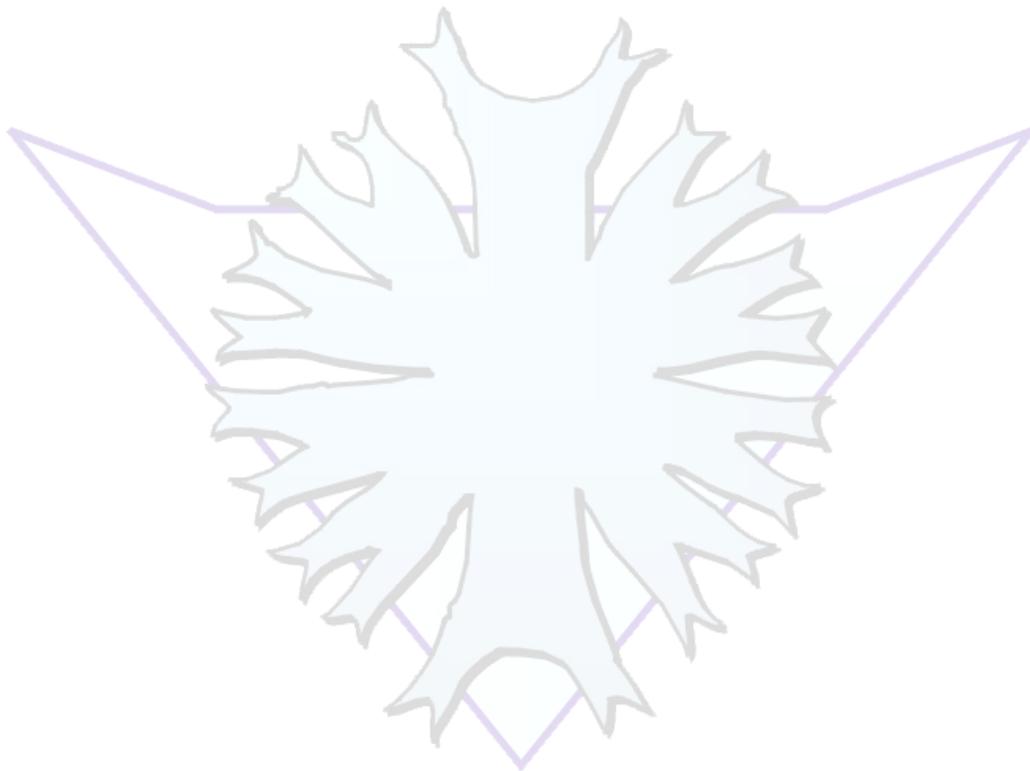


Aquatics Assessment

**(STREAM AND WETLAND REPORT: PORTION 10 OF FARM
787, VAN WYK'S RIVER, PAARL)**

FINAL REPORT

Dr William R Harding



Report to Guillaume Nel Environmental Consulting

**by
DH Environmental Consulting
South Africa**

Undertaken in association with Muller Environmental

DHEC Report 565/2010

STREAM AND WETLAND REPORT: PORTION 10 OF FARM 787, VAN WYK'S RIVER, PAARL.

EXECUTIVE SUMMARY

Portion 10 of Farm 787, Van Wyks River, Paarl, was assessed in order to establish the current ecological function and value of the existing wetlands and stream channel on the Site, and to offer alternatives to the developer to improve both ecological function and value without diminishing any present value and function the Site may offer. An additional portion, this being a 1 ha area to the east of the site, was also evaluated. The intention is to develop the site as a technopark.

The portion of the Van Wyks River through the site was re-aligned during the 1990s and the site filled with imported material to create a building platform. The re-aligned stream channel is ecologically-degraded (Category E). Water pooling on the compacted surface during winter has given rise to superficial indications of wetlands. These are, however, of negligible ecological value and their prognosis for future conservation is doubtful.

This assessment has concluded that restoration of the stream to its original course and bed depth, with reconstructed banks, provides a sustainable and ecologically-meritworthy option for the future development of the site. The hydraulic feasibility of this option remains to be determined and the ultimate site layout amended to the findings thereof.

Provisional landscaping scenarios have been provided.



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Registered Professional Natural Scientist (Ecological Sciences) (South Africa)
May 2011

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SPECIALIST DECLARATION

The aquatic assessment performed for this project was conducted by Dr William R Harding, BSc (Chemistry/Microbiology); BSc (Hons) (Microbiology); MSc (Zoology – Freshwater Biology) and PhD (Zoology – Freshwater Biology). Dr Harding is registered as a Professional Natural Scientist (Pr Sci Nat) as an Ecological Scientist with the South African Council for Natural Scientific Professions (SACNASP), Registration No. 400059/97). Dr Harding is also a USA-certified Lake Manager, accredited by the North American Lake Management Society (NALMS, 98/04/M). Dr Harding is also registered as an Ecologist with the Southern African Society of Ecologists and Environmental Scientists (SAIEES). He also serves on the Minister of Science and Technology's advisory council of the South African Council for Natural Scientific Professions (SACNASP).

Dr Harding has been active in the field of hydrobiology and aquatic ecology for 22 years.

The views expressed in the report are the objective, independent views of Dr Harding and the survey was carried out under the aegis of his registered Close Corporation, DH Environmental Consulting CC, established in 1995. Neither Dr Harding, nor DH Environmental Consulting CC, has any business, personal, financial or other interest in the proposed development, apart from fair remuneration for the work performed.

STREAM AND WETLAND REPORT: PORTION 10 OF FARM 787, VAN WYK'S RIVER, PAARL.

The property was visited on 20 September 2010 and again on 2 February & 2 March 2011 in order to establish the current ecological function and value of the existing wetlands and stream channel on the Site, and to offer alternatives to the developer to improve both ecological function and value without diminishing any present value and function the Site may offer.

The terms of reference from the client were as follows:

1. Determine the extent, nature of, ecological function and importance of existing wetlands and streamline on Site – using the extant information and primary data gleaned from a Site visit. Contextualise same with the Drakenstein EMF and where relevant, seek provisional consensus with the Drakenstein local authority;
2. With respect to the intact wetlands, identify areas of mitigation and trade off for development whilst retaining wetland function and value in a sustainable manner;
3. Provide options to augment and strengthen existing intact wetlands;
4. Produce a landscape design and planting plan (streamline and edges and wetlands) based on the design elements adopted by the developer;
5. Assess the present condition of the approx. 1ha portion on the property east of Fairview Rd;
6. Produce a report detailing the findings including information for method statements and monitoring protocol.

Please Note. Site specific method statements can only be formulated for the Site once a development plan is in place.

SECTION A

METHOD

The Study Site (hereafter the “Site”, see **Figure 1**) was traversed on foot and certain points were marked using a handheld Garmin 60CSx GPS accurate to 15 m. The areas surrounding these points were photographed and a detailed commentary of these points follows after the general Site description (see **Section B** and **Appendices A & B**). Accurate GPS mapping was undertaken using a Leica GS20 High Resolution GPS unit, accurate to < 0.5 m.

Five trenches were excavated along the approximate route of the original stream alignment line in order to establish its presence and to inform the study of the nature of the fill material, the width of the original stream and any defining characteristics which may still be present.

Please Note: The road past the southern border of the Site is referred to as R101 in some reports. The R101 ends some distance to the west at R304 and the road becomes the R45 as it passes Simonsvlei (MapSource). This report therefore refers to the road as the R45.

GENERAL SITE DESCRIPTION

This report confines it self to comment on the Site to the west of the R44. The small section to the east of the R44 will be dealt with in a separate, appended document.

The Site is roughly 900 m in extent from west to east and 160 m wide in the west narrowing to 110 m wide in the east. About 13 ha in extent, the property is bounded by the N1 to the north, the R45 in the south, the R44 to the east and a conservation area established by the Simonsvlei Wetland Trust on the Van Wyks River to the west. There is an earth-canalised section of the Van Wyks River about 690 m long running parallel with the R45 entering from the west running east where it enters a culvert and crosses the R45 in a southerly direction. Three drainage ditches from the N1 bisect the property to discharge into the stream channel. These ditches are, however, blocked in various places.

THE VAN WYKS RIVER

The Van Wyks River (referred to as the stream channel on the study Site) is part of the Great Berg system (G10C Quaternary Catchment). The stream is non-perennial,

draining the farmlands on the south-western flank of the Paarlberg. The drainage to the stream would be expected to contain chemicals from fertilizers, herbicides and the various fungicides and pesticides used during normal farming activities in the area.

After crossing the N1, it becomes a meandering stream through flatter surroundings through the property to the west of the Site. Before extensive alteration of the streamline, the stream showed the same 'meandering' characteristic on the study Site as the portion immediately west from where it crosses the N1.

On the property to the west, the stream splits as it enters the Site (see **Figure 2**). The main channel appears to be closer to the R45, and a lesser side channel joins into ditch No 1 flowing from the N1. This side channel then flows around a (filled) platform before joining the main channel a short distance away. This arrangement could prevent polluted stormwater from the N1 impacting on the Simonsvlei Wetland Trust Property by entering the main channel some distance away from the property boundary. It is unknown whether this was planned or a coincidence. The platform between the two channels is compacted with imported fill, with steep un-vegetated banks on both the main and side channels.

The steep banks of the channel have been trampled in several places where the cattle grazing on the property go to the water or cross the channel. There is little or no vegetation on the banks or in the stream in these areas. Most of the stream channel is overgrown with *Typha* and *Phragmites* reeds up- and downstream of the crossings.

The original stream had two clear, almost horseshoe-shaped bends, with very narrow wetlands developed on the insides of the bends. These wetlands would have shown the same characteristics as the wetlands on the Site immediately west of the study Site. See *historical images 1953 – 1973*.

THE UPLAND SITE

The Site is fairly level, sloping gently from the N1 towards the river channel. There are three stormwater ditches discharging runoff from the N1 to the river channel, spaced east-west across the Site.

The Site was previously covered with *Acacia saligna*, during the Site visit on 20 September 2010. Although this bush has now mostly been cleared by cutting, the stumps were not treated, and the brush was not removed, causing a fire hazard.

The study Site was extensively infilled and the stream realigned to its current linear arrangement in the late 1990's in order to create a building platform (see FCG Report compiled August 2009). The nature of the fill material is unconsolidated silt/ sand, with some foreign material, such as small patches of clay and nodules of laterite. There is also a lot of very thin stainless steel wire mesh in the sand. The surface of the infilled material on the study Site shows signs of extensive compaction which has led to the formation of an impermeable surface in the fine silt/sand. Standing water ponds on this impermeable surface as a result of various drainage ditches from the N1, which are blocked, overflowing before they reach the stream channel, as well as from direct rainfall puddling on the surface.

The property is wet in winter with standing water on the Site to the west of stormwater ditch No 3. The free flow of runoff in ditch No 3 to the channel has been impeded by infilling to make an access road to the Site. The ditch overflows at this point and floods to the west on top of the infilled area. The area to the west of ditch No 3 is covered in *Cynodon*, and there are sparse clumps of *Juncus* and *Phragmites australis* on the grassy plain. Some *Zantedeschia aethiopica* was seen in the area during the site visit on 20 Sept 2010, but no other wetland-associated geophytes were seen.

A small patch of *Pennisetum macrourum* is present near the N1 to the west. There seems to be a tributary stream draining to the Site in this area from a dam to the north of the N1. Prior to the infilling, this stream would have pooled in the coarse sand and the stream then percolated into the ground water at this point. At the present level a wetland has formed on the surface as there is a thin clay layer in the infilling, at about 500 mm below the surface.

The eastern part of the Site is relatively clear of alien vegetation and fairly grassy. The area has been extensively grazed. Wetland plant species such as *Cliffortia* and *Pennisetum macrourum* are growing near to the road culvert on the R45.

A wetland delineation of the Site was carried out in August 2009 by FCG. Their findings were that: '*most of the Site contained wetland and recommended that an assessment of present ecological condition and the ecological importance of the wetland be carried out, and that recommendations to the developer contain identification of possible impacts associated with development in wetlands and how these could best be mitigated.*' Based on our findings we cannot concur with this conclusion. Wetlands on the unfilled site would have been limited to the wetland-like stream riparian zone.

HISTORICAL ECOLOGICAL VALUE OF THE SITE

The original character of the Site has been permanently changed by infilling. Historically, the Site would have been gently undulating, sloping towards the Van Wyks River that meandered through the Site, curving in a wide arc towards what is today the N1 and then heading towards the R45 in a series of gentle curves through cultivated fields. According to the historical images, the river at the N1 was wide and showed narrow floodplain wetland characteristics on the inside bank. Historical imagery between 1938 - 1973 showing the meandering stream is very different to the position of the stream channel in recent years. The stream channel of the Van Wyks River on the Site has been recently (1990s) realigned, straightened and canalised between two high banks near to the R45. The extent of infilling over the rest of the Site is not clear from the imagery obtained. Indications are that the Site was completely infilled with silt/ sand over much thereof and some areas with clay over rubble, as seen at a degraded spot on the side of the channel near the culvert under the R45 (GPS pos 303, Section B.)

It appears that the entire Site was disturbed and the topsoil lost with the resultant loss of natural vegetation, which has not yet returned after more than 10 years. The soil at natural level before infilling would have been of the Malmesbury shale Group with Swartland Shale Renosterveld comprising the natural vegetation as classified by (Murcina and Rutherford). Renosterveld is usually associated with dry areas of fertile soil. The wetlands on the Site would have been associated with the stream, mainly formed as the riparian edge, as is evident from the historical images.

CURRENT ECOLOGICAL VALUE OF THE RIVER AND WET AREAS

Swartland Shale Renosterveld is described as Critically Endangered (Murcina and Rutherford: *The Vegetation of Southern Africa*). In its natural state, therefore, the Site would be expected to have a high ecological value.

The existing stream channel is narrow with very steep sides. The current (DWA) river grading overall is Category D (moderately to highly modified) with a desired Category C. The reach of stream channel through the study Site is graded Class E. The Drakenstein EMF (DEMF) has classified much of the Site as wetland loosely following the route of the original stream. We concur with the conclusion that the original alignment would have been characterized by a narrow riparian zone.

Based on our observations, the conditions on Site are contrary to and inconsistent with the findings of the DEMF. We conclude that the DEMF is preliminary, subject to ground truthing - which this survey has now provided.

SANBI have identified a dam on the northern side of the N1 as a wetland, but have not identified any wetlands on the southern side of the N1 in the immediate vicinity of the study area.

The National Water Act (NWA, 1998) defines a wetland 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.*

Wetland functions, as further defined by the DWA, are:

1. to recharge ground water
2. to offer flood attenuation
3. to remove chemical silt and other pollutants from the water
4. offer a varied habitat

Under the current conditions on the study Site, the perching of rain puddles and overflow from blocked drainage ditches collecting on top of infilled and compacted ground, cannot be construed as wetland offering any high ecological value to the Site or the stream system as a whole.

- Recharging of ground water through the infilling is unlikely these wet areas are perched on top of filled material – unconsolidated silt/ sand that has a compacted surface layer;
- The Site has limited function as flood attenuation due to the current ground levels, infilling and berms. At best the flat area displays very low flood attenuation ability;
- The dominant vegetation in the area is *Cynodon dactylon* which is a couch pasture grass that will grow anywhere *in disturbed soil and is able to tolerate wet conditions*. *Cynodon dactylon* is dormant in winter and the few clumps of *Juncus krausii* and *Pennisetum macrourum* found on the Site are unlikely to contribute much to improvement in water quality;
- The perched wet areas on top of infilling dominated by *Cynodon* do not provide a varied enough habitat to support the sort of ecology normally associated with rivers running through Swartland Shale Renosterveld habitat;
- The presence of livestock both trampling and over grazing the little ground cover available will cause the area to quickly degrade past a level where it is able to sustain the existing environment or be capable

of developing habitat similar to the adjoining property or that would be expected to be present in this area;

- The loss of topsoil over the entire Site will preclude any attempts at rehabilitation of natural habitat on the Site in its present condition;
- As is evident from the excavation of trenches, the site does not conform to the aforementioned definition of a wetland.

Poor drainage due to surface compaction of silt/sand probably causes the standing water now evident on Site in winter. The standing water is a result of direct collection of rain in the slight depressions across the Site and from the 3 drainage ditches bringing runoff from the N1. Two of these ditches from the N1 are blocked so that runoff does not reach the van Wyks River channel. These ditches overflow in winter flooding the adjoining land causing standing water over large areas on the surface. It is deemed likely that this pooling of water resulted in the identification of 'wetlands' over much of the area as identified by FCG report.

TRENCHING

Five trenches were excavated (see **Figure 3**) on the property to attempt to track the old stream line. The trenches were about 10 m long and 2.5-3 m deep. Dug in March, the driest part of the summer season, the soil profile showed the following:

- i. In most of the trenches the unconsolidated sandy/silt fill material was about 1.5m - 1.8m deep. The material was dry with no discolouring to indicate the presence of wetlands;
- ii. Foreign material such as thin stainless steel wire mesh, clumps and nodules of clay and gravel were seen in the fill in some of the holes. The colour of the fill varied slightly in the various trenches showing that the infill material either has different origins or excavation depths at the source Site;
- iii. The organic layer of the original stream bed was found at about 1.8m depth, about 0.3 – 0.5m above the base flow on the Site. Active baseflow was found in all the trenches excavated on the streamline;
- iv. Assuming that during winter baseflow may rise by 0.3 – 0.5m, under present conditions, the ground water level will be 1.3 – 1.5m below the infilled (extant) surface (i.e. inconsistent with a wetland);
- v. There was no evidence of riparian wetlands other than the narrow organic band either side of the channel profile;
- vi. The trench excavated in the Tributary stream near the N1 showed a thin clay layer at a depth of 500mm in the infilling. The damp area seems perched on top of the clay layer. The soil below the infilled material was

very porous. This shows that that the stream would have percolated into the ground at this point and is unlikely to have flowed over the surface.

CURRENT IMPACTS ON THE AREA

- The study Site has lost any ability to revert to natural state due to permanent changes to the natural levels of the Site, soil characteristics and the realignment of the stream;
- Possible impact on the upstream area caused by infilling and flow retardation. This would need to be considered during rehabilitation of the area and in any stormwater management plans;
- Infestation of the area by alien vegetation;
- Clearing of vegetation in areas and not stump treating, consequently all are sprouting re-growth. There is a current high fire hazard on the Site because the cut brush has not been removed from Site;
- Heaps of dumped material overgrown with *Pennisetum clandestinum*;
- The ponding areas are species dominated grassy depressions. *Cynodon dactylon* is the dominant species;
- Trampling of river banks and surface of the Site by cattle causing erosion on the banks and compaction on other areas;
- Extensive over grazing of grass on the banks and flat areas;
- Drainage ditches from the N1 are cut off from the main channel by infilling to form access roads. The ditches then flood onto the Site and drain to the channel via ditch No 2;
- The section of stream on the property is choked with *Typha* and *Phragmites* – a fire hazard when dry - presents a danger of flooding upstream in winter, causing a possible change in character of the Simonsvlei trust area.

CONCLUSIONS

All conservation-worthy elements of the stream through the property was permanently lost when the Site was infilled. Species dominance of the wet areas, caused by a perched water table on top of infilling, affords low to negligible ecological importance to these areas.

The re-aligned stream is perched well above any groundwater and is thus unsupported thereby. The original stream would have been perennially-supported by baseflow.

All original riparian wetlands that may have been present, barring the small patch near the N1, were lost during the infilling operation.

If the Site is left undeveloped and without any environmental management, alien vegetation is likely to invade the Site and the stream. Flooding of the upstream conservation area will occur more frequently and could possibly change its character permanently.

Constant use of the area by cattle will soon cause erosion of the steep stream banks and loss of the little existing vegetation cover as well as pollution by nutrient enrichment of the stream.

PROPOSED MITIGATION AND THE WAY FORWARD

At present ecological value of both the wet areas and riparian environment on the property is low.

- Carefully planned and managed development could create corridors of natural areas, linking the Site to others in the area via the river buffer corridors;
- The river and riverine environment could be restored to its original alignment (see **Figure 3**), and could be conserved by the establishment of 10m buffers on each side of the stream line, linking to a system of wetlands providing natural stormwater attenuation on the Site. We consider this to be the most desirable option. The hydraulic feasibility of this proposal needs to be evaluated by an engineer and this has been recommended to the client and it is understood that the necessary work is being carried out;

- The rehabilitation and development of the river and bank areas will enhance the ecological value of the river environment, and provide a linking corridor to adjacent Sites;
- Careful rehabilitation is needed to prevent negative impacts on stream flow through the upstream wetlands. The 'delta area' where the stream enters the Site in the west, should be carefully rehabilitated to control flows from the upstream Site thereby ensuring that there will be no impact on present conditions in the Simonsvlei Wetland Trust area by any actions of the development on the study Site;
- Leaving the stream channel in its present position and reshaping the banks and creating wetlands else where on the property to provide attenuation is also an option, depending on the type of development. This would, however, provide substantially less in terms of ecological restoration;
- The small wetland at the outflow of the dam above the N1 could be improved with plant management to create a varied habitat. Care should be taken not to influence flows through this area to keep its integrity intact.

LANDSCAPE DESIGN

This report provides a concept design that will develop once further information is available. Details of hydraulic characteristics of the proposed restoration are required. Impressions of what the eventual Site could look like are presented in three collages superimposed on various sections of the Site (see **Appendix D**).

Every effort should be made to take cognisance of the surrounding area and the historical appearance of the Site in the landscape design.

SECTION B

DETAILED SITE DESCRIPTION AT SPECIFIC WAY POINTS

Please refer to Appendices A & B

Photographs 001- 004

These images are downstream of the study Site and the culvert under the R45. Immediately on passing under the R45, the stream is narrow, infilled along the banks and overgrown with *Typha capensis* and *Cyperus textiles*. The banks are steep and they are covered in *Pennisetum clandestinum*. The ground surrounding the stream appears unnaturally level and the stream line is straight with almost 90° bends as it passes between 2 properties. It then takes on more natural curves through a cleared area currently under development.

On the study Site at the culvert, there is a tree (*Salix*) which has fallen over presumably during flooding last year. Photograph 003 shows the material that seems to have been used in the infilling of the Site (sandy with rubble protruding - to be verified with excavation).

Photograph 005 shows Simonsvlei Wetland Trust area upstream of the Site. The Site is presumed to have looked like this before it was infilled. This photograph shows a sedge and reed channel from the N1 to the stream in the foreground through Swartland Shale Renosterbos vegetation.

GPS Position 270 Photograph 007a

This position marks the small wetland on the north-western part of the Site. Water enters this wetland from a dam via a ditch under the N1. The plant species seen in this area are *Cynodon dactylon* and *Pennisetum macrourum* and the invasive *Pennisetum clandestinum* (kikuyu)

GPS Positions 292 – 294 Photographs 006 – 014a

These positions are marked on the narrow portion of the Site between the stream, the R45 and the Van Wyks River Wetland Trust. The area is high and appears to have formed part of the infilling. The stream bank is steep and the adjacent area to the west is much lower as seen in Photograph 009. This photograph shows the stream entering the property. The riparian area is flat with almost no discernable stream banks. The stream is defined by the swathe of *Typha* through the photograph.

Photograph 009 shows the level of the surrounding area in relation to the adjoining property.

The area is densely vegetated with alien vegetation, *Acacia saligna*. Attempts to clear the bush have been made between the first visit in September 2010 and the Site visit on 2 February 2011. The bush has been left *in situ* and is a fire hazard. The stumps were not yet trees and are already re-sprouting.

Photograph 010 (Position 293) shows young *Typha* in the foreground, possibly showing an area that is newly-flooded due to the channel from the N1 being blocked. Position 293 shows a view of the channel on the study Site. This end of the channel is thickly overgrown with *Typha capensis*.

Position 294 shows the channel bank height at this point, the cleared vegetation, lack of growth on the stream bank, and a view to the northwest (Photograph 014a), showing the left stream bank with an infilling forming a platform and another channel beyond. It seems as if the channel from the N1 on the boundary between the Van Wyks River Trust and the study Site (Channel No 1) is diverted along this channel. There is a small patch of young *Typha* shown in Photograph 010 on this channel line.

Plants seen in the channel are *Typha capensis* (dominant vegetation), *Cyperus textiles* and *Pennisetum macrourum*, *Juncus* sp small amount of *Phragmites australis*. Various grass species such as *Avena* (oats)

GPS Positions 295 & 296 (Photographs 015 & 016)

This is an infilled area to the north of the branched stream at Position 296. This area is high and was covered in alien vegetation - what grasses may have been there have now been grazed by cattle. Some *Cynodon* grass still covers the ground in places. There is some *Arundo donax* near to the N1 in the drainage ditch.

There is a drain from the N1 near Position 296, entering the channel near Position 297. Although the drainage ditch from the N1 at Position 296, Photograph 016, was dry at the time of the February Site visit. The channel was wet from this point on downstream but was completely dry in March.

GPS Positions 297 & 298 (Photographs 017 – 020)

Photograph 017 (Position 297) shows the general condition of the channel and bank. At this point there is a track where cattle cross the channel. The channel bottom and bank side have been severely trampled. Plants in this area include *Cynodon*

dactylon, *Typha capensis*, *Phragmites* and alien vegetation (*Acacia saligna*). In Photograph 017 a clear line between the *Typha* and *Phragmites* is seen – (*Typha* upstream). Historical imagery for this area shows a wetland on the northern (left) bank of the stream which was close to the R45 at this point. The area beyond towards the N1 is cultivated field.

Position 298 (Photographs 018, 019, 020) shows a level area which appears to retain some rainfall or other surface water overflowing from the drains at the N1. The *Cynodon* is thick and there are clumps of *Juncus* scattered sparsely over the area. At the Site visit during September 2010 there were tall grass species in the area. These were not evident during the February 2011 Site visit and it is presumed that they have been grazed.

GPS Positions 299 – 300 (Photographs 020 – 024)

At Position 299 is drainage ditch No 2 from the N1. This ditch has been infilled to provide an access track. There is no pipe connectivity under the track. The drain now overflows onto the Site mainly to the west of the ditch. Photograph 019 shows a view from Position 298 towards this drainage ditch. Sparse clumps of *Juncus* sp are seen.

Photographs 021 - 023 show the ditch blocked by the access road. There is a stand of *Cyperus textiles* and *Juncus* sp upstream and *Typha capensis* downstream of the access track.

At Position 300 there is a slight depression characterised by thicker mat of kweek, (*Paspallum*) small clumps of *Cyperus textiles* and *Juncus* and some *Phragmites*. Photograph 024, Position 300, shows a view west towards drainage ditch No 2. The *Juncus* and *Phragmites* are in poor condition.

GPS Position 301 – 303 (Photographs 025 – 032)

Views to the north over this area appear almost natural, although very level with poor quality pioneer plant species. Between Positions 300 and 301 to the north, there is an area of stockpiled material forming berms N/S and some E/W. These berms are grass-covered.

Historical imagery shows cultivated fields on this section of the Site (Position 302, Photograph 026).

GPS Position 302 (Photographs 026 & 028) shows the area to the North and NE that was previously cultivated.

Photograph 027 shows the channel bank close to the culvert under the R45. There is a thick stand of *Cliffortia* and *Carprobrotus* sp on the channel edge.

GPS Positions 304 and 306 (Photographs 033 – 037)

At Position 303, opposite the culvert under the R45, water is seen seeping from under the rubble fill. There is a ditch opposite the culvert on the N1 which enters a pipeline that is broken and cut off at the downstream end. It is possible the runoff from the N1 filters through the rubble and follows the original line of the drainage ditch to the channel at this point.

View west over the Site from Position 304 shows *Pennisetum macrourum* in the foreground, with short dry grass and pioneer shrubs in the back ground towards the N1. This area was previously cultivated farm land.

At Position 306 there is a slight depression, this area was cut off from the channel at the culvert by construction of the main haul road onto the Site during the infilling operation. Plants in this area indicate wetland species *Cliffortia*, *Passerina* sp, *Stoebe* sp, *Cyperus* sp and *Carex* sp.

TRENCHING

Please refer to **Appendix F**.

Trenches were excavated on 2 March 2011 using a TLB digger-loader. The trenches are marked on Site Map No 2 as TP Nos 1- 5. Except for TP No 1, the trenches were dug to discover the original ground level and stream bed. This was determined by the grey/black organic layer that underlaid the streambed.

TP No 1 was dug to determine the origin of seepage water seen near the culvert during the Site visit. A blocked drainage pipe presumed to originate from the N1 was discovered close to the surface.

TP No 2 (Photographs 001, 002)

The trench was dug to about 2 m. Sandy silt mixed with clods of clay was found in the top 1.5m. Organic grey black sand was evident from about 1.5 m, sloping down to 2.0 m

Black roots and plant rests were found in the organic layer. The plant rests resembled those of *Typha*.

Coarse sand with seepage water was seen below the grey/black sand layer. Water seeped into the trench from the west and flowed east.

In these photographs the 'basin shaped' dark organic sand below the fill is clearly visible tracking the stream and bank. The fill sand shows various colours in patches, rather than layers as it would do if it were natural sand layers.

TP No 3 (Photograph 004)

In this trench the top 300 mm was sandy on top of 1.2 m layer of yellow sandy clay. A 300 mm organic layer of grey/black sand was excavated below the infilled layer. Coarse white sand was found below the organic layer, with water seeping from west to east. There was stainless steel wire mesh in the fill material. No whole plant rests were found on the trench.

TP No 4 (Photograph 005)

This trench contained unconsolidated sandy/silt fill to about 1.5 m deep. The trench collapsed easily as soon as it was opened and obtaining a proper profile of the old stream line was not possible. An organic layer of about 500 mm was found in the trench at about 1.2 m deep after it was elongated and excavated to the north.

TP No 5

This trench showed a thin clay layer near the surface which is responsible for trapping the flows from the dam on the northern side of the N1. A small wetland has recently formed in the area. The base of the wetland is dry and does not yet have a discernable organic layer, indicating that it is very newly formed.

SECTION C

ASSESSMENT OF THE EASTERN 1 Ha SITE

The above 1 ha site for proposed development was visited on 20 September 2010 and 2 February 2011 in order to identify and assess the condition of any wet environments on the property, and to comment on the impact of development on these areas.

The property was traversed on foot and certain points were marked using a handheld Garmin 60CSx GPS accurate to 15m.

The areas surrounding these points were photographed and a detailed commentary of these points follows after the general site description. Please refer to **Appendices A & C**.

GENERAL SITE DESCRIPTION

The site is bounded R44 in the west, the R45 to the south and the N1 to the North, and vineyard to the east. The site was until recently a vineyard which now appears to be abandoned.

Sloping N – S, the site is almost square in shape. There is a drainage ditch along what is probably the eastern boundary from the N1 to the R45. A drainage ditch from the R44 drains along the southern boundary of the site.

The naturally occurring soil on the site before disturbance of agriculture would have been of the Malmesbury shale Group with Swartland Shale Renosterveld the natural vegetation as classified by (Murcina and Rutherford). Renosterveld is usually associated with dry areas of fertile soil.

Soil appears to be well cultivated gravely sandy soil. A trench about 500mm deep was found on site and the soil type verified. No mottling which would indicate wetland soils was seen in the trench.

Olea Africana, *Searsia angustifolia* and *S. crenata*, *Cliffortia atrata* (botanical report, Bergwind) are growing down the side of what was probably the access road to the vineyard, and now appears to be the eastern boundary of the study site. No other natural vegetation was seen on the site.

The vines (which were bearing during the February site visit) are overgrown with *Cynodon dactylon*. No wetland plant species were present on the site during either of the two site visits.

A stand of *Pennisetum macrourum* is growing near the road partly on the study site and partly in the road reserve, where the drain from the site and the ditch along the road meet. There were a few *Zantedeschia aethiopica* growing in the stand of *Pennisetum* and some dry *Rumex* sp were seen during the February site visit. There was standing water in this area during the September site visit, i.e. after recent rains. The area was dry in February.

SUMMARY

This is a small area previously disturbed by agriculture. No natural vegetation exists on the site itself. There is a small, seasonally wet area at the junction of the 2 drains. This may have formed due to blockages or other insufficiencies in the road drainage system which, if repaired, may drain this site and remove the existing conditions which have lead to the formation of the wetland. This area is considered to offer nil ecological value as a wetland.

Although the site was wet during the September site visit, the only standing water on the site was at the intersection of the 2 drains, leading to the conclusion that the site is well drained. As the site was previously farmed with vine, it is clearly a well drained site as vines will rot if they are subjected to long periods in standing water during their dormant phase.

There are no development constraints on this site as far as wetland issues are concerned.

DETAILED SITE DESCRIPTION.

GPS Position 273 (Photograph 001)

General view over the site to the south. The patch of *Pennisetum macrourum* can be seen in the distance in front of the cars

GPS Position 274 (Photographs 002 – 005)

GPS Position 274 is almost in the centre of the site and shows views to all compass points. The site is an old, overgrown vineyard.

GPS Position 275 (Photograph 006)

This position is in the wetland patch of *Pennisetum* near to the R45. although this area was wet, there was no standing water on the outer edge of the wetland.

GPS Position 305 (Photograph 007)

This trench about 500 mm deep was found on the study site and photographed to illustrate the soil type as sandy gravel typical of Malmesbury Shale soil that has been cultivated. No wetland soil indicator in the form of mottling was seen in the trench.