Aller River Walk Report

6th & 7th November 2015

Compiled by Penny Rees
Duzi uMngeni Conservation Trust (DUCT)
December 2015

Background

Following the success of the Source to Sea uMngeni River walk in May 2012, the Mayday team felt that follow up walks were necessary, as during the uMngeni walk we witnessed many impacts that clearly originated from tributary streams and rivers, and realised that in order to rehabilitate the uMngeni River, many of the tributaries would have to be investigated. The eThekweni Conservancies Forum approached the Mayday team in 2015 with the request to walk and map all impacts on the Aller River.

Thus, on the 6th November 2015, Mark Liptrot of the uThekwane Conservancy joined Preven Chetty and I as we set off from the source of the Aller River in New Germany, Durban. The Aller "walk" proved to comprise more hacking than walking as we made our way along the river banks through almost impenetrable bush in an attempt to avoid contact with the sewage infested river water. This was time consuming, and took us two hard days to follow the ten kilometres of Aller from the source to the confluence with the uMngeni River in Reservoir Hills.

We attempted at all times to stay beside the river, and when that was not possible we mostly kept the river in sight, aside from three areas: the first was a 300 metre section inside the Clermont township comprising low income houses / informal settlement where we were advised to leave the river for security reasons. On our support crew then arriving with a police escort to enable our safe passage, we nonetheless abandoned the attempt as we all agreed that walking the stretch was an absolute health hazard due to illegal dumping, broken glass, human faeces, rotting waste and general filth in the river and on the banks resulting in us missing out two sections of 200 metres and 900 metres respectively. The last missed area comprising 1.8 kilometres was due to an extremely steep section of unnavigable river banks and steep surrounding hillsides. Had the water been less dangerously contaminated, we would probably have been able to walk in the river and would thus most likely not have missed out this section.

All impacts were recorded by GPS, Dictaphone and photograph. One Mini SASS river health assessment test and six Methylene Blue bacterial indicator tests were carried out. The maps used by the team are marked with numbered waypoints every 200 metres in order to record the location of impacts to within 200 metres. These maps comprise Appendix 1

This report is the record of our observations.

Acknowledgements

Our thanks to:

- Paolo Candotti and the eThekwini Conservancies Forum for initiating and supporting the walk
- Mark and Cecily Liptrot for their absolutely superb hospitality and for making us feel so completely at home in your "eyrie" overlooking the Krantzkloof Nature Reserve
- Justine Saunders who undertook all the pre walk mapping and who was joined by Phumelele Moroka in assisting Hugh McGibbon with providing us with water resupply and support along the way.
- Constables Ziqubu and Shozi who were so prepared to slog down the river with us
- All the friendly and helpful landowners and residents that we met along the river

Don't ever volunteer as support crew for one of these walks – its hard work!
An enormous thank you to our indefatigable support driver Hugh McGibbon who reccee'd the entire route prior to our arrival. Not satisfied with just dropping us off in the mornings and finding us in the evenings, Hugh would (somehow) accurately calculate our time of arrival at a pre anticipated spot and we would be pleasantly surprised by Hugh joined at times by Justine and Phumelele with a shout, smile, friendly wave and a water resupply along the river! Knowing that you were close by and in contact was comforting when we went through some dodgy areas – dodgy due to human as well as terrain challenges!
Thank you just does not verbalise our gratitude.

Penny Rees
December 2015

The Duzi uMngeni Conservation Trust (DUCT)
Dedicated to the health of the uMsunduzi and uMngeni Rivers

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1 Area description

GPS Co-Ordinates

Start: - 29 47 08 73S 30 52 18 98E (Corner of Hilmer Street, New Germany, Durban, KZN)

Finish: -29 46 50 61S 30 55 46 63E (Confluence of the uMngeni River, Reservoir Hills, Durban, KZN)

Altitude drop

365 metres to 20 metres above sea level

General Description

The Aller River begins life as a pretty pool in New Germany. Situated in a crescent of hills and surrounded by a "guard of honour" of Strelitzia and other indigenous tropical coastal plants, the stream once would have received its water from innumerable trickles running off the hillside. Today these tiny watercourses are built over with roads and houses, and all storm water runoff is channelled via a large storm water pipe into the gully wherein the pool lies.

Thereafter the small stream with mostly rocky stream bed is surrounded by beautiful indigenous bush inundated with invasive plants, a park of mown grass and erratic piles of illegally dumped garden waste. A causeway delineates where the park ends, and thereafter houses and gardens abut the stream which disappears in places under a mantle of invasive creepers. The banks increase in height and there are patches of indigenous bush interspersed with invasives.

Emerging from suburbia, we see that a sewerage pipeline runs along the bank of the river – the raised concrete manholes indicating the route of the underground pipe. The Aller then enters an industrial area where factories replace homes on the river banks, where the dumped ingredients comprise

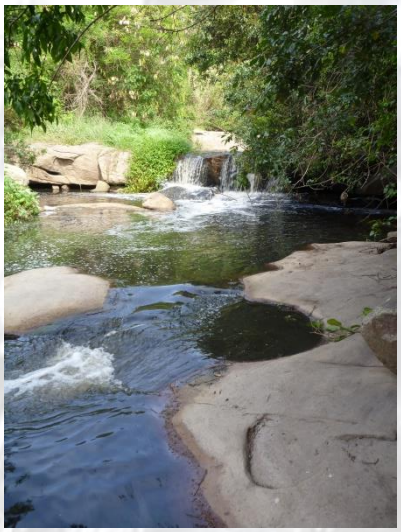
Top: Source area of the Aller
Middle: Suburban area of Aller
Bottom: Industrial area of Aller

general waste and building rubble and there after the factories are in turn replaced by informal settlements. The stream is now descending, the banks becoming steeper and higher as the water gathers momentum and quantity. The steep banks become strewn with waste of all sorts, the stench rising in the humid heat whist the water is by now a murky grey.

The hillside comprises Clermont township, with a burgeoning informal settlement that has sprung up in the area between the river and the township houses. On the sandy soils of the river bank beside the informal settlement, waste alternates with small vegetable patches, outdoor “latrine” sites and the sewerage pipeline.

As we reach the New Germany Waste Water Treatment Works (WWTW) we find we have left urbanisation and are walking through an area of large indigenous trees shading natural bush – albeit dotted with invasive plants. This stretch of river is beginning a slightly steeper descent and there are areas that could be very pretty riffles and cascades, but the filthy water denies that. The water released from the WWTW is not clear – there seems to be a carry-over of solids – disinfected solids judging by the extremely strong smell of chlorine which is used to treat the water prior to release back into the river.

Now the Aller enters a rural area, and approximately 1.8 kilometres downstream of the WWTW the river water is clear again. The atmosphere, terrain and vegetation are now more of Valley Bushveld, as the Aller gives sustenance to subsistence farms and cascades over a rock ledge before spreading out over rocks worn smooth by aeons of water flow. The waters edges are black with small snails feeding on the strands of algae – an indicator of the increased nutrients, from sewage.



Top: Clermont Township
Upper Middle: Clermont informal houses
Lower Middle: Sewage in the lower reaches of the Aller
Bottom: Clear, snail infested cascade area

Not 400 metres downstream a sewer manhole is surcharging, pouring raw sewage into the Aller River and turning the clear water into a grey mess. Having thus far run in a general west to east west direction, the Aller now begins to run in a north-easterly direction, the river rapidly descending and the steep sides of the valley rising up a hundred metres above the river in places. The banks are clothed in thick Valley Bushveld species as the Aller cascades and rushes in tight bends downwards to the uMngeni River flowing for approximately six kilometres through a largely wild and untouched valley of interlocking spurs, where the cliffs echo with bird calls, and the only riparian impacts seem to be ten old causeways, six water pipes crossing the valley bottom, the ever present sewage manholes and a rough largely disused vehicle track running alongside the river.

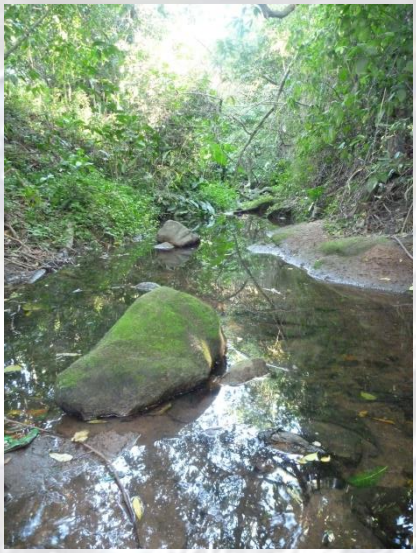
Small isolated piles of plastic rubbish lie on the banks in places – testimony to the high floods that rush down the valley during summer rains that are exacerbated by all the urban storm water flows which find their way into the river. As the Aller bursts out of the valley, channelled in a small flood plain completely smothered in invasive Spanish Reeds, the water is finally clear. But one last surcharging manhole ensures that the Aller is once again completely grey and contaminated with sewage when the waters meet with the clear uMngeni River.

Top: View of valley through which the lower reaches of the Aller flows
Upper Middle: Water pipe crossing the Aller Valley
Lower Middle: End of the valley
Bottom: Aller / uMngeni confluence

2 Wild Animals

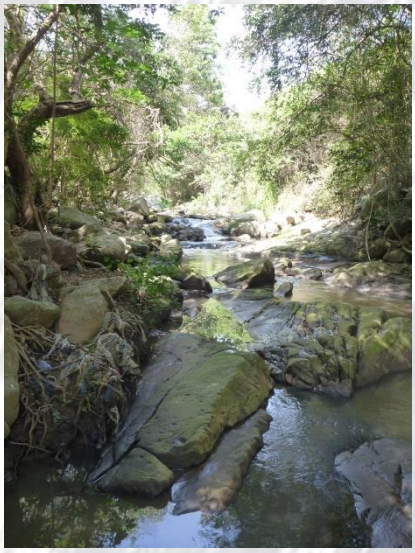
A total of forty six butterfly species and forty one bird species were recorded. A Fish Eagle was heard in the source area and Africa's largest raptor, a Marshall Eagle, was seen in the lower reaches of the valley where numerous Purple Crested Turaco were also seen. (See appendix 2 for full species lists). Besides Water Mongoose tracks in the mud near Janine Road and scat in the lower reaches and a sighting of a metre-long Water Monitor there were few signs of mammals. Residents with Aller river frontage in New Germany informed us that they *"used to see water mongoose as well as crabs and frogs quite frequently coming up into our garden. More recently, it has been just a few crabs".* The lack of spoor and droppings in the uninhabited indigenous bush along the lower two kilometers of the river was surprising.

3 Terrestrial Vegetation / Least impacted riparian buffer areas



- The Aller River is 13.5 kilometres long, thus there are a total of 27 kilometres of river bank along the length of the river.
- Of the 27 kilometres comprising both banks of the Aller there are 4.3 kilometres of relatively un-impacted to completely un-impacted riparian buffer. These areas are as follows:

Area 1
Left Bank
Waypoint: 51 – 49.5 (Source to Chait Close causeway)
Distance from source: *Source*
Length: 300 metres
Vegetation: Mix of Valley and Coastal Bush
Comment: A large expanse of inland Coastal Forest



Area 2
Both Banks
Waypoint: 10 to confluence with uMngeni River
Distance from source: 8.2 km
Length: 4 kilometres (total both banks)
Vegetation: Mix of Valley and Coastal Bush
Comment: There are occasional impacts in this area comprising pipelines (purified and waste water) that cross the valley, a dirt vehicle track which at times runs in the buffer either parallel to the river or on approaches

Top: Spialia spio (Mountain Sandman)
Middle: Area 1
Bottom: Area 2

to the causeways; a few small concrete structures related to the pipeline and some invasive plants that are beginning to colonise the riparian zone in the lower section. Besides these however the riparian area is un-impacted.

For security reasons, the team was advised to leave the river between waypoints 42 to 40.5. Due to health concerns raised by the rotting solid waste and faeces on the river banks the team did not see the section between waypoints, 39.5 to 38.5 and 38 to 33.5, and finally, due to densely vegetated and extremely steep banks combined with the fact that the sewage in the water eliminated the possibility of walking in the river itself, the team missed the area from waypoint 19.5 to 10. This section needs farther investigation as there is a good possibility that this riparian area is un-impacted.

For a list of indigenous plants recorded on the Aller see appendix 3

4 Wetlands

Wetlands are nature's water storage and purification works and they are an integral part of natural systems. They slow down the flow of water, thus providing flood prevention; they supply downstream areas with water due to the fact that they store water and slowly release it; wetland plants remove contaminants from water, thus "polishing" or purifying the water, and of course wetlands provide an extensive habitat for a large variety of birds, mammals and amphibians.

No wetlands were noted on the Aller, although at the time of the walk we may have referred erroneously to a wetland in the area of the Aller / uMngeni confluence. This area is in fact a floodplain.

5 Negative Impacts

Riparian Buffer Zone

Rivers and the adjacent land function together and impacts on one have a direct effect on the other. Thus a healthy riparian zone will have positive impacts on the health of the adjacent river. For this reason rivers have a riparian buffer which comprises a belt of land extending out from both river banks for 32 metres wherein disturbance is illegal. Exemptions to this are historical activities (eg decades-old constructions such as homes and roads)

Photo: Waypoints 39.5 to 38.5: Rotting solid waste and human faeces on the river banks

Terrestrial Invasive Vegetation

Indigenous vegetation on the Aller River banks is heavily infested with alien plants in the majority of areas. In the New Germany area, from the source to Berkshire Road (waypoints 51 to 44) the majority of these alien plant species are garden species, such as Arrowhead vine, Singapore daisy, Sword Fern, Ginger and Wandering Jew (Tradescantia spp). They have most likely taken root after having been dumped as waste, having self-seeded, escaped from gardens or been seeded by birds. The section immediately downstream of Chait Close (Waypoints 48.5 to 47.5) is completely smothered in a mix of Sou Sou (Solanum torvum) and Moon Flower (Ipomea alba).

From the industrial area (right bank) and Claremont (left bank) the dominant alien plants comprise many of the invasive species seen commonly all over Durban. The most prevalent of the 29 species recorded along the Aller include Balloon vine, Bug weed, Lantana, Madumbi, Mexican Sunflower, Spanish Reed, Syringa and Yellow Bells. In many areas the invasive plants have completely smothered the indigenous bush to the point that it cannot be seen to be identified.

Downstream of the New Germany Waste Water Treatment Works, somewhere between waypoints 19.5 to 10 the invasive plants decline prior to a re-emergence in the last few hundred metres of predominantly Balloon Vine, Mexican Sunflower, Yellow Bells, Singapore Daisy, the occasional Syringa tree and Madumbis. These are in low densities and could be brought under control if their elimination were prioritised as soon as possible.

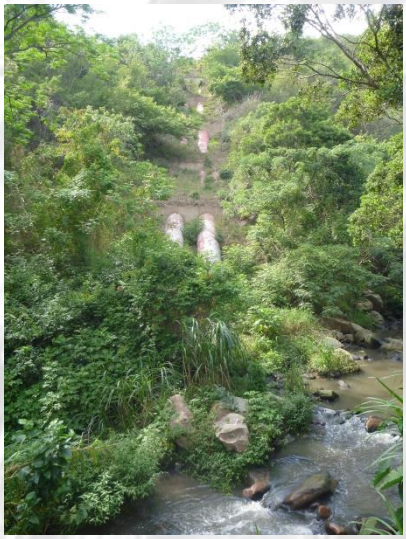
Appendix 3 contains lists of all invasive and alien plants recorded

Top: Suburbia - Garden, lawn; Madumbi, Ginger, Sou Sou, Moon Vine on river banks
Middle: Industrial area - Indian Laurel forest, Syringa, Bug weed and Cromolaena
Bottom: Near New Germany WWTW - Mexican Sunflower, Bug weed, Eucalyptus

Drainage ditches / dykes / diversions
None noted

Construction / buildings
Many of the buildings such as homes, industrial buildings and parking areas that are situated inside the buffer area were constructed prior to the legal implementation of the buffer zone. The Low Cost Housing development seems to have initially respected the buffer as all the formal homes have been constructed outside the buffer. However there are many informal homes that have been and are being constructed inside the "vacant" buffer zone, some as close as ten metres from the edge of the river. There are in addition the following:

- A buried main sewer line runs on the left bank almost constantly from the source to close to the uMngeni River confluence. There is either lawn or a cleared vehicle inspection access route on top of the pipeline for most of the length of the Aller. Raised manhole access points are situated approximately every 50 to 100 metres along the length of the river.
- Eleven causeways, eleven road bridges and seven pipelines cross the river
- Downstream of the source, there are some places where the river banks have either houses and or gardens in the buffer (Ghait Road to Sander Road waypoints 49 - 45.5)
- In the industrial area, buildings and parking grounds are situated in the buffer
- Some small kitchen gardens were observed on the river banks upstream of the New Germany WWTW



Top: Suburbia – manhole & public area lawn in buffer
Upper Middle: Industrial – construction and dumping
Lower Middle: Clermont – informal houses in buffer
Bottom: Lower reaches – pipeline in buffer

Erosion

Elevated, unnaturally high levels of silt in a river reduce or block sunlight penetration, which impacts negatively on aquatic plants and animals. Plants need sunlight to produce their food and silt levels block the visibility of aquatic creatures, effecting hunting and fleeing behaviour. Fish and many other aquatic insects have gills which can be clogged by silt. All this has a profound impact on the health of a river. Natural erosion takes place during floods and in the meandering incised river channels as the river erodes the outer banks and deposits silt on the inner banks.

As the Aller banks are heavily vegetated for much of the rivers length there is little soil erosion, however, the very sandy soils used for subsistence cultivation may erode if the river bursts its banks

Roads

As mentioned above, an unpaved sewer pipe access track runs for approximately half of the length of the Aller. This is in two sections:

- Sporadically on the left bank of the from a point near the intersection of Roger Sishi & P Tshabalala Ave to the lower end of Clermont (waypoints 33 - 19.5)
- From two kilometres upstream of the Aller / uMngeni confluence to just 200 metres from the confluence, crossing the river ten times via a series of concrete causeways. This road switches from left to right bank a number of times in order to utilise the flatter areas of the inside river banks

Top: Erosion potential, industrial area
Upper Middle: Erosion potential, lower end of Clermont
Lower Middle: Access track and Balloon Vine between waypoints 33 - 19.5
Bottom: Access track and causeway, lower reaches near confluence

Sand Mining
None noted

Illegal Dumping
Illegal dumping of garden, domestic, building and general waste impacts the riparian zone and river from the source to waypoint 24. Once there is no habitation close to the river, the dumping of waste stops.

- There is apparently usually much dumping immediately downstream of the source, however the Aller walk took place a month after world Coastal clean-up day, during which many bags of refuse were removed from the this area, which was still clean when we began the walk.
- Most dumped garden waste was in the suburbs at points where the stream is easily accessed via open lawn or road; building rubble was seen more frequently in the industrial area.
- In the informal settlements where there is apparently no municipal waste disposal, household waste is thrown over the river banks.
- In the township, general waste was dumped onto the river bank or into the river and occasionally burnt.
- In the rural area some burn-pits were observed close to the river.
- 200 metres upstream of the Aller / uMngeni confluence a pile of old vehicle tyres lies on the river bank at the foot of a steep hill slope topped by cliffs. Some tyres are wedged in trees and it is evident that the tyres have been thrown off the top of the cliff some 50 metres above the river seemingly from open ground between two suburban properties on Annet Drive.

Top: Suburban garden waste dumping
Upper Middle: Suburban dumping
Lower Middle: Clermont dumping
Bottom: Tyres thrown off cliffs in the last 200 metres of the Aller

In-stream Impacts

Extraction / Water Demand

None noted.

Nutrification / Sewage

Nutrification is the process whereby excess loads of nutrients such as ammonia, nitrites, nitrates, phosphates, organic carbon and nitrogen enter a river due to poor management of effluent, incorrect agricultural application, dumping, leaks and spills. Human and livestock faeces, industrial waste and fertilisers are all sources of such excess nutrients.

Visual indicators of excessive nutrient levels include:

- "sludge" (elevated levels of microscopic organisms called Diatoms) is sometimes evident on submerged rocks and river bed.
- large amounts of green algae
- water a grey colour
- water with foam looking like soap suds

At times the only indication of contamination is the smell of the water which can assist in identifying the source / type of contamination.

Downstream of Waypoint 43 in the industrial area, the water of the river began to look slightly turbid. At waypoint 39.5 the river banks were an open latrine and by waypoint 38 the river smelt of sewage and had algal blooms in the water. This was particularly concerning as the Clermont School is situated above the river, and there is a path leading across the Aller at this point.

Between waypoints 33 and 27 one manhole was observed surcharging raw sewerage into the Aller River and a total of six manholes showed evidence of recent surcharges (wet faeces pooled and dried faeces stacked around and against the manholes or making a black trail away from the relevant manhole towards the river).

Top: Waypoint 38 – sewage smell and algal bloom. Manhole with signs of surcharge
Bottom: Waypoint 31 – dried excrement from surcharge

At the upper end of the New Germany WWWTW (waypoint 32) there were heavy loads of sludge (diatoms) on the river bed and submerged rocks, and there were also clumps of algae.

The water being released from the New Germany WWTW smelt of chlorine and was, additionally, extremely turbid. This is possibly as a result of carryover, whereby a problem at the works prevents the effective separation of solids and liquids, resulting in the solids ending up in the water that is released back into the river. When carryover occurs, the release water is often given extra doses of chlorine in an attempt to destroy bacteria - this would explain the strong chlorine smell at the release site.

By waypoint 22.5 the river water had finally become clear and had no smell of sewage, but 200 metres downstream of this at waypoint 21.5, a second manhole was surcharging into the river. We left the river not far below this point and re-joined it at waypoint 10 by which time the turbidity as still evident, but less than at the previous surcharging manhole.

The turbidity of the river gradually lessened until waypoint 1 which although still turbid, was bordering on clear. By the time the Aller reached its confluence 200 metres downstream, it was again 100% turbid grey w ith sewage.

Industrial effluent

Possible effluent releases may be occurring in the industrial area, however due to the extremely dense vegetation we did not observe any storm water drains or other potential release points into the river.

Top: Upper end of WWTW – clear water, elevated diatoms and algae
Upper Middle: WWTW outlet – turbid water & strong chlorine smell
Lower Middle: Waypoint 21.5 – surcharging manhole
Bottom: Turbid Aller, clear uMngeni at confluence.

Vehicle Emissions

On all roads there are numerous pollutants that originate from vehicles, either via emissions into the air, or from leaks, drips and spills. During a 1991 study on urban runoff pollution, it was calculated that *direct emissions from vehicles were estimated to be 0.2g per vehicle-kilometre travelled & 0.125g from tyre wear…. 50% of lead emissions formed stable aerosols in the atmosphere which could then be widely spread.* (Simpson, 1991 pg 2). The following are some of the common toxins originating from vehicles:

Sulphur*: sulphur is present in diesel and after leaving the combustion chamber, undergos various changes until it becomes sulphuric acid, which is responsible for sulphate particulate matter emissions. Sulphur oxides are the number one culprits when it comes to acid rains*

Carbon monoxide (CO)*: hydrocarbons (HC), and aldehydes are generated in the exhaust and from engine lube oil* http://www.fleetwatch.co.za/

Nitrogen oxides (NOx)*: are generated from nitrogen and oxygen, are very toxic and NO and NO2 contribute to acid rain*

Volatile Organic Compounds (VOC's*): Consisting of unburned hydrocarbons can further react to form ground level Ozone (O3), a major component of smog.*

Metals *such as lead, zinc and cadmium are deposited from tyre wear; copper and asbestos from anti-freeze and brake linings.* (Simpson, 1991 pg 2)
http://www.engen.co.za/

Due to the sloping terrain of the area around the Roger Sishi / P Tshabalala intersection there is also the possibility of toxins from vehicle leaks being washed down the road and into the Aller via storm water drains. Farther east, from waypoints 33 to 20, Roger Sishi Road and the adjacent dual carriage way run roughly parallel to the river on the top of the south hillside in this area. This close proximity to the river may result in toxic chemicals from general traffic being blown into the Aller from these roads.

Dams / Weirs

Dams, weirs and causeways negatively impact on river health by reducing or changing flow regimes; trapping silt; depositing water of a different temperature into the river and depositing silt either via outlet releases (large dams) or when changing water temperatures during spring and autumn cause currants that stir up detritus on the dam bed.

The pipeline servitude track mentioned above crosses the river by means of a series of ten causeways. All these causeways have large pipes built into them which prevent complete damming of the river, however they do effectively slow the flow of the river.

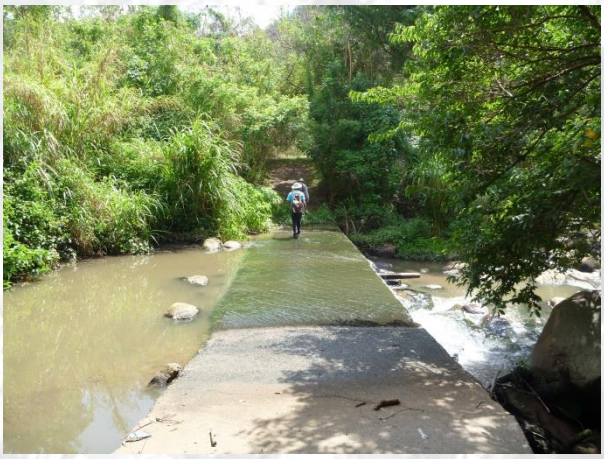


Photo: Typical causeway in the lower reaches of the Aller

Litter / dumping

- The low level bridge in Janine Road is blocked up by litter that has been washed downstream
- Dumping into the river takes place in the industrial area where vehicles can access the river
- In the lower reaches of the Aller, plastic waste carried by high flood levels is left behind on the banks by receding floodwaters

Sand Mining

None noted

Construction

Construction for an unknown reason was taking place in a section of the Aller river bed at the start of the industrial area

6 River Health

One needs to keep in mind the difference between water quality and river health. Water quality is defined as "*to describe the physical, chemical, biological and aesthetic properties of water that determines its fitness for a variety of uses and for the protection of the health and integrity of aquatic systems"* (SA Water Quality Guidelines)

River health on the other hand, comprises a far broader range taking in the entire ecological system of the river and interconnected land; of not only the water, but also the physical river (river bed and river banks) as well as flora and fauna communities in the river and occurring on the banks.

During the walk, all impacts were recorded and photographed, and regular Mini SASS, Methylene Blue, Turbidity & one Index of Habitat Integrity (IHI) tests were undertaken. Mini SASS is a general indicator of river health, Meth Blue indicates levels of bacterial & oxygen (the higher the level of bacteria the lower the amount of oxygen in the water), turbidity indicates levels of suspended solids in the water whilst IHI indicates the percentage of disturbance to river and buffer.

Top: Litter trapped at Janine Road low level bridge
Middle: Dumped items in river bed
Bottom: Plastic waste left in tree by receding floodwaters, lower reaches

Mini SASS

Mini SASS is a very simple and enjoyable way of determining the health of the river, and the results give an overall picture of river health that is often missed by laboratory tests, for the pure and simple reason that a lab test, if taken say a week after a chemical contamination, may not reveal any chemicals whilst the Mini SASS gives an overall picture of the rivers health at any time. With Mini SASS, aquatic insects are caught, identified and classed according to tolerance levels of pollution and a simple scoring method results in an accurate picture of river health.

Mini SASS scores are broken down as follows:
Under 5.1 = Seriously / critically modified, very poor condition
5.1 – 6.1 = Largely modified / poor condition
6.1 – 6.8 = Moderately modified / fair condition
6.8 – 7.9 = Largely Natural / few modification GOOD condition
+7.9 = Unmodified / Natural condition

Due to the high levels of sewage contamination we were only able to conduct one Mini SASS test approximately 100 metres from the source, and this produced a score of 5.3 indicating that the river was in poor condition.

Methylene Blue

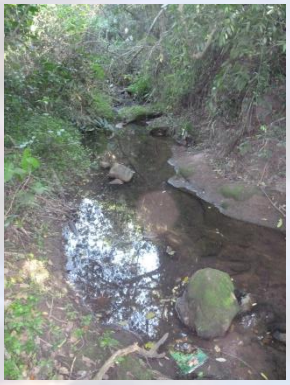
Bacteria in water consume oxygen, thus reducing the availability of oxygen for the inhabitants of the river (for example fish and invertebrates).
Methylene Blue is utilized to give an indication of bacterial and oxygen levels in water. The Meth Blue is used to stain the oxygen in a sample of river water and as any bacteria present consume the oxygen, the blue colour fades. If there are no bacteria, the blue does not fade. A control sample is boiled prior to staining, in order to kill any bacteria and thus the colour will not fade and the control provides a colour benchmark. The control sample will not change as boiling kills all bacteria.

A total of six Methylene Blue tests were carried out along the length of the Aller

Site 1: Mini SASS

Site description: The Aller source area comprising a number of drainage lines has been transformed and the natural water course routes have been re-landscaped by suburban development which has altered the source. Situated at the foot of a hill slope as well as a junction of three roads, the Aller River begins in a bowl shaped depression fed by storm water drains from the roads which empty into the “bowl” of the source and is scoured out by the storm waters running off the roads. The Mini SASS site is situated approximately 100 metres downstream of the source “bowl”.
Waypoint: 50.5
Surrounding Land use: Residential suburb of New Germany
Surrounding Vegetation: Right bank: narrow band of indigenous vegetation bordered by tar road; left bank: indigenous vegetation
Turbidity: Water 100% clear
Siltation on river bed and submerged rocks: River bed muddy, no silt on submerged rocks
IHI: 27.5% - slight impact
Mini SASS score: 5.3 On the cusp of Seriously / critically modified, VERY POOR condition and Largely modified / POOR condition

River Health negatively impacted due to: storm water scouring; “invisible” harmful / toxic chemicals, pesticides, herbicides etc in storm water, close proximity of roads; alien vegetation



Site 2: Methylene Blue

Site description: At Mini SASS site approximately 100 metres downstream of the source

Waypoint: 50.5

Surrounding Land use: Residential suburb of New Germany

Surrounding Vegetation: Right bank: narrow band of indigenous vegetation bordered by tar road; left bank: indigenous vegetation

Turbidity: Water 100% clear

Siltation on river bed and submerged rocks: River bed muddy, no silt on submerged rocks

IHI: 27..5% - slight impact

Indicator: Sample remained unchanged in 5 days indicating extremely low to no bacteria and conversely, oxygen levels of 80 to 100%. Thus the low Mini SASS score at the 1st test site is not caused by bacterial contamination

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Site 3: Methylene Blue

Site description: Upstream boundary of New Germany Waste Water Treatment works, approximately 3.8 kilometres from source. Downstream of informal settlement on banks of Aller in Clermont

Waypoint: 32

Surrounding Land use: Township and WWTW

Surrounding Vegetation: Right bank: indigenous with alien invasives; left bank: indigenous with alien invasives

Turbidity: Water 100% clear

Siltation on river bed and submerged rocks: Thick layer of “sludge” (Diatoms) on river bed and submerged rocks, algae present

IHI: Not tested

Indicator:: Sample faded completely after four days indicating 60 – 80% oxygen and 20 – 40% bacteria.

River Health negatively impacted due to: close proximity to WWTW; downstream of surcharging sewer manholes; litter in river

Site 4: Methylene Blue

Site description: Downstream boundary of New Germany Waste Water Treatment works, approximately 4 kilometres from source. Smell of chlorine

Waypoint: 31

Surrounding Land use: WWTW

Surrounding Vegetation: Right bank: WWTW; left bank: Indigenous with invasives

Turbidity: Water 100% brown grey turbid

Siltation on river bed and submerged rocks: Not seen due to high turbidity

IHI: Not tested

Indicator: Sample turned clear within 48 hours indicating high bacterial levels and little oxygen.

River Health negatively impacted due to: effluent releases of the New Germany WWTW

Site 5: Methylene Blue

Site description: Approximately 8.6km from source, slight smell of sewage

Waypoint: 8

Surrounding Land use: Vacant land

Surrounding Vegetation: Right bank: indigenous bush since WWTW outflow 4.6 km upstream; left bank: 2km downstream of sewer surcharge that has reportedly been flowing "for a long time"

Turbidity: Water 100% grey brown turbid with some foam on surface

Siltation on river bed and submerged rocks: Not seen due to high turbidity

IHI: Not tested

Indicator: Sample turned clear within 48 hours indicating high bacterial levels and little oxygen

River Health negatively impacted due to: sewerage from surcharging manholes

Site 6: Methylene Blue

Two samples were taken – the first from the Aller River water and the second sample from the uMngeni River.

Site description: Aller River at confluence with uMngeni River

Waypoint: 0

Surrounding Land use: Vacant land

Surrounding Vegetation: Aller - Right bank: floodplain invaded by Spanish Reed; left bank: floodplain

uMngeni – Right bank invaded by Spanish Reed; left bank indigenous bush

Turbidity: Aller - Water 100% grey turbid and smelling of sewage

uMngeni - Water clear, no sewage smell

Siltation on river bed and submerged rocks: Aller - Not seen due to high turbidity

IHI: Not tested

Indicator: Aller - Sample turned clear within 48 hours indicating high bacterial levels and little oxygen

uMngeni – Sample remained unchanged indicating high oxygen levels and low bacteria levels

River Health negatively impacted due to: sewerage from surcharging manholes

Methylene Blue samples:

All samples were originally the same blue colour as the Control sample on top.

Bottles from left:

- Site 2: Waypoint 50.5
- Site 3: Waypoint 32
- Site 4: Waypoint 31
- Site 5 Waypoint 8
- Site 6: Waypoint 0 – Aller
- Site 6: Waypoint 0 - uMngeni

Summary of River Health Tests

Site	Distance From source	Upstream Land Use	Adjacent Land Use	Buffer vegetation	Invasive Vegetation in buffer	Turbidity (Visibility)	Silt on bed	IHI	Mini SASS / Meth Blue
1	100m	New Germany suburbs	Houses & road	Left intact buffer. Right narrow band only	Very little	100%	Bed not visible.	27.5% - slight impact	5.3 On the cusp of Seriously / critically modified, VERY POOR condition and Largely modified / POOR condition
2	100m	New Germany suburbs	Houses & road	Left intact buffer Right narrow band only	Very little	100%	Bed not visible.	27.5% - slight impact	Sample remained unchanged in 5 days = very low bacteria / 80 to 100% oxygen levels
3	3.8km	Clermont, industrial area and indigenous bush	WWTW & Clermont township	Both banks: indigenous with alien invasives;	Over 50%	100%	Bed not visible		Sample faded completely after four days = 60 to 80% oxygen / 20 to 40% bacteria.
4	4km	WWTW	WWTW & Clermont township	Left bank: Indigenous with invasives	Over 50%	0% Brown	Bed not visible		Sample turned clear within 48 hours = high bacterial levels and little oxygen.
5	8.6km	None	Indigenous bush; & township 2km downstream of sewer surcharge	Both banks: indigenous with alien invasives;		0% Grey brown. Surface foam	Bed not visible		Sample turned clear within 48 hours = high bacterial levels and little oxygen
6	13.5km Aller	None	None	Left: Indigenous Right: invasive	Spanish Reed	0%. Grey	Bed not visible		Sample turned clear within 48 hours = high bacterial levels and little oxygen
6	uMngeni	None	None	Left: Indigenous Right: invasive	Spanish Reed	100% clear			Sample remained unchanged = high oxygen levels and low bacteria counts

Reasons for poor river health

As a result of the impacts described in 5 above, the health of the Aller River is un-acceptably low due to damage to the riparian areas in the upper reaches, and the sewage contamination in the lower reaches. Due to the worsening destruction of the riparian zone downstream of the Mini SASS test site plus the contamination via sewerage and illegal dumping the assumption has been made that the Aller deteriorates to very poor condition for the majority of its remaining length.

Buffer Vegetation:

Although the buffer vegetation has not been removed or destroyed in many places along the length of the Aller, it is invaded for almost its entire length with alien plants, many of which are invasive. Two areas that are least impacted by invasives are the left bank immediately below the source area (waypoints 51 to 49) and the lower reaches from waypoints 10 to 4.5 which seem to have a low density of invasives which then increase again from waypoint 4.5 until the confluence with the uMngeni River.

Storm Water:

The source of the Aller is a small bowl shaped depression in an urban environment adjacent to a junction of three roads that slope steeply towards the source basin. This results in the river being the receiving point for large quantities of storm water from the surrounding area which will have the impact of scouring the river bed. Thus the likely causes of the low river health score so close to the source are most likely to be

- invisible contaminants entering the river via roads and storm water (for example herbicides and pesticides from neighbouring gardens; toxins from passing vehicles – drips, leaks and emissions)
- scouring action of storm water flows

As discussed on page 15 above there is the possibility that storm water is also carrying toxic vehicle leaks and drips into the Aller

Top: Buffer invaded by Spanish Reed, waypoint 1
Middle: Storm water entry point at causeway, waypoint 49
Bottom: Source – storm water receptacle

Siltation:

Some siltation of the river bed between Chait Close and Janine Road (waypoints 49 and 45.5) as well as in the industrial area downstream of Berkshire road (+- waypoint 43) was observed. This occurrence, in conjunction with stone gabions, some eroded banks plus river banks of +- 3 or more metres high indicates that erosion is taking place, most likely exacerbated by the scouring effect of storm water flows originating from surrounding paved surfaces may be impacting the upper reaches.

Turbidity:

For the 1st three kilometres (waypoints 51 – 36) the river is clear, with 100% clarity. Thereafter until the confluence with the uMngeni River, the water is mostly very grey and cloudy. All turbidity seemed to originate from effluent from surcharging manholes and the outflow of the New Germany Waste Water Treatment Works.

Bacteria:

Methylene Blue tests confirmed an increase in bacteria (and a decrease in oxygen) along the length of the Aller.

Nutrients:

The Indicators of excessive levels of nutrients in the Aller comprised the following:

- algae in the river – 1st occurrence in Clermont (waypoint 38);
- high levels of sludge (diatoms) just upstream of the WWTW
- high levels of snails (Physidae or Lymnaeidae spp) at waypoint 22.5
- foam with the appearance of soapsuds (waypoint 27)
- sewage from surcharging sewer manholes

Top: Stone gabion and turbid water from eroded banks, waypoint 43
Upper Middle: Turbid river, waypoint 21
Lower Middle: Snails, waypoint 22.5
Bottom: Foam, waypoint 27

Vehicle emissions

There is the possibility of contamination from vehicle emissions.

Conclusion:

The negative health of the Aller River is caused predominantly by the following major impacts:

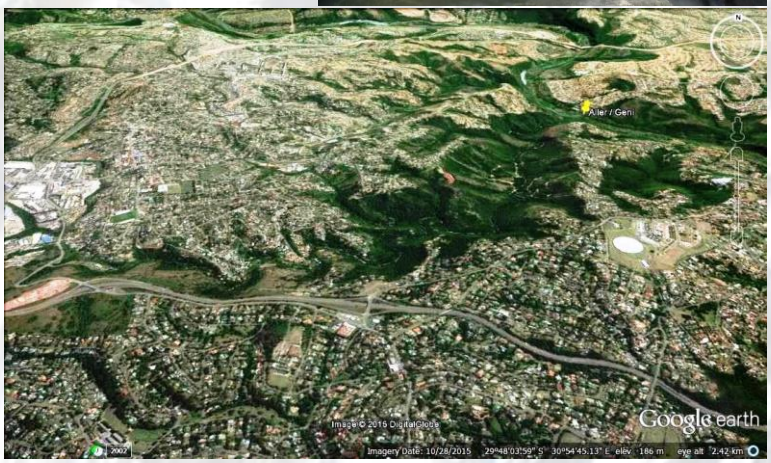
- Source to Clermont's Roger Sishi / P Tshabalala Ave Intersection (Waypoints 51 – 33):
  - The destruction of the riparian habitat by invasive and alien plants
  - The contamination of the river by invisible urban and possibly industrial contaminants
  - Storm water surges / scouring
- Roger Sishi / P Tshabalala Ave Intersection to confluence (waypoints 33 – 1):
  - Contamination by sewage.

7 Green Corridor

Potential Stewardship / Conservancy Sites

The area discussed hereunder has the potential for protection via either Stewardship or the lower Conservancy status. The lower four kilometres of the 13.5km long Aller River lie in a wild, steeply sided, deep and almost inaccessible valley of surprising size when viewed on Google (see Google image bottom right).

Densities of invasive plants in this area are low enough that their eradication is possible, and we strongly urge that some protection be afforded this area in order to serve as a buffer for the uMngeni River as well as provide a green lung to Durban. There is also a vast potential for the valley to be used for recreational purposes such as hiking, mountain biking, trail runs, birding and, should the river be free from sewage, tubing. Appendix 4 shows the location of the area.



River hiking way potential

The lower four kilometres worthy of protection status discussed above has the potential for cycling and walking and a circular route may well be an option.

Photos: the lower reaches of the Aller River worthy of some form of protection

Findings and Recommendations

Findings

Impacts

In light of the fact that the Aller passes through so many different urban land uses, its saving grace is the deep almost impenetrable valley in its lower reaches which, due to the surrounding terrain, has remained by and large un-impacted.

Water Quality - Mini SASS

Mini SASS tests are only an effective means of monitoring river health in the absence of contaminants hazardous to health and thus the Methylene Blue tests are a good backup giving some indication of the rivers state.

Catchment Management

Catchment management (or the lack thereof) has meant that terrestrial invasive plants have become rampant along the upper reaches of the Aller. These plants not only destroy the indigenous vegetation, but also utilise ground water which would otherwise enter the river system, in many cases block the sunlight from the river, changing the whole ecology of the river and damaging bio diversity.

A program to remove the alien plants in the riparian areas would assist in restoring the health of the riparian zone and would also enable the river to better absorb some of the impacts of severe storm water flows. Security issues of some neighbouring residents in the upper reaches are a concern, whilst others that we spoke to immediately upstream of Janine Road welcomed the clearing of the invasives along the river.

Recommendations

Sewage contamination

The Aller is contaminated with sewage from two main sources: surcharging sewer manholes and the New Germany WWTW. This situation needs to be prioritised and remedied as a matter of urgency.

Immediately after the Aller Walk, the sewage contamination seen at the Aller / uMngeni confluence was reported. In early December 2015, we received reports that the area was still awash in sewage, and a second more concerted round of reporting took place. This highlighted the difficulties in reporting such surcharges in that the problem reporting facilities available to the public are not satisfactory.

Recommendation 1:
Improve: access to available contact details to report problems
Improve: hotline efficiency, replies, responses and follow ups

Recommendation 2:
Sewer Education Program**:** a mixture of drama and educational activities at local schools, churches and other organisations to educate users on how water borne sewers work, and how to use them. This has been done in Durban previously, and was run in Mpophomeni in Howick for three years with great success

Recommendation 3:
Eco Champs: the appointment of local residents who reside close to the sewer manholes who report surcharges. This prevents sewers from surcharging for days or weeks.

Recommendation 4:
Sewer Monitors: We observed that the pipeline path from way points 33 to +- 24.5 has been kept cut open. In areas where there are no nearby homes, a local resident/s could be appointed to walk / ride a bicycle daily along given lengths of this pathway to inspect the pipeline and report any surcharges

Solid Waste

Recommendation 5:
Solid Waste Removal needs to be implemented by the authorities to eliminate dumping.

Invasive plants

The riparian areas of the Aller are negatively impacted by invasive plant species in various degrees of density.

Recommendation 6:
An alien invasive plant removal program needs to be initiated from the source to the Aller / uMngeni confluence in order to restore natural riparian vegetation.

- The area at the source is not heavily infested with invasives, and it would not take much effort to clear these (waypoints 51 – 49).
- Downstream of Chait Road (waypoint 49 – 45) is 100% smothered by Sou Sou and Moonflower which will continue to spread. It was impossible to see what, if anything, is still growing underneath these creepers, and this area needs to be dealt with as a matter of priority.
- An area that would be worth further investigation for invasive / alien removal is the section immediately upstream of Janine Road, where the invasives are less dense and hidden away is a very beautiful stretch of stream which could be rehabilitated without massive work load (waypoint 47 to 45.5)
- From Berkshire Road through the industrial area, (waypoint 44 to 42) balloon vine is the major invasive which will take serious work to eliminate, with other species being less dense in occurrence and easier to eliminate. At the stand of Indian Laurel trees (waypoint 42 to 43), Balloon Vine seedlings are emerging in their hundreds, and these need to be hand pulled asap prior to them colonising and taking over this area.
- By Sishi / Tshabalala intersection (waypoint 33) Lantana has become dense as well as Balloon Vine and Mexican Sunflower, with lesser concentrations of other invasives
- The lower reaches of the Aller have low infestations of invasives up until waypoint 2.5 when the invasives begin to increase dramatically, specifically Balloon Vine, Spanish Reed and Syringa

See appendix 3 for lists of invasives by name and waypoint

Large Invasive Trees

Over enthusiastic felling of all large invasive trees down the river needs to be approached with caution in areas where there are no large indigenous trees. Due to development, suitable nesting sites are disappearing or have already disappeared, particularly for raptors, and in some cases the large invasives along the river may be the only suitable nesting sites if they are the only large trees left. Thus the wholesale removal of all large trees could result in the disappearance of especially any raptor species.

Recommendation 7:

Teams who work the river clearing invasives should be trained to find and identify raptor nests, and a scientific guideline should be drawn up with criteria for the eradication choices concerning these large trees. A rule of thumb is to leave five large trees around the nest tree. For example, the Crowned Eagle will have a nest in one tree, but as a security measure will often alight on a nearby large tree prior to approaching the nest. Thus if all trees other than that which holds the nest are felled, this will also impact these birds ability to nest and raise their young. Many Fish Eagle nests seen on other river walks were situated in large gum trees, and many of the raptor sightings were of these birds perched in the large trees.

Buffer lengths (as opposed to buffer widths)

As noted time and again on other river walks, given enough space, the health of a river will improve if there is enough length without impact. Some may argue that then contamination is not a problem, but it should be kept in mind that a tipping point could be reached whereby there is so much contamination that the river will be unable to heal.

A healthy Aller River will (i) ensure the rivers ability to function as a storm water buffer and (ii) will prevent raw sewage entering the uMngeni River which will in turn improve the health of the uMngeni River reducing health risks to downstream users. In the 1.5 kilometres immediately downstream of the Aller / uMngeni River confluence we observed riverside vegetable farmers who use the river to irrigate their crops and local children swimming in the uMngeni. We have also previously seen the uMngeni in the area used for the following: Sangoma Cleansing ceremony; Shembe Healing Ceremony and Hindi Funeral ceremony.

Recommendation 4:

In order to increase the resilience and health of the Aller River and the downstream uMngeni River, it would thus make sense to implement a buffer length (in addition to the current 32 metre buffer width) in all planning programs - municipal and other, in order to ensure that the river water is able to rejuvenate. Areas identified as being potential contamination sources, no matter how much of an effort is made to avoid such contamination, could then have a sufficient buffer length downstream that should be guaranteed / protected. The area we noted for this purpose is that uninhabited area downstream of Clermont from waypoints +-21 to 0

Monitoring River Health

Without the input of local residents, it will be a difficult task to rehabilitate and restore the Aller River

Recommendation 8:
Hold water workshops with local residents in order to empower and enable them to take part in monitoring their area of river by means of Mini SASS, as well as taking part in the rehabilitation of their area of river. Workshops could include suburban and township residents as well as factory staff from the industrial area. Two ideal target areas are two schools in Clermont both situated extremely close to the river.
A request was made to the team by a local resident in Clermont for assistance with implementing programs with local school learners during school holidays and tis could be a useful way of approaching tis aspect.
More information can be accessed on www.minisass.org

Vehicle Emissions

There seems to be a definite possibility of either wind borne or solid vehicle emissions contaminating the Aller waters.

Recommendation 9:
This subject needs more investigation in the area of the Aller.

Limitations

- This was not a scientific data collecting expedition, and thus our records, although accurate, are not complete. There were occasions where we would have to detour away from the river due to either heavy bramble infestations or terrain challenges, which restricted our ability to keep records.

- It is impossible to physically record and photograph every single negative impact seen, although the majority of impacts were recorded.

- We have attempted to compile this report for ease of reference for both laymen and those with environmental backgrounds.

- We hope that our efforts assist in not only raising awareness regarding the plight of the Lions River, but also inspire rehabilitation and care of this precious resource for the benefit of all those “downstream”

Conclusion

In addition to various negative impacts which include invasive plants, construction and invisible water contaminants, the Aller is contaminated with sewage for at least 8.5 kilometres of its 10 kilometre length. Be it River Health or Water Quality, the end result for the Aller and the folk who live along this small river is the same. With the province entering a severe drought, the Aller should be able to sustain neighbouring communities. They should be able to use its water without danger instead of watching this toxic stream flow by.

This short river stands out as a large green chunk in Durban Metro, and is thus worthy of rehabilitation and restoration. The negative impacts are by no means irreversible and we trust that this report can be used as the first phase of the rehabilitation of the Aller River

Penny Rees
December 2015

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With these hands, with this heart
and with the pure intention of God
this water is now blessed
Removing and transmuting all impurities and
returning them to the light forever.
Peace.
Kuan Yin Water Blessing

Appendix 1

Area Description

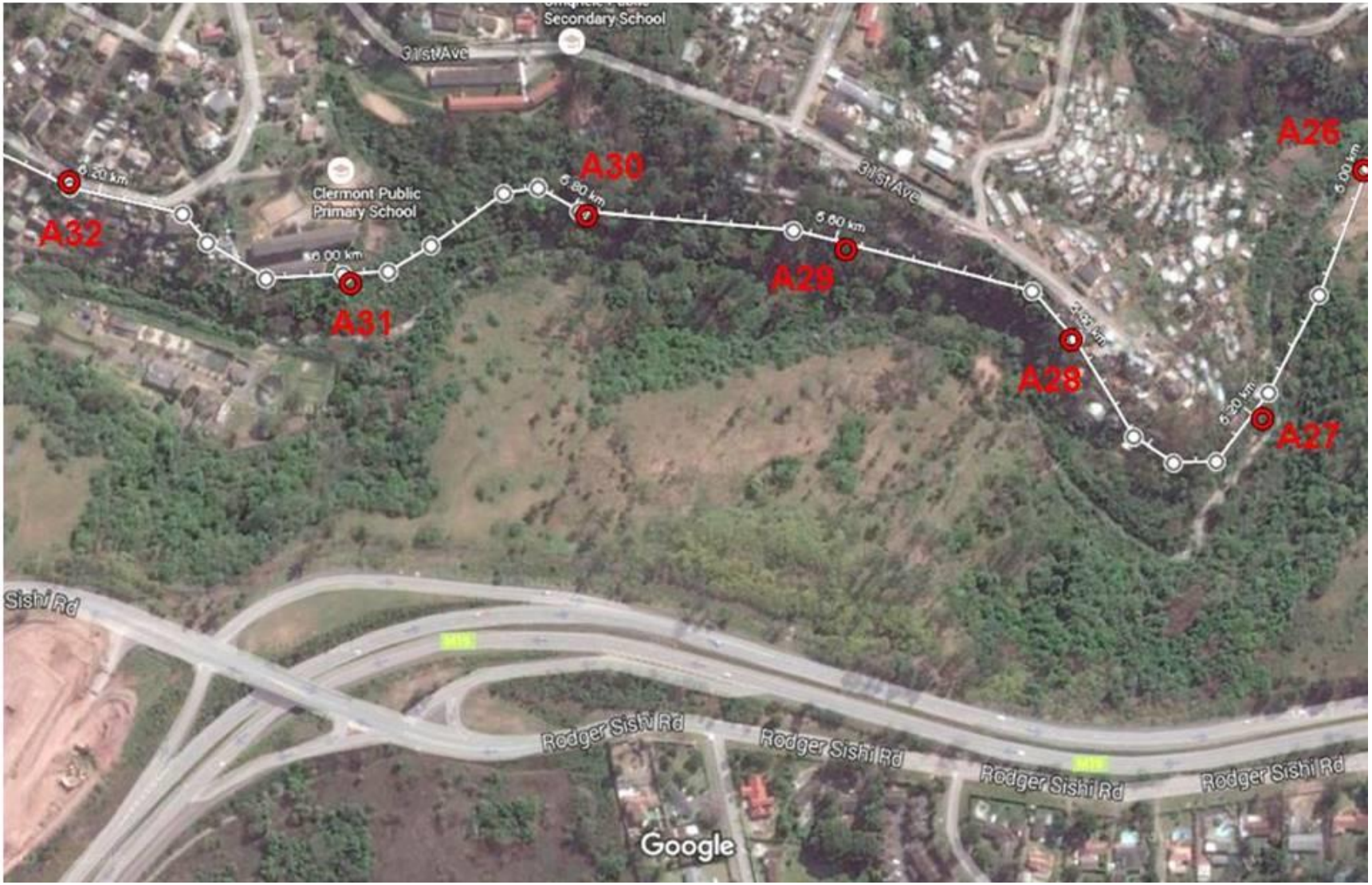
Aller waypoints 51 to 48

Aller waypoints 47 to 43

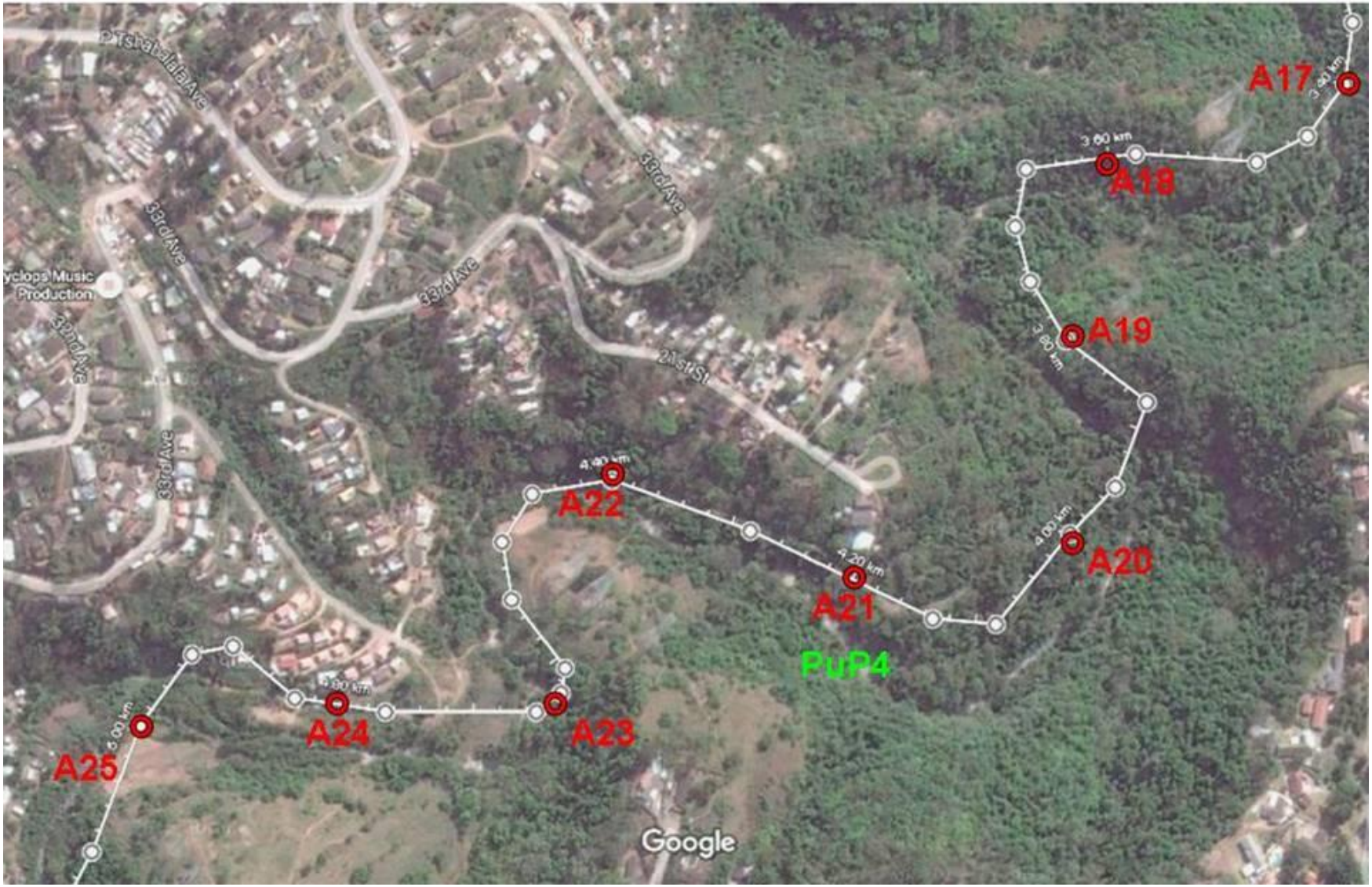
Aller waypoints 42 to 36

Aller waypoints 35 to 33

Aller waypoints 32 to 26



Aller waypoints 26 to 17



Aller waypoints 16 to 11

Aller waypoints 10 to 8

Aller waypoints 8 to 5

Aller waypoints 4 to 0

Appendix 2

Wildlife

Bird species list
Butterfly species list

Bird species Identified

Roberts No.	Common Name	Scientific Names
451	African Hoopoe	Upupa africana
710	African Paradise Flycatcher	Terpsiphone viridis
84	African Sacred Ibis	Threskiornis aethiopicus
464	Black-collared Barbet	Lybius torquatus
857	Black-headed Heron	Ardea melanocephala
545	Black-headed Oriole	Oriolus larvatus
857	Bronze Mannikin	Spermestes cuicullatus
391	Burchell's Coucal	Centropus supercillisosus
598	Cape Robin-chat	Cossypha caffra
713	Cape Wagtail	Motaccilla capensis
796	Cape White-eye	Zosterops pallidus
732	Common Fiscal	Lanius collaris
758	Common Myna	Acridotheres tristis
568	Dark-capped Bulbul	Pycnonotus tricolor
102	Egyptian Goose	Alopochen aegyptiacus
631	African Fish Eagle	Haliaeetus vocifer
541	Fork-tailed Drongo	Dicrurus adsimilis
452	Green-shouldered Wood-hoopoe	Phoeniculus purpureus
94	Hadeda Ibis	Bostrychia hagedash
205	House Sparrow	Passer domesticus
578	Kurrichane Thrush	Turdus libonyuana
355	Laughing Dove	Streptopelia senegalensis
140	Martial Eagle	Polemaetus bellicosus
196	Mountain Wagtail	Motacilla clara
790	Olive Sunbird	Nectarinia olivacea
371	Purple-crested Turaco	Tauraco porphyreolopha
858	Red-backed Mannikin	Spermestes nigriceps
600	Red-capped Robin-chat	Cossypha natalensis
377	Red-chested Cuckoo	Cuculus solitarius
352	Red-eyed Dove	Streptopelia semitorquata
842	Red-faced Mousebird	Urocolius indicus
769	Red-winged Starling	Onychognathus morio
469	Rock Martin	Hirundo fuligula
572	Sombre Greenbul	Andropedus importunus
494	Southern Black Flycatcher	Melaenornis pammelaina
810	Spur-winged Goose	Piectropterus gambensis
359	Tambourine Dove	Turtur tympanistria
199	Village Weaver	Ploceus cucullatus
787	White-eared Barbet	Stactolaema leucotis
86	Yellow-billed Duck	Anas undulata
126	Yellow-billed Kite	Milvus parasitus
869	Yellow-fronted Canary	Crithagra mozambica
471	Yellow-rumped Tinkerbird	Pogoniulus billineatus

Butterfly species Identified

Acleros	mackenii	mackenii	Macken's dart
Coeliades	keithloa		Red-tab policeman
Gegenes	niso	niso	Common hottentot
Parnara	monasi		Water watchman
Sarangesa	motozi		Elfin skipper
Spialia	dromus		Forest sandman
Tagiades	flesus		Clouded forester
Azanus	moriqua		Black-bordered babul blue
Azanus	natalensis		Natal babul blue
Cacyreus	lingeus		Bush bronze
Hypolycaena	philippus	philippus	Purplebrown hairstreak
Leptotes	sp.		Zebra blue
Zizeeria	knysna	knysna	African grass blue
Zizina	otis	antanossa	Dark grass blue
Acraea	horta		Garden acraea
Acraea	natalica		Natal acraea
Acraea	oncaea		Window acraea
Amauris	albimaculata	albimaculata	Layman; Layman friar
Bicyclus	safitza	safitza	Common bush brown
Byblia	anvatara	acheloia	Joker
Danaus	chrysippus	orientis	African monarch, Plain tiger
Eurytela	dryope	angulata	Golden piper
Eurytela	hiarbas	angustata	Pied piper
Junonia	oenone	oenone	Blue pansy
Junonia	orithya	madagascariensis	Eyed pansy
Neptis	saclava	marpessa	Spotted sailer
Protogoniomorpha	parhassus		Mother-of-pearl
Telchinia	encedon	encedon	White-barred acraea
Vanessa	cardui		Painted lady
Graphium	leonidas	leonidas	Veined swordtail
Papilio	dardanus	cenea	Mocker swallowtail, Flying Handkerchief
Papilio	demodocus	demodocus	Citrus swallowtail
Papilio	nireus	lyaeus	Green-banded swallowtail
Afrodryas	leda		Autumn leaf vagrant
Belenois	creona	severina	African common white
Belenois	gidica	abyssinica	African veined white
Colotis	auxo	auxo	Sulphur orange tip
Colotis	erone		Coast purple tip
Colotis	euippe	mediata	Smoky orange tip
Dixeia	pigea		Ant-heap white
Eronia	cleodora		Vine-leaf vagrant
Eurema	brigitta	brigitta	Broad-bordered grass yellow
Leptosia	alcesta	inalcesta	African wood white
Mylothris	agathina	agathina	Common dotted border
Nepheronia	argia	mhondana	Large vagrant
Pontia	helice	helice	Meadow white

Appendix 3

Vegetation – Indigenous and Invasive

Indigenous Trees Identified

Invasive Plants and Weeds Identified
Invasive and alien plant location by waypoint reference
Invasive and alien plant location by common name

Indigenous Trees Identified

Latin name	Common name
Acacia caffra	Common hookthorn
Albizia adianthifolia	Flatcrown
Bersama lucens	Glossy white ash
Brachylaena discolor	Coast silver oak
Bridelia micrantha	Mitzeeri
Calodendrum capense	Cape chestnut
Canthium inerme	Common Turkey-berry
Celtis africana	White stinkwood
Chrysanthemoides monilifera	Bush tickberry
Clausena anisata	Horsewood
Clerodendrum glabrum	Cat's whiskers
Clutia pulchella	Warty-fruited Clutia
Coddia rudis	Small bone apple
Combretum erythrophyllum	River bushwillow
Combretum molle	Velvet bushwillow
Crotalaria capensis	Cape rattlepod
Croton sylvaticus	Forest fever berry
Cryptocarya woodii	Cape quince
Cussonia sphaerocephala	Natal forest cabbage tree
Cussonia spicata	Common cabbage tree
Dalbergia armata	Thorny rope
Dalbergia obovata	Climbing flat bean
Deinbollia oblongifolia	Dune soap berry
Diospyros villosa	Hairy star-apple
Dombeya rotundifolia	Common wild pear
Dracaena aletriformis	Large leafed dragon tree
Ekebergia capensis	Cape ash
Erythrina lysistemon	Common coral tree
Ficus lutea	Swamp fig/Giant Leaved fig
Ficus natalensis	Natal Fig
Ficus sur	Broom cluster fig/Cape fig
Ficus sycamorus	Common cluster fig
Ficus thonningii	Common wild fig
Grewia occidentalis	Crossberry
Gymnosporia buxifolia	Common Spikethorn
Halleria lucida	Tree fuschia
Harpephyllum caffrum	Wild plum
Heteropyxis natalensis	Lavender tree
Indigofera jucunda	River indigo
Keetia guenzii	Climbing turkeyberry

Macaranga capensis	Wild poplar
Millettia grandis	Umzimbeet
Obetia tenax	Mountain nettle
Ochna natalitia	Natal plane
Pavetta lanceolata	Weeping bride’s bush
Phoenix reclinata	Wild date palm
Plumbago auriculata	Plumbago
Protorhus longifolia	Red beech
Psychotria capensis	Black bird berry
Rauvolfia caffra	Quinine tree
Rhoicissus tomentosa	Common forest grape
Rhoicissus tridentata	Bushman’s grape
Sclerocarya birrea	Marula
Searsia chirindensis	Red Currant
Searsia dentata	Nana berry
Searsia lucida	Glossy currant
Strelitzia nicolai	Natal wild banana
Syzygium cordatum	Waterberry / umdoni
Tabernaemontana ventricosa	Forest toad tree
Tecomaria capensis	Cape honeysuckle
Tetradinia riparia	Iboza
Trema orientalis	Pigeonwood
Trichilia dregaeana	Forest mahogany
Trimeria grandifolia	Wild mulberry
Vangueria infausta	Wild medlar
Vepris lanceolata	White ironwood
Zanthoxylum capense	Small knobwood
Ziziphus mucronata	Buffalo thorn

Invasive Plants and Weeds Identified

Genus	Species	Common name
Acacia	mearnsii	Black wattle
Ageratum	conyzoides	Ageratum
Ardisia	crenata	Coral bush
Arundo	donax	Spanish/giant reed
Bidens	pilosa	Black-jack
Caesalpinia	decapetala	Mauritius thorn
Callisia	repens	Creeping inch plant
Canna	indica	Indian shot
Cardiospermum	grandiflorum	Balloon vine
Cestrum	laevigatum	Inkberry
Cinnamomum	camphora	Camphor tree
Cromolaena	odorata	Triffid weed
Eucalyptus	grandis	Saligna gum
Hedychium	sp.	Ginger lilies
Ipomea	alba	Moonflower (white)
Ipomea	sp.	Morning glory (purple)
Jacaranda	mimosifolia	Jacaranda
Lantana	camara	Lantana
Litsea	glutinosa	Indian laurel
Melia	azedarach	Syringa
Mimosa	pudica	Sensitive weed/Pantrop weed
Montanoa	hibiscifolia	Tree Daisy
Morus	alba	Mulberry
Nephrolepis	exaltata	Sword fern
Pereskia	aculeata	Barbados gooseberry
Pistia	stratiotes	Water lettuce
Psidium	guajava	Guava
Ricinus	communis	Castor-oil plant
Rubus	cuneifolius	American bramble
Schinus	terebinthifolius	Brazilian pepper tree
Senna	didimobotrya	Peanut butter cassia
Solanum	mauritanum	Bugweed
Tecoma	stans	Yellow bells
Thelochitonia	trilobata	Singapore daisy (Wedelia)
Tithonia	diversifolia	Mexican sunflower
Tradescantia	fluminensis	Wandering Jew
Tradescantia	zebrina	Wandering Jew

Invasive and alien plant location by waypoint reference

Location	Waypoint	Common name	Genus	Species
Source to Chait Close	49 - 50	Angels Trumpet	Brugmansia	suaveolens
Source to Chait Close	49 - 50	Angels Trumpet	Brugmansia	suaveolens
Source to Chait Close	49 - 50	Arrow head vine	Syngonium	podophyllum
Source to Chait Close	49 - 50	Balloon Vine	Cardiospermum	grandiflorum
Source to Chait Close	49 - 50	Bug weed	Solanum	mauritanum
Source to Chait Close	49 - 50	Bugweed	Solanum	mauritanum
Source to Chait Close	49 - 50	yellow Bells	Tecoma	stans
Source to Chait Close	49 - 50	Ginger	Hedychium	
Source to Chait Close	49 - 50	Madumbi	Colocasia	esculenta
Source to Chait Close	49 - 50	Mexican sunflower	Tithonia	diversifolia
Source to Chait Close	49 - 50	Moon flower	Ipomoea	alba
Source to Chait Close	49 - 50	Singapore daisy	Thelochitonia	trilobata
Source to Chait Close	49 - 50	Sword Fern	Nephrolepis	exaltata
Source to Chait Close	49 - 50	Syringa	Melia	azedarach
Source to Chait Close	49 - 50	Tree daisy	Montanoa	hibiscifolia
Source to Chait Close	49 - 50	Umbrella Tree	Schefflera	arboricola
Source to Chait Close	49 - 50	Wandering Jew	Tradescantia	
Source to Chait Close	49 - 50	yellow Bells	Tecoma	stans
Chait Close to Janine Rd	45,5 - 49	Baloon vine	Cardiospermum	grandiflorum
Chait Close to Janine Rd	45,5 - 49	Baloon vine	Cardiospermum	grandiflorum
Chait Close to Janine Rd	45,5 - 49	Bamboo	Bambusa	
Chait Close to Janine Rd	45,5 - 49	Barbados goosberry	Pereskia	aculeata
Chait Close to Janine Rd	45,5 - 49	Bouganvilla		
Chait Close to Janine Rd	45,5 - 49	Bug weed	Solanum	mauritanum
Chait Close to Janine Rd	45,5 - 49	Bug weed	Solanum	mauritanum
Chait Close to Janine Rd	45,5 - 49	Coralberry tree	Ardisia	crenata
Chait Close to Janine Rd	45,5 - 49	Garden & fence		
Chait Close to Janine Rd	45,5 - 49	Ginger	Hedychium	
Chait Close to Janine Rd	45,5 - 49	Ginger	Hedychium	
Chait Close to Janine Rd	45,5 - 49	Madumbi	Colocasia	esculenta
Chait Close to Janine Rd	45,5 - 49	Madumbi	Colocasia	esculenta
Chait Close to Janine Rd	45,5 - 49	Moon flower	Ipomoea	alba
Chait Close to Janine Rd	45,5 - 49	Shoo Shoo	Solanum	torvum
Berkshire Rd to Dinkleman Rd	42 - 44	Balloon vine	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Balloon vine	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Baloon vine SEEDLINGS	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Bug weed	Solanum	mauritanum
Berkshire Rd to Dinkleman Rd	42 - 44	Bugweed	Solanum	mauritanum
Berkshire Rd to Dinkleman Rd	42 - 44	Ginger	Hedychium	
Berkshire Rd to Dinkleman Rd	42 - 44	Hibiscus (red flower)	Hibiscus	
Berkshire Rd to Dinkleman Rd	42 - 44	Indian Laurel	Litsea	glutinosa
Berkshire Rd to Dinkleman Rd	42 - 44	Mulberry	Morus	alba
Berkshire Rd to Dinkleman Rd	42 - 44	Pine	Pinus	
Berkshire Rd to Dinkleman Rd	42 - 44	Syringa	Melia	azedarach

Berkshire Rd to Dinkleman Rd	42 - 44	Triffid???	Cromolaena	odorata
Berkshire Rd to Dinkleman Rd	42 - 44	Unidentified		
Berkshire Rd to Dinkleman Rd	42 - 44	Wandering Jew	Tradescantia	
Dinkleman Rd	40,5-39,5	Madumbi	Colocasia	esculenta
Dinkleman Rd	40,5-39,5	Mexican sunflower	Tithonia	diversifolia
Dinkleman Rd	40,5-39,5	yellow Bells	Tecoma	stans
D/S R Shishi / P Tshabalala Ave	33 - 32	Baloon Vine	Cardiospermum	grandiflorum
D/S R Shishi / P Tshabalala Ave	33 - 32	Castor Oil	Rhicinus	communis
D/S R Shishi / P Tshabalala Ave	33 - 32	Mexican sun flower	Tithonia	diversifolia
D/S R Shishi / P Tshabalala Ave	33 - 32	Yellow Bells	Tecoma	stans
D/S R Shishi / P Tshabalala Ave	32 - 31	Balloon vine	Cardiospermum	grandiflorum
D/S R Shishi / P Tshabalala Ave	32 - 31	Bramble / Lantana?		
New Germany WWTW to 21st Str	31 - 27	Balloon Vine	Cardiospermum	grandiflorum
New Germany WWTW to 21st Str	31 - 27	Blue Gum	Eucalyptus	
New Germany WWTW to 21st Str	31 - 27	Blue Gum	Eucalyptus	
New Germany WWTW to 21st Str	31 - 27	Bug weed	Solanum	mauritanum
New Germany WWTW to 21st Str	31 - 27	Bugweed	Solanum	mauritanum
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
New Germany WWTW to 21st Str	31 - 27	Mexican sunflower	Tithonia	diversifolia
New Germany WWTW to 21st Str	31 - 27	Mexican sunflower	Tithonia	diversifolia
New Germany WWTW to 21st Str	31 - 27	Peanut Butter Cassia	Senna	didimobotrya
New Germany WWTW to 21st Str	31 - 27	Sword Fern	Nephrolepis	exaltata
New Germany WWTW to 21st Str	31 - 27	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	31 - 27	Wandering Jew	Tradescantia	
New Germany WWTW to 21st Str	27 - 26	Gum	Eucalyptus	
New Germany WWTW to 21st Str	27 - 26	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	27 - 26	Yellow Bells	Tecoma	stans
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Castor Oil	Rhicinus	communis
4 to 3km from confluence	21,5 - 19,5	Lantana	Lantana	camara
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Wandering Jew	Tradescantia	
4 to 3km from confluence	21,5 - 19,5	Yellow Bells	Tecoma	stans
Freese Rd	39,5	Balloon vine	Cardiospermum	grandiflorum
New Germany WWTW to 21st Str	24	Wandering Jew	Tradescantia	
New Germany WWTW to 21st Str	23,5	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	21,5	yellow Bells	Tecoma	
2 - 1km from confluence	10	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	9	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	9	Wandering Jew	Tradescantia	

2 - 1km from confluence	9	Yellow Bells	Tecoma	stans
2 - 1km from confluence	8	Balloon vine	Cardiospermum	grandiflorum
2 - 1km from confluence	8	Lantana	Lantana	camara
2 - 1km from confluence	6	Canna	Canna	
2 - 1km from confluence	6	Madumbi	Colocasia	esculenta
2 - 1km from confluence	6	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	6	Yellow Bells	Tecoma	stans
Under 1km from confluence	4,5	Balloon Vine	Cardiospermum	grandiflorum
Under 1km from confluence	4,5	Mulberry	Morus	nigra
Under 1km from confluence	4,5	Yellow Bells	Tecoma	stans
Under 1km from confluence	4	Balloon Vine	Cardiospermum	grandiflorum
Under 1km from confluence	4	Castor Oil	Rhicinus	communis
Under 1km from confluence	4	Indian Shot	Canna	indica
Under 1km from confluence	4	Madumbi	Colocasia	esculenta
Under 1km from confluence	4	Singapore daisy	Thelochitonia	trilobata
Under 1km from confluence	4	Syringa	Melia	azedarach
Under 1km from confluence	4	Yellow Bells	Tecoma	stans
Under 1km from confluence	3	Bug weed	Solanum	mauritanum
Under 1km from confluence	3	Lantana	Lantana	camara
500 metres from confluence	2,5	Balloon Vine	Cardiospermum	grandiflorum
500 metres from confluence	2,5	Mexican sunflower	Tithonia	diversifolia
500 metres from confluence	2,5	Singapore daisy	Thelochitonia	trilobata
500 metres from confluence	2,5	Syringa	Melia	azedarach
Under 1km from confluence	2	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	2	Bug weed	Solanum	mauritanum
Under 1km from confluence	2	madumbi	Colocasia	esculenta
Under 1km from confluence	2	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	2	Syringa	Melia	azedarach
Under 1km from confluence	2	yellow Bells	Tecoma	stans
Under 1km from confluence	1,5	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1,5	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1,5	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	1,5	Syringa	Melia	azedarach
Under 1km from confluence	1	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1	Bugweed	Solanum	mauritanum
Under 1km from confluence	1	Canna / Indian shot	Canna	
Under 1km from confluence	1	Madumbi	Colocasia	esculenta
Under 1km from confluence	1	Mexican sunflower	Tithonia	diversifolia
200m from confluence	1	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	1	spanish Reed	Arundo	donax
Under 1km from confluence	1	spanish Reed	Arundo	donax
Under 1km from confluence	1	spanish Reed	Arundo	donax
200m from confluence	1	spanish Reed	Arundo	donax
Under 1km from confluence	1	Syringa	Melia	azedarach

Invasive and alien plant location by common name

Location	Waypoint	Common name	Genus	Species
Source to Chait Close	49 - 50	Angels Trumpet	Brugmansia	suaveolens
Source to Chait Close	49 - 50	Angels Trumpet	Brugmansia	suaveolens
Source to Chait Close	49 - 50	Arrow head vine	Syngonium	podophyllum
Source to Chait Close	49 - 50	Balloon Vine	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Balloon vine	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Balloon vine	Cardiospermum	grandiflorum
D/S R Shishi / P Tshabalala Ave	32 - 31	Balloon vine	Cardiospermum	grandiflorum
New Germany WWTW to 21st Str	31 - 27	Balloon Vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
4 to 3km from confluence	21,5 - 19,5	Balloon vine	Cardiospermum	grandiflorum
Freese Rd	39,5	Balloon vine	Cardiospermum	grandiflorum
2 - 1km from confluence	8	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	4,5	Balloon Vine	Cardiospermum	grandiflorum
Under 1km from confluence	4	Balloon Vine	Cardiospermum	grandiflorum
500 metres from confluence	2,5	Balloon Vine	Cardiospermum	grandiflorum
Under 1km from confluence	2	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1,5	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1,5	Balloon vine	Cardiospermum	grandiflorum
Under 1km from confluence	1	Balloon vine	Cardiospermum	grandiflorum
Chait Close to Janine Rd	45,5 - 49	Baloon vine	Cardiospermum	grandiflorum
Chait Close to Janine Rd	45,5 - 49	Baloon vine	Cardiospermum	grandiflorum
D/S R Shishi / P Tshabalala Ave	33 - 32	Baloon Vine	Cardiospermum	grandiflorum
Berkshire Rd to Dinkleman Rd	42 - 44	Baloon vine SEEDLINGS	Cardiospermum	grandiflorum
Chait Close to Janine Rd	45,5 - 49	Bamboo	Bambusa	
Chait Close to Janine Rd	45,5 - 49	Barbados goosberry	Pereskia	aculeata
New Germany WWTW to 21st Str	31 - 27	Blue Gum	Eucalyptus	
New Germany WWTW to 21st Str	31 - 27	Blue Gum	Eucalyptus	
Chait Close to Janine Rd	45,5 - 49	Bouganvilla		
D/S R Shishi / P Tshabalala Ave	32 - 31	Bramble / Lantana?		
Source to Chait Close	49 - 50	Bug weed	Solanum	mauritanum
Chait Close to Janine Rd	45,5 - 49	Bug weed	Solanum	mauritanum
Chait Close to Janine Rd	45,5 - 49	Bug weed	Solanum	mauritanum
Berkshire Rd to Dinkleman Rd	42 - 44	Bug weed	Solanum	mauritanum
New Germany WWTW to 21st Str	31 - 27	Bug weed	Solanum	mauritanum
Under 1km from confluence	3	Bug weed	Solanum	mauritanum
Under 1km from confluence	2	Bug weed	Solanum	mauritanum
Source to Chait Close	49 - 50	Bugweed	Solanum	mauritanum
Berkshire Rd to Dinkleman Rd	42 - 44	Bugweed	Solanum	mauritanum
New Germany WWTW to 21st Str	31 - 27	Bugweed	Solanum	mauritanum

Under 1km from confluence	1	Bugweed	Solanum	mauritanum
2 - 1km from confluence	6	Canna	Canna	
Under 1km from confluence	1	Canna / Indian shot	Canna	
D/S R Shishi / P Tshabalala Ave	33 - 32	Castor Oil	Rhicinus	communis
4 to 3km from confluence	21,5 - 19,5	Castor Oil	Rhicinus	communis
Under 1km from confluence	4	Castor Oil	Rhicinus	communis
Chait Close to Janine Rd	45,5 - 49	Coralberry tree	Ardisia	crenata
Chait Close to Janine Rd	45,5 - 49	Garden & fence		
Source to Chait Close	49 - 50	Ginger	Hedychium	
Chait Close to Janine Rd	45,5 - 49	Ginger	Hedychium	
Chait Close to Janine Rd	45,5 - 49	Ginger	Hedychium	
Berkshire Rd to Dinkleman Rd	42 - 44	Ginger	Hedychium	
New Germany WWTW to 21st Str	27 - 26	Gum	Eucalyptus	
Berkshire Rd to Dinkleman Rd	42 - 44	Hibiscus (red flower)	Hibiscus	
Berkshire Rd to Dinkleman Rd	42 - 44	Indian Laurel	Litsea	glutinosa
Under 1km from confluence	4	Indian Shot	Canna	indica
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
New Germany WWTW to 21st Str	31 - 27	Lantana	Lantana	camara
4 to 3km from confluence	21,5 - 19,5	Lantana	Lantana	camara
2 - 1km from confluence	8	Lantana	Lantana	camara
Under 1km from confluence	3	Lantana	Lantana	camara
Source to Chait Close	49 - 50	Madumbi	Colocasia	esculenta
Chait Close to Janine Rd	45,5 - 49	Madumbi	Colocasia	esculenta
Chait Close to Janine Rd	45,5 - 49	Madumbi	Colocasia	esculenta
Dinkleman Rd	40,5-39,5	Madumbi	Colocasia	esculenta
2 - 1km from confluence	6	Madumbi	Colocasia	esculenta
Under 1km from confluence	4	Madumbi	Colocasia	esculenta
Under 1km from confluence	2	madumbi	Colocasia	esculenta
Under 1km from confluence	1	Madumbi	Colocasia	esculenta
D/S R Shishi / P Tshabalala Ave	33 - 32	Mexican sun flower	Tithonia	diversifolia
Source to Chait Close	49 - 50	Mexican sunflower	Tithonia	diversifolia
Dinkleman Rd	40,5-39,5	Mexican sunflower	Tithonia	diversifolia
New Germany WWTW to 21st Str	31 - 27	Mexican sunflower	Tithonia	diversifolia
New Germany WWTW to 21st Str	31 - 27	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
4 to 3km from confluence	21,5 - 19,5	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	10	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	9	Mexican sunflower	Tithonia	diversifolia
2 - 1km from confluence	6	Mexican sunflower	Tithonia	diversifolia
500 metres from confluence	2,5	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	2	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	1,5	Mexican sunflower	Tithonia	diversifolia
Under 1km from confluence	1	Mexican sunflower	Tithonia	diversifolia
200m from confluence	1	Mexican sunflower	Tithonia	diversifolia
Source to Chait Close	49 - 50	Moon flower	Ipomoea	alba

Chait Close to Janine Rd	45,5 - 49	Moon flower	Ipomoea	alba
Berkshire Rd to Dinkleman Rd	42 - 44	Mulberry	Morus	alba
Under 1km from confluence	4,5	Mulberry	Morus	nigra
New Germany WWTW to 21st Str	31 - 27	Peanut Butter Cassia	Senna	didimobotrya
Berkshire Rd to Dinkleman Rd	42 - 44	Pine	Pinus	
Chait Close to Janine Rd	45,5 - 49	Shoo Shoo	Solanum	torvum
Source to Chait Close	49 - 50	Singapore daisy	Thelochitonia	trilobata
Under 1km from confluence	4	Singapore daisy	Thelochitonia	trilobata
500 metres from confluence	2,5	Singapore daisy	Thelochitonia	trilobata
Under 1km from confluence	1	spanish Reed	Arundo	donax
Under 1km from confluence	1	spanish Reed	Arundo	donax
Under 1km from confluence	1	spanish Reed	Arundo	donax
200m from confluence	1	spanish Reed	Arundo	donax
Source to Chait Close	49 - 50	Sword Fern	Nephrolepis	exaltata
New Germany WWTW to 21st Str	31 - 27	Sword Fern	Nephrolepis	exaltata
Source to Chait Close	49 - 50	Syringa	Melia	azedarach
Berkshire Rd to Dinkleman Rd	42 - 44	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	31 - 27	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	27 - 26	Syringa	Melia	azedarach
New Germany WWTW to 21st Str	23,5	Syringa	Melia	azedarach
Under 1km from confluence	4	Syringa	Melia	azedarach
500 metres from confluence	2,5	Syringa	Melia	azedarach
Under 1km from confluence	2	Syringa	Melia	azedarach
Under 1km from confluence	1,5	Syringa	Melia	azedarach
Under 1km from confluence	1	Syringa	Melia	azedarach
Source to Chait Close	49 - 50	Tree daisy	Montanoa	hibiscifolia
Berkshire Rd to Dinkleman Rd	42 - 44	Triffid???	Cromolaena	odorata
Source to Chait Close	49 - 50	Umbrella Tree	Schefflera	arboricola
Berkshire Rd to Dinkleman Rd	42 - 44	Unidentified		
Source to Chait Close	49 - 50	Wandering Jew	Tradescantia	
Berkshire Rd to Dinkleman Rd	42 - 44	Wandering Jew	Tradescantia	
New Germany WWTW to 21st Str	31 - 27	Wandering Jew	Tradescantia	
4 to 3km from confluence	21,5 - 19,5	Wandering Jew	Tradescantia	
New Germany WWTW to 21st Str	24	Wandering Jew	Tradescantia	
2 - 1km from confluence	9	Wandering Jew	Tradescantia	
Source to Chait Close	49 - 50	yellow Bells	Tecoma	stans
Source to Chait Close	49 - 50	yellow Bells	Tecoma	stans
Dinkleman Rd	40,5-39,5	yellow Bells	Tecoma	stans
D/S R Shishi / P Tshabalala Ave	33 - 32	Yellow Bells	Tecoma	stans
New Germany WWTW to 21st Str	27 - 26	Yellow Bells	Tecoma	stans
4 to 3km from confluence	21,5 - 19,5	Yellow Bells	Tecoma	stans
New Germany WWTW to 21st Str	21,5	yellow Bells	Tecoma	
2 - 1km from confluence	9	Yellow Bells	Tecoma	stans
2 - 1km from confluence	6	Yellow Bells	Tecoma	stans
Under 1km from confluence	4,5	Yellow Bells	Tecoma	stans
Under 1km from confluence	4	Yellow Bells	Tecoma	stans
Under 1km from confluence	2	yellow Bells	Tecoma	stans

Appendix 4

Green Corridor Location


N
Aller / Geni
INDUSTRIAL AREA
CLERMONT
NEW GERMANY WWTW
POTENTIAL PROTECTED AREA
RESERVOIR HILLS

Appendix 5

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