FINAL REPORT

August 2002

SOUTHERN WATERS ECOLOGICAL RESEARCH AND CONSULTING

In response to:	Chand-Ecosense
C-Eco Contact person:	Mark Sasman
SW Contact person:	Dr W R Harding
Date:	August 2002

EXECUTIVE SUMMARY

The overall impact of the proposed R300 alignment on aquatic ecosystems within the metropolitan area of Cape Town.

At the south-western extremity of the route the alignment has the potential to impact severely on the Zandvlei ecosystem. Adoption of the precautionary approach, and the need to protect the least impacted systems first, principles dictate that, notwithstanding the existence of a road reserve, this alignment be narrowed or redirected elsewhere. Cape Town is poorly endowed with wetlands, and with few of those that it has existing in good condition. Zandvlei, despite the very high level of urbanization and recreational use, is the healthiest of all the wetlands in the CMA. The fragility of the ecosystem services provided by the two environments (Westlake Wetland and the Bird Sanctuary) that will be impacted by the roadway is unknown, but may be such that any further loss may bring about degradation of the ecosystem as it is at present.

At the north-western extremity, the intersection of the route with the Blaauwbergsvlei is a non-negotiable option, and the route has been realigned southwards.

Between these two extremes, the identified affected sites can be easily accommodated, without ecosystem damage, using appropriate mitigation and/or minor re-alignments (e.g. Varkensvlei Forest Reserve). As is typical with urban rivers, many of the environments identified are highly degraded and, where-ever possible, construction of the road should incorporate lateral give backs to aquatic environments in terms of upgrading and protection.

Lastly, from an aquatic ecosystem perspective, the route alignment in the vicinity of Zeekoevlei may provide more benefits than are immediately apparent. However, this observation remains to be qualified at the specialist integration meeting as there may be non-negotiable ecological arguments that preclude the route from passing along the proposed alignment.

TABLE OF CONTENTS

1. TERMS OF REFERENCE

Southern Waters Ecological Research and Consulting (Southern Waters) was appointed by Chand-Ecosense to undertake an evaluation of the surface aquatic ecosystems that, potentially, could be impacted on by the construction and/or operation of the R300 Toll Road. Southern Waters appointment was in accordance with the following Terms of Reference:

(i) Identify the rivers (including estuaries), streams and wetlands which will be affected by the proposal;

(ii) Carry out field and desktop assessment of any impacts (including downstream impacts) that may be identified in addition to those emulating from the Scoping Report. Impacts should include construction and operation impacts (e.g. road spillage; littering);

(iii) Identify and describe the cumulative impacts that the construction of the Cape Flats Freeway Extension in conjunction with the R300 / N21, would have on the freshwater ecology (freshwater ecosystems) of the combined area. The recommendations from the Scoping and EIA for the Cape Flats Freeway Extension must be considered in context to the overall impact of the construction of both roads;

(iv) Make specific recommendations towards avoiding or mitigating identified impacts;

(v) Assess the road design to ensure implementation of recommendations or concerns. This would be in the form of both desktop assessment and a workshop with the engineers and other specialists;

(vi) Provided a detailed description of construction phase mitigation requirements/recommendations and rehabilitation requirements for inclusion into the construction phase management plan.

At the time of preparing this final report, no information had been provided pertaining to TOR (v) and (vi). It is understood that this input will be provided to the engineering team by means of a mini-workshop and, accordingly, no comment thereon is provided hereunder.

2. SOUTHERN WATERS APPROACH

Southern Waters addressed the above TOR in the following manner:

- Overlay of the proposed route with Southern Waters GIS mapping of previously identified surface aquatic ecosystems;
- Overlay of the route onto the 1998 aerial photography undertaken for the Metropolitan Area;
- Determination of the ecological importance and sensitivity of each aquatic system intersected by the proposed alignment using existing protocols and assessments conducted for the Metropolitan Area;
- Field visits to each of the identified sites to determine how they would be impacted by the construction of the road; and the need for mitigation, where applicable;
- Discussions and communication with other specialists involved with this study, or with previous studies pertaining to various portions of the route. This phase concentrated on botanical and groundwater issues;
- Examination of all existing reports prepared either for this project, or for other studies coincident with the route;
- Interviews with local conservation officials responsible for managing various portions of the route;
- Description of the likely impact of the route interaction with each of the identified aquatic ecosystems, as per the protocol provided by Chand-Ecosense;
- Synthesis of the overall (cumulative) impact of the route insofar as aquatic ecosystems are concerned;
- Preparation of Draft and Final reports.

3. FINDINGS

3.1 Overall summary

This assessment identified 21 sites where the route intersects surface aquatic ecosystems. These are listed in Table 1. The listing starts at the south-western end of the proposed R300 (Blue Route-Steenberg Road intersection), and terminates at the north-western end, i.e. at Melkbosstrand.

Of the 21 route intersection sites:

- 5 were deemed likely to cause moderate to high negative impacts, even with mitigation;
- 10 were considered likely to cause low to moderate negative impacts if not mitigated to a minor degree;
- 6 were considered likely to produce nil to negligible impacts, and did not require any consideration of mitigation.

In addition,

- 7 areas within the 21 sites were identified as likely to derive upgrade benefits or improvements to their present condition as a consequence of the road construction.

Furthermore,

- the need for alternative alignments was identified for 4 sites.

This analysis is summarized in Table 2, and the identified sites shown, in relation to the rivers and wetlands of the CMA, in Figures 1-3.

3.2 Individual sites (numbering refers to that used in Table 1, i.e Sector/Section)

3.2.1 Sites with identified moderate to high negative impacts

Site 2: Road reserve north of the Westlake Wetland (1/1)

Here the proposed alignment closely abuts the northern edge of a Category B wetland, i.e. one determined as possessing High Ecological Importance and Sensitivity. The Westlake Wetland is the last wetland remnant linked to Zandvlei (Category B estuarine wetland), an estuarine system that is almost completely surrounded by dense urban development, and which is subject to high levels of recreational use. The wetland is of known high botanical importance. The proposed road alignment abuts the upland (terrestrial) interface of this wetland, and will encroach within the 40 m ecological buffer determined for this system (Southern Waters, 2001).

Construction of this section of the proposed route will narrow the existing buffer area between the northern boundary of the wetland and the residential area, impose the risk of damage to the wetland and vegetation during the construction process, and bring about increased movement, light and noise disturbances during the operational phase.

It is proposed that consideration be given to narrowing the route to two lanes through this section, or that an alternative route alignment be sought. Conservation of the Site 2 local area should be considered together with Site 4 (see below), as well as with Site 3.

Specific legislative requirements (NEMA) may be applicable with respect to possible impacts on the Westlake Wetland and Zandvlei.

Site 3: Crossing of the Keysers River (1/1)

At this point the proposed route will cross the unlined channel of the Keysers River, upstream of Zandvlei, and midway between Sites 2 and 4. Accordingly, this reach of the Keysers River abutts the undeveloped areas of the Westlake Wetland and the Zandvlei Bird Sanctuary. As such this Site forms a continuum between Sites 2 and 4, although already impacted by the alignment of the railway line.

At this point the Keysers River is described as having a Low Ecological Importance and Sensitivity, a rating that increases to Moderate when considered in conjunction with the importance of Zandvlei (Category B estuarine wetland of high conservation importance), and the wetland and bird sanctuary environments of augmentative ecological value on either side.

Construction of a bridge at this location would not only impact upon the bed and banks of the river, but also on the special environments on either side. Furthermore, construction activities would impose a risk to the ecology of Zandvlei.

It is proposed that an alternative route alignment be sought for this section of the road. Conservation of the Site 3 local area should be considered together with Site 2 (see below), as well as with Site 4.

Specific legislation is applicable in terms of the Water Act of 1998 in that licencing is required for any activities that may impact on the bed and/or banks of a river or stream course. It is recommended that the Department of Water Affairs and Forestry be approached for a 'blanket' licencing for the whole project.

Site 4: Road reserve north of the Zandvlei Bird Sanctuary (1/1)

This area of the route encompasses some 6 ha of land adjacent to the northern boundary of the bird sanctuary and the former council nursery. This

area has been fenced off for several years as a deterrent to illegal dumping. A non-exhaustive assessment of this site revealed the following (C. Dorse, pers. comm.):

- The presence of 20 species of plants that do not occur elsewhere within the reserve (see Appendix A);
- Small populations of grysbok and porcupines;
- Stands of the grass *Imperata cylindrica* that is the only food plant for three species of butterflies; namely the White Branded Swift (*Pelopoides thrax*); the unique ranger (*Kedestes lenis*) and the Barbers ranger (*Kedestes barbarae bunta*). The latter has its type locality as the Steenberg Station, and is only known from this one site;
- The area is utilized by a population (size undetermined) of the fynbos associated Leopard Toad (*Bufo pantherinus*), as well as at least two other species of frogs, one likely to be *Strongylopus grayii*.

Construction of the road will result in the complete loss of this site. As indicated for Site 2, the Zandvlei estuary has limited areas of undeveloped shoreline, and the bird sanctuary/Site 4 area is the only zone of natural to semi-natural terrestrial environment remaining. The likely success of a vegetation translocation and faunal search and rescue operation prior to construction has not been determined. Furthermore, the proposed alignment will abut directly onto the northern boundary of the bird sanctuary, and will narrow the existing buffer area between the northern boundary of thereof and the residential area, impose the risk of damage to the wetland and vegetation during the construction process, and bring about increased movement, light and noise disturbances during the operational phase.

It is proposed that an alternative route alignment be sought for this section of the road or, that at the very least, the alignment width be narrowed to no more than two lanes. Conservation of Site 4 should be considered together with Site 2 (see above), as well as with Site 3.

Specific legislation requirements may be applicable (NEMA) in terms of this sections proximity to Zandvlei.

Site 20: Diep River at farm Welvergenoeg (downstream of Kuiperskraal) (3/7)

It was determined from the position of established R300 route markers that the alignment will cross the Diep River in the vicinity of the existing drift on the farm Welvergenoeg. At this point the route will traverse a wide valley floor with moderate to steep gradients on either side. At this point the Diep exists as a wide seasonal river vegetated with large eucalypts, bordering and within braided channels lined with the reed *Cyperus textiles*. This reach of the river has been deemed to have a Low to Moderate Ecological Importance and Sensitivity, and providing of valuable habitat and ecosystem services.
The site is upstream of the Vissershok floodplain wetland, the latter being the last wetland before the important and diverse Rietvlei system.

Crossing of the Diep will require the construction of a large bridge. While the bridge in its probable final form should not pose any threat to the future ecology of the river and downstream environments, considerable risk to the local and downstream environments is embodied in the construction phase. The bridge design should be developed in conjunction with input from a river ecologist and a fluvial geomorphologist (see Mitigation).

Specific legislation requirements are applicable in terms of the Water Act of 1998. It is deemed unlikely that DWAF will include this crossing as part of a blanket licence for all watercourses along the route.

Site 21: Blaauwbergs Vlei (3/8)

This vlei is a rare and unique system that is not only the single perennial source of water in the area, but possesses high (B Category) botanical, ecological and geohydrological significance. Furthermore, the vlei was the focus of the 1806 Battle of Blaauwberg, and is thus a site of high historical significance. In its historical context the site is an International War Grave, and is a South African National Monument site.

The vlei has to-date only been subject to cursory specialist evaluation. This is a serious limitation that should be addressed through a comprehensive study as soon as possible. It is possible that the perching of the vlei and its upstream drainage line may be delicate in terms of the risk of induced leaks and, accordingly, no construction or excavation should be allowed in the immediate area. While the vlei currently has a 100 m "no-go" buffer area, local vegetation patterns suggest that this should be expanded to 500 m centered on the spring, as well as encompassing the likely recharge area, pending a exploratory study (see Figure 4). A survey marker for the R300 lies immediately north of the vlei, and within this 500 m buffer.

The so-called Tableview alignment of the R300 was previously considered as an option for the Blaauwberg East-West Arterial Road Study (Jeffares and Green, 1999). That study ruled out this option on the basis of its intersection with the vlei and historical site.

At a meeting held at the offices of KAYAD Consulting Engineers on 5 August 2002 it was learnt that the northern edge of the road reserve will pass some 220 m south of the spring. Based on a report submitted by KAYAD (557wetland) this alignment should not impact on the water sources feeding the spring. South of the spring the alignment will cross the dry downstream watercourse and, as such, will need to incorporated into DWAFs consideration of the licensing requirements for the route.

Specific legislation requirements are applicable in terms of the Water Act of 1998, NEMA and SAHRA. The area of the vlei, i.e. northwards of the proposed alignment (as per 5 August 2002) should be cordoned off, preferably fenced, as a "no-go" area during construction of the road.

3.2.2 Sites with Low to Moderate negative impact

Site 8: Road crosses through effluent ponds P8 & P9 of the Cape Flats wastewater treatment works (WWTW) (1/2)

While this section of the alignment does not impact directly on any natural or semi-natural environments, it may pose a limited threat to bird populations moving between the WWTW and the surrounding areas. This risk would predominantly be to small and/or low flying waterfowl, and adults moving with their young. The risk would take the form of occasional collisions with motor vehicles and/or street lighting. There is also some, although probably minor, impact from noise, light and movement disturbance that may affect the more sensitive species that move at night. These considerations will need to be qualified by the avifaunal specialist.

It is understood that the proposed road will be constructed as a causeway over the ponds, i.e. providing waterways beneath.

This section of the route embodies potential for the derivation of positive benefits (see Section 4).

Site 9: Area east and north-east of the Cape Flats wastewater treatment works (WWTW) (1/2)

Here the route traverses a dune/Strandveld area that is now degraded and invaded with woody alien vegetation. Some marshy and boggy areas remain in the dune slack and depressions, and which may have some significance for amphibians.

The importance of this zone requires qualification by the findings of the botanical, amphibian and mammal specialists. A separate study being undertaken by the Freshwater Consulting Group (Dr E Day, pers. comm.) has indicated that there are some small, possibly rare, marsh-type wetland zones

amongst the dunes in this area. It is, however, not known whether these areas are conservable, or whether they are represented by similar zones within, for example, the Wolfgat or Strandfontein reserve areas. There is, currently, no local policy directing the management of 'ecosystem fragments' such as those encountered through this section.

Site 10: Varkensvlei Forest Reserve (5/10)

This remnant of a former forestry area (the 'Reserve' is dominated by eucalypts, contains some small areas of dune slack wet areas that are in various states of degradation (the area does not enjoy any particular protection). The area does, however, have identified botanical importance (Low, 1997) and if this assessment is still valid, the area should be considered for protection provided that adequate conservation and management services can be provided and sustained.

It is recommended that the route be re-aligned to the south to avoid this site.

Site 11: Varkensvlei (5/10)

This site comprises the remnant of the once more extensive Varkensvlei as depicted on historical topocadastral mapping produced in 1897. At that time the vlei area lay within an area of shallow dunes, of which only subtle remnants still remain. The remaining vlei area has become seriously degraded and is utilized for agricultural purposes during the dry season. As such the area has limited conservation importance, assuming that funding for rehabilitation and management can be provided.

Realignment of the road to avoid Site 10 would result in Site 11 also being avoided. A suitable alignment has previously been proposed in the 1997 study.

Site 12: Vanguard Drive Wetlands (5/10)

This area, due west of the terminus of the existing R300 and Vanguard Drive, has been described in Snaddon (1997), and Low (1997). The area is on the site of the former Joyce's Dairy, a location where Low (1997) found two Red Data Species of plants, namely *Otholobium fruitcans* (skaapbostee) and *Euphorbia marlothiana* (melkbos succulent). These species are conserved elsewhere (Low, 1999). It is unclear whether the so-called wetlands identified by Snaddon were not, in fact, previously mined borrow pits containing water and rapidly-colonizing species of common wetland reeds and sedges. Low (1999) identified several areas ranging from Low to Very High conservation importance, but it is not clear that any of these have remained. Post-1999 the area has been extensively mined for sand and clay, and is now seriously degraded. The remaining wet areas have no conservation value as wetlands *per se.*

As previously recommended by Low (1997), consideration could be given to recreating the previous vegetation type with the design of the interchange planned for this site. This should depend on the current botanical assessment for this site.

Site 15: Kuils River at the N1 interchange (3/6)

At this point the route will be extended northwards above the east bank of the Kuils River. A large amount of construction work will be required in the vicinity the N1 interchange, in close proximity to the river. If not appropriately mitigated, such works could impact on the Kuils River at and downstream of this point.

Conventional construction phase mitigation measures are recommended (see Mitigation).

Site 16: Kuils River north of the N1 interchange (3/6)

Between the N1 and Fairtrees Road the route will be aligned to the east of the river, presumably above the riparian zone. As such the properly-managed construction and operation of the route should not impact negatively on the river. Construction phase mitigation measures are recommended to protect the river (see Mitigation). Although the Kuils River exists in a D-category (= Low Ecological Importance and Sensitivity), these upper reaches represent the best remaining condition for the entire river.

Opportunities exist for upgrading this section of the river (see Potential Benefits).

Site 17: Area north and south of Wellington Road (3/6)

The headwaters of the southern arm of a tributary of the Mosselbank River rises in this area, and then flows east and north towards the Mosselbank. The creation of drainage lines on both sides of the road have somewhat altered the area, with more natural seasonal stream character being evident towards the east.

The construction of the road across this area is deemed unlikely to disrupt the natural groundwater pattern (R. Parsons, Parsons and Associates, pers.comm..).

Construction-phase stream protection measures should be employed (see Mitigation).

Site 18: Route crosses streamline on the farm Phesantekraal (3/7)

Here the route crosses a stream line (northern arm of the tributary referred to in Site 17). The crossing occurs just below a large farm dam that has

degraded the natural character of the area. Downstream of the dam agricultural activities encroach to within a few meters of the stream.

Construction-phase stream protection measures should be employed (see Mitigation).

Site 19: Route between Phesantekraal and the Kuiperskraal Road (3/7)

In this section the route encircles the northern slopes of the Humeklip before turning westwards. The area has been extensively farmed, but a number of small natural drainage lines exist, together with fragments of vegetation, in the hillside valleys. These small fragments comprise the only vestiges of natural habitat that this otherwise barren landscape offers.

At the time of writing this report the precise alignment of the route for this site was not available/marked out. Protection and conservation of these remnant nodes should be provided by the site-specific realignment of the route in order to by-pass them.

Construction-phase stream protection measures should be employed (see Mitigation).

3.2.3 Low to negligible impact sites

Site 1: Route crosses the Westlake Stream (1/1)

At this point the route crosses the very degraded Westlake Stream (Low Ecological Importance and Sensitivity) via an existing 4-lane bridge construction that has been in place for many years. Accordingly, this site is not considered further.

Site 5: Route crosses the Sand River (1/1)

At this point the Sand River exists as a lined box canal, with negligible ecological value. The water level in the canal is determined by the outlet of the vlei in summer, and a combination of outlet level and wet season flows during summer. Crossing of this point will require a bridge, the construction of which could incorporate an upgrading of the canal in this area (see Benefits).

See comments under 3.2.1 for Sites 2, 3 & 4 concerning the need to consider re-alignment of the R300 route west of Site 5.

Site 6: Route crosses the Zeekoe Canal (1/2)

The route will cross this man-made canal at the point of an existing single-lane concrete bridge above a gabion-butressed steep step in the canal bed level. The Zeekoe Canal exists in an extremely degraded condition, and provides very little ecological value. Crossing of this point will require a bridge, the construction of which could incorporate an upgrading of the canal in this area (see Benefits).

Site 7: Route between the Zeekoe Canal and the pump station (1/2)

The route between Site 6 and Site 8 passes along an existing sandy track that forms the southern boundary of the Rondevlei Reserve, and the Cape Flats wastewater treatment works. At the eastern end of this section, in the vicinity of the pump station, the route passes south of some degraded, seepage-fed and nutrient enriched ponded areas. Construction of the route to this point could result in a landscape upgrading of this area. It is not known how the route will interface with the existing effluent pump station.

Site 13: R300/N2 interchange (2/3)

This site is at an existing interchange that has retained some groundwater-fed wetland nodes within the cloverleaf reserves. No further impacts are anticipated.

Site 14: R300 crosses the Kuils River at Bottelary Road (2/4)

Here the existing R300 highway crosses the Kuils River via an existing structure that has been in place for many years. No further impacts are anticipated.

4. POTENTIAL BENEFITS

Certain aspects of the proposed road construction could embody positive "give-back" benefits that could, in a cost-effective manner, provide much needed upgrading of some of the aquatic environments encountered along the route. Some examples are provided in a preliminary fashion below:

4.1 Bridges

Construction of new bridges across, for example the Sand River and the Zeekoe Canal encompasses the opportunity to remove the existing constrictions on water flow and riparian corridor posed by these utilitarian engineering structures. In their place could be created wider structures, with minimal intrusion on river bed and bank, and allowing the riparian fringe to continue unbroken beneath the bridge, thus allowing continuity of the ecological corridor. At present, at times of high flow, animals are forced to either enter the water to pass the bridge, or climb the embankment and attempt to cross via the road.

Proposals have been made for the general upgrading of the Zeekoe Canal in terms of creating a series of stepped weirs. The upgrading of the bridge could form an integral part of this initiative.

4.2 Riparian corridors

Construction of the R300 alongside the upper reaches of the Kuils River could be integrated with the general restoration of the neglected and degraded riparian corridor, and could form the nucleus of a green corridor for the entire Kuils River system.

4.3 Eco-tourism potential

Examination of the public comments indicates a vociferous opposition to the alignment south of Zeekoevlei. Several of the comments appear to be based on some misunderstandings that require clarification. For example, it is

Southern Waters' understanding that the route does not pass through the Rondevlei Reserve, rather along its southern boundary. Similarly, the route crosses the WWTW ponds well south of Zeekoevlei and, as a consequence of its bridge construction, will not pose a physical barrier to fauna using the ponds to move between Zeekoevlei and the treatment works. Furthermore, some comments appear to indicate that large mammals, presumably the hippopotami, move or should move between the WWTW and the Reserve. This is an unworkable option.

The general Zeekoevlei area appears to be on a trajectory of slow economic decay. For various reasons, the area is not nearly as widely used for recreational purposes as it was in the 1980s for example. A possible reason for this could be inaccessibility. It may be argued the creation of the proposed highway to the south of the vlei, both opening up the vista of the waterbody, and providing road access to both the vlei and Rondevlei Reserve from the south, as well as to a host of eco-recreational opportunities, could provide a much need economic boost, both to the local area as well as to the regional value. In turn, the income generated from this provision of (controlled) accessibility could be invested into the upgrading and management of both Rondevlei and Zeekoevlei.

4.4 Engineering (phosphorus barrier)

Recent studies commissioned by the South Peninsula Administration have identified the need for the construction of a physical geohydrological barrier between the ponds of the WWTW and Zeekoevlei. While the existing road alignment lies south of where the barrier should ideally be placed, consideration could be given to the possible integration of the barrier with the road construction. This could encompass cost-effective benefits for both civil engineering needs.

5. MITIGATION MEASURES

The derivation of mitigation measures per individual site is best derived on a site by site-specific basis, as opposed to the simple generation of a list of Best Management Practices that may or may not be relevant, or not have any proven efficacy for a particular application. In general terms, however, the fundamental mitigation requirements for this project encompass the following:

5.1 River and wetland protection

With the exception of the sites for which a re-alignment of the route is recommended, mitigation devolves to the during construction protection of the river from impacts that could arise during the construction process. This simply entails the provision of whatever types of barriers (silt fences, bales, coffer dams) may be necessary, on a site-specific basis, to prevent silt, cement and other construction-related materials from reaching the river overland. Such measures are common accepted practice within the international civil engineering industry, and should be mandatory stipulations contained in the Method Statements for the civil works.

5.2 Roadway runoff

At present all road and highway runoff generated with the CMA reaches a river or vlei via the stormwater drainage system. Construction of the R300 highway will contribute a very small additional fraction to the existing load. Aquatic ecosystems adjacent to the route can be well protected by the over-road routing of some of the runoff for soakaway in the median, and/or via broad overland swales on either side of the roadway. The construction of oil and grease traps are ineffective on all but reasonably large stormwater conveyances, and are simply not indicated for every drain serving the intended route.

5.3 Toxic spills

One-off toxic spills do indeed pose a threat to aquatic environments. However, the probability of such events occurring in the immediate vicinity of a bridge crossing or storm drain is extremely low. Furthermore, toxic spills occurring at any remote point within a catchment can impact on rivers and wetlands via the stormwater drainage system. It would be unreasonable to expect the construction to have to create physical containment devices, nor would it be reasonable to argue against a route that requires bridges to cross waterways.

6. CONCLUSIONS (Individual and cumulative impacts)

The overall impact of the proposed R300 alignment on aquatic ecosystems within the metropolitan area of Cape Town is considered to be Low to Moderate, and manageable using appropriate and sensitive mitigation measures.

At the south-western extremity of the route the alignment has the potential to impact on an area of road reserve that has become part of the Zandvlei ecosystem. The precautionary and need to protect the least impacted systems first principles dictate that, notwithstanding the existence of a road reserve, this alignment be reduced in width, or redirected elsewhere. Cape Town is poorly endowed with wetlands, and with few of those that it has existing in good condition. Zandvlei, despite the very high level of urbanization and recreational use, is the healthiest of all the wetlands in the CMA. The fragility of the ecosystem services provided by the two environments (Westlake Wetland and the Bird Sanctuary) that will be impacted by the roadway is unknown, but may be such that any further loss may bring about degradation of the ecosystem as it is at present.

At the north-western extremity, the intersection of the route with the Blaauwbergsvlei is a non-negotiable option, and the route has been realigned as proposed 220 m south of the spring.

Between these two extremes, the identified affected sites can be easily accommodated, without ecosystem damage, using appropriate mitigation and/or minor re-alignments (e.g. Varkensvlei Forest Reserve). As is typical with urban rivers, many of the environments identified are highly degraded and, where-ever possible, construction of the road should incorporate lateral give backs to aquatic environments in terms of upgrading and protection.

Lastly, from an aquatic ecosystem perspective, the route alignment in the vicinity of Zeekoevlei may provide more benefits than are immediately apparent. However, this observation remains to be qualified at the specialist integration meeting as there may be non-negotiable ecological arguments that preclude the route from passing along the proposed alignment.

Bibliography

Jeffares and Green Consulting Engineers (1999) Environmental Impact Assessment for the Blaauwberg East-West Arterial Road. Jeffares and Green, Pinelands, Cape Town.

Low, AB (1997) Cape Flats Freeway Extension: Plantlife and Habitat Quality. Coastec, Cape Town.

Snaddon, K (1997) Cape Flats Freeway Extension. Wetlands Specialist Study. Report prepared for the Cape Metropolitan Council.

Southern Waters (2001) Draft Protocol for the Determination of Ecological Buffers for Urban Wetlands. Report to the South Peninsula Administration.

FLORA SPECIES REPRESENTED IN THE ROAD RESERVE BUT NOT IN THE NATURE RESERVE

(Source: C. Dorse, Zandvlei Nature Reserve)

Besides being a valuable buffer to the nature reserve, the road reserve has at least 20 species that do not occur (or only single specimens occur) within the reserve. These species are as follows:

Anthospermum cf aethiopicum	
Ruschia sp1.	
Maytenus heterophylla	Pendoring, Lemoendoring
Pterocelastrus tricuspidatus	Kershout
Dimorphotheca pluvialis	Witbotterblom
Willdenowia sp.1	
Moraea fugax	Soet uintjie
Romulea sp. 1	
Lachenalia bulbifera	Viooltjie
Gladiolus cunonius	
Solanum tormentosa	
Brunsvigia orentalis	
Babiana ambigua	
Jordaaniella dubia	
Lycium afrum	Bokdoring
Lycium ferocissimum	Bokdoring
Ferraria crispa	
Imperata cylindrica	Cottonwool grass
Crassula dichotoma	
Zygophyllum flexuosum	

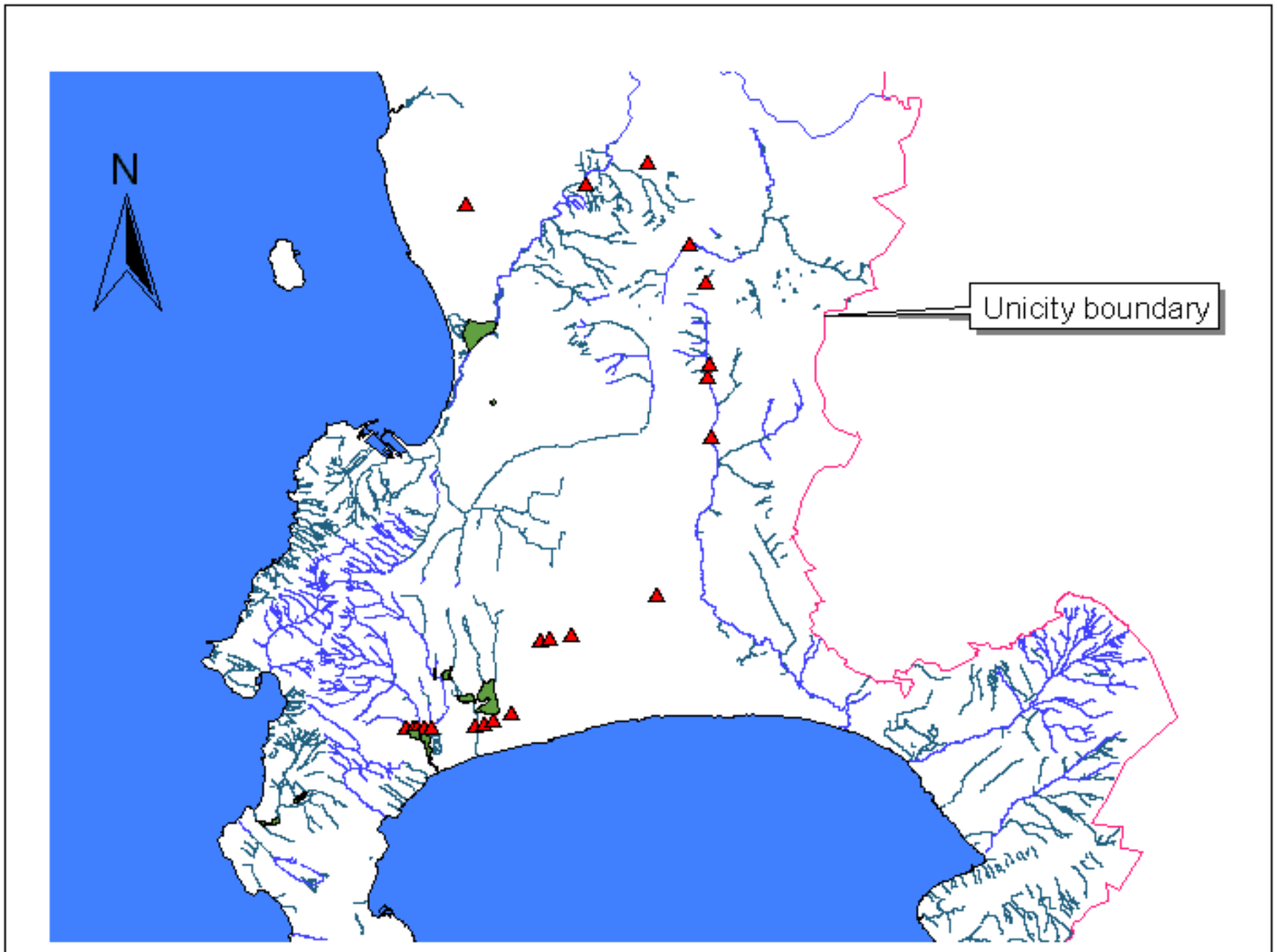

Figure 1: Overlay of proposed R300 route on the CMA rivers and wetlands, showing] the locations of identified affected aquatic ecosystems as detailed in the text.

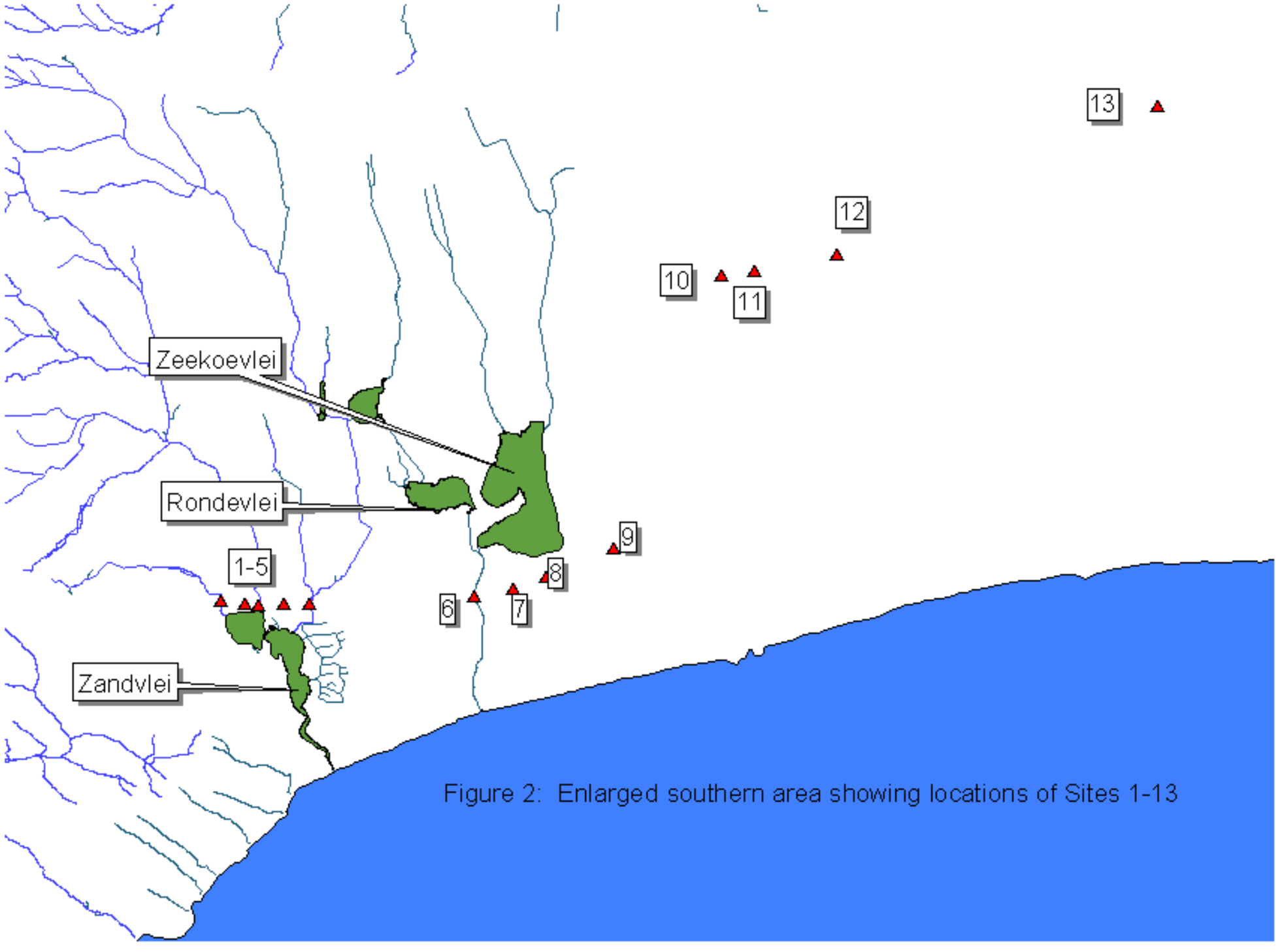

Figure 2: Enlarged southern area showing locations of Sites 1-13

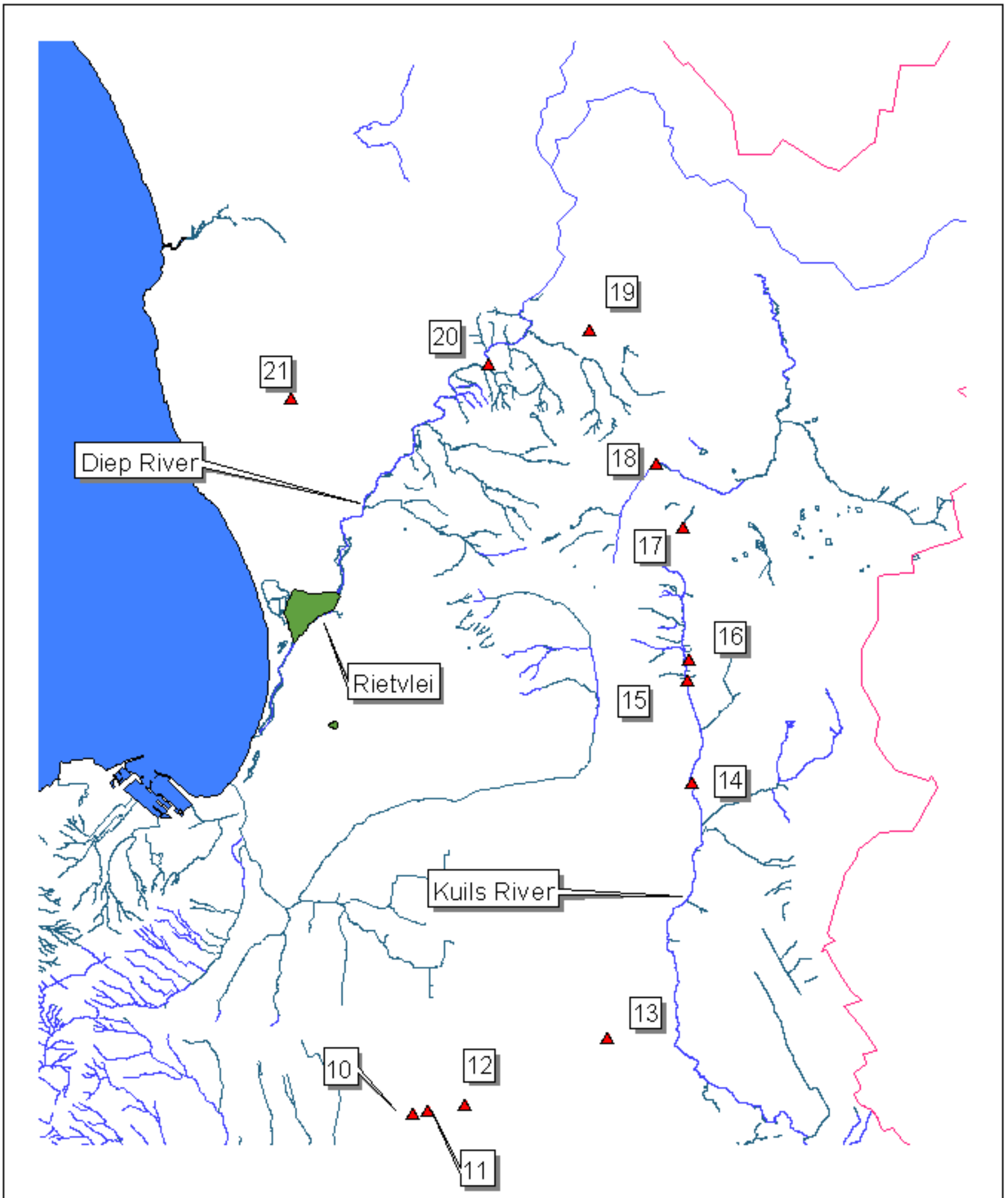

Figure 3: Enlarged central and northern area showing locations of Sites 13-21.

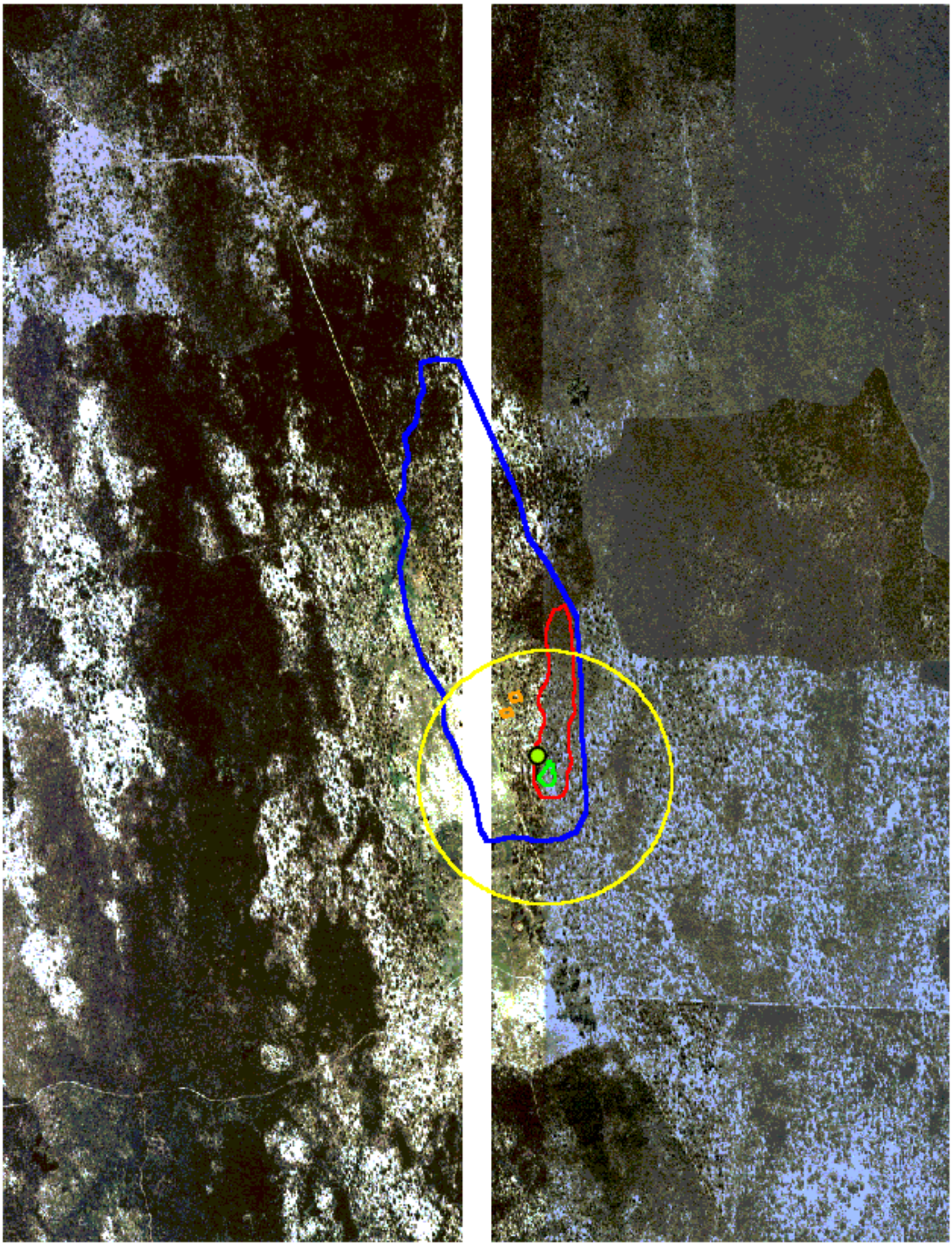

Figure 4: Blaauwberg Vlei