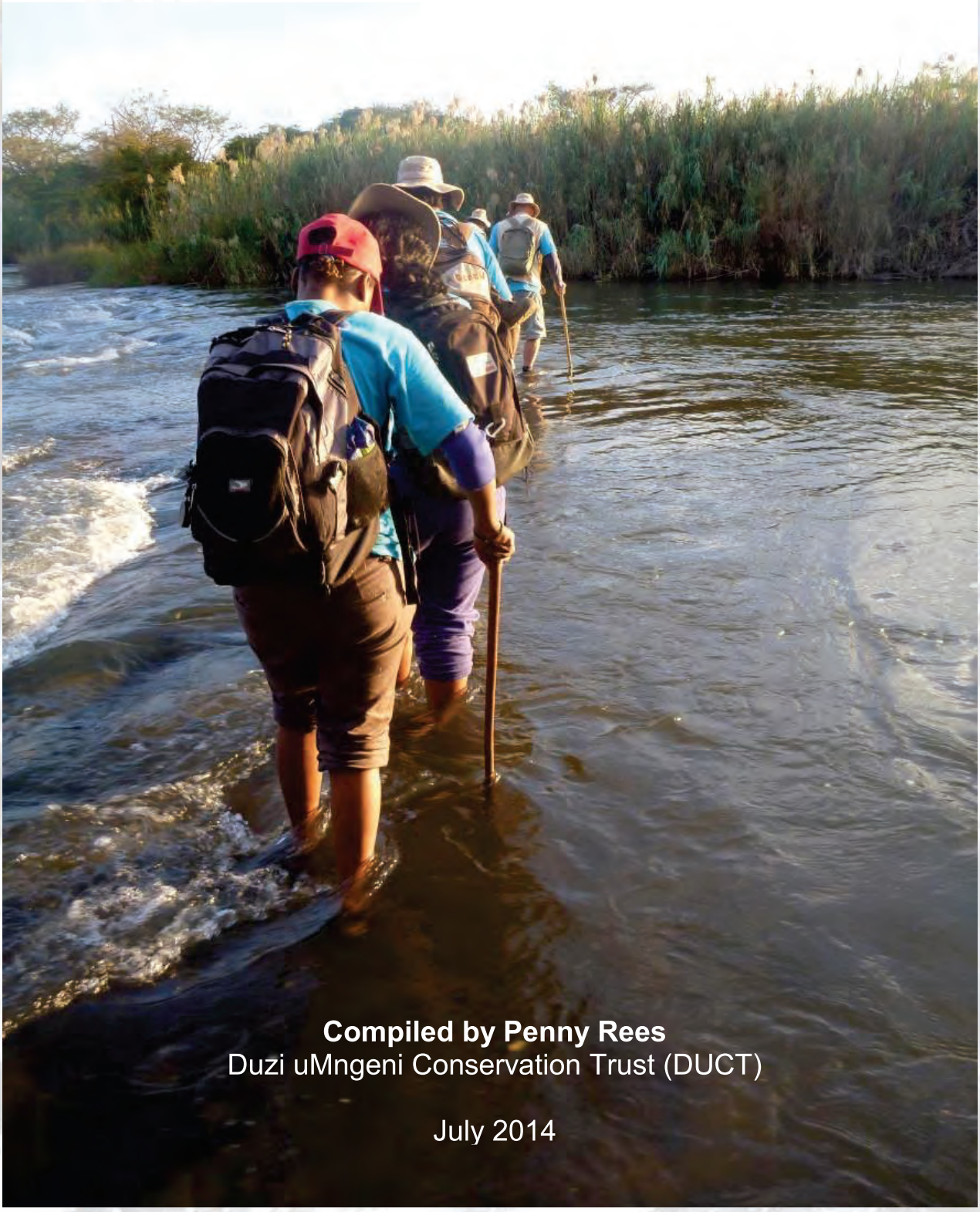
uMngeni River
Source to Sea Walk

30 April to 28 May 2012



Compiled by Penny Rees
Duzi uMngeni Conservation Trust (DUCT)

July 2014

Foreword

From 30 April to 28 May 2012, a team of five people walked the length of the uMngeni River from its source to the sea. This river is situated in KwaZulu-Natal, South Africa, and supplies one thousand million litres of potable water per day to nearly half of KwaZulu-Natal's population – almost the entire Durban area, as well as most of the KwaZulu-Natal Midlands. Unlike KwaZulu-Natal's other major rivers which all have the high Drakensberg Mountains as their birth place, the uMngeni River's source lies in the hills above the Dargle valley and its estuary is situated in the city of Durban at Blue Lagoon. Over the course of 265 kilometres the river descends through agricultural and urban areas, across the gentle rolling Dargle countryside of the Midlands and through wild gorges in the Valley of a Thousand Hills.

This was not a scientific data collecting expedition, and 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. We canoed two sections of the river (below Albert Falls and on Cumberland Nature Reserve) due to the almost impenetrable riparian vegetation, which restricted our ability to keep records.

After walking for 28 days and covering a distance of 311 kilometres, putting together a report on all our observations was far more daunting than the walk itself! I finally settled on a layout that will, I hope, suit a range of readers with different interests. Following this foreword, the background to the walk and acknowledgements, the introduction provides a short summary of our sightings. Thereafter I have divided the report into nine sections: the major dams on the uMngeni River are dividing points between these sections, and there is a section on each of the dams. Each section has general data on wild animals and birds, vegetation, impacts, water quality and the possibility for the area to become part of a Green Corridor (areas that would benefit from some type of protection, and assessment for the possibility of a hiking route / path). More detailed lists, findings, aerial photographs, maps and photographs can be found in the Appendices.

You will see references to left or right bank: this seemed very un-technical and easy, especially considering the meanderings of the river whose banks could be on all four of the cardinal points in the space of merely one kilometre! Left bank refers to the left bank of the river if heading downstream, and right bank refers to the right bank.

We hope that this report will be useful and lead to a greater understanding of the use and abuse of our beautiful uMngeni River. We hope that it inspires others to protect our precious rivers in South Africa.

On behalf of the Mayday for Rivers team, I would like to take this opportunity to thank all those who supported and assisted our walking team, both on the walk itself and with compiling this report. It has been a most remarkable team effort throughout!

Please feel free to use the information contained herein – we only ask that you credit the DUCT Mayday for Rivers Team and quote the report: *DUCT uMngeni River Source to Sea Walk Report, June 2014; P.S. Rees (author).*

Penny Rees
Howick, July 2014

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

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Acknowledgements

The uMngeni River Source to Sea Walk would never have happened without the assistance of a large number of people who so willingly gave to our cause – many heard of our plans and offered what became vital to the successful completion of the walk. The team was stunned at the enthusiasm and generosity that we received from so many people, most of whom were strangers. Without all these amazing folk, the Mayday for Rivers walk would never have progressed from the wild idea to an actual walk. To each and every one of you we can never say a big enough thank you. What a magnificent team effort this was!

Landowners
About 70 landowners along the river who (all but one) gave us permission to traverse their properties, even though they did not know us, did not know if we would behave (which we did!) or exactly when we would be crossing their land.

Funders
The funders that enabled the purchase of essential equipment and fuel:

uMgungundlovu District Municipality – Sbu Khuzwayo and Riaz Jogiat
Wildlands Trust and CEPF – Roelie Kloppers and Dumile Tshingana
Umgeni Water
The WESSA Eco Schools Program
The KZN Department of Agriculture & Environmental Affairs
Dr B Shapiro
Mills Fitchet – Alan Stephenson

Accommodation
Those who supplied accommodation for the team as well as evenings of wonderful company, social gatherings and storytelling – your homes and establishments invaded by the team and our equipment:

Aidin and Malcolm Griffin
Beverley Country Cottages – Kate Kelly
Kathryn and Gavin Coulson
Cumberland Nature Reserve – John and Stella Behn
Greg and Wilma Martingdale
Hilton College – Deren Coetzer, David Whyte, John Roff
Mfula Store – Jill and John Graaf
Msinsi Albert Falls – Denise Govender
Msinsi Nagle Dam – Thandi Zulu
Riverside Hotel, Durban – Brendan Hackett
Tanglewood Hotel – Nikki and David Mann
Umgeni Valley Nature Reserve – Shari Cade and staff
Umgeni Water, Inanda Dam – Loratio Olifant
Wildlands Trust – Xanthe Holmes
Doug Burden – erecting and moving the 5x5 tent!

Meals
They say an army marches on its stomach, and there is no doubt that our small army was one of the world's best fed! We received pre-cooked dinners, homemade and restaurant dinners, had dinners delivered on site, dinners cooked on site for us - giving the poor support crew a well-earned rest. Thank you to:

Bart Fokkens – the best vetkoek in Africa, from a converted container near Inanda Dam
Beverley Country Cottages
Cumberland Nature Reserve
Dargle Ducks
Hanbury Chickens
Highveld Eggs
Red Apple Cafe
Tanglewood Hotel
Umgeni Estuary Conservancy & Beachwood Mangroves – Margaret and Piet Burger
Merrill King, Yvonne Munk, Pam Haynes, Tamara Mork-Chadwick, Julia Colvin, Moraig Peden, the Burden family, Ian Bailey, Riaz Jogiat, Dave Still, the Behn family, Douw Steyn, Mr Schofield and Lucinda Bate whose scones we missed, only to sample a few months later!

And the girls responsible for rounding up all the food, sorting it and delivering it on time: the two Liz's (Taylor and Gow) and Nikki Brighton.

Education Programme

A key aspect of the walk involved education. People of all ages along the course of the river learned so much along the way. Thanks for the education programme support go to:

DGC Inanda Adventure Centre – hosting schools day at Inanda dam
Norma Bode – hand puppets
Zakhele Maduge – catering and faciliation
Umgeni Water – Alistair Hunter, Ian Bailey, Lungi Makhaye, Nomsa Nkasa
WESSA Eco-Schools – Bridget Ringdahl, Anisa Khan, Sharon Gilbert
Midlands Meander Education Project – Alison Kelly, Charlene Russell
Liz Taylor and Mphopomeni Sanitation Education Project – presentation play
Hilton College – Derren Coetze, John Roff
SA Plastics Federation – Douw Steyn
KZN Young Water Professionals WRC – Bonani Madikizela
Birdlife Port Natal – Chrystelle Wilson (maps, bird posters)
Learn with Echo – Kathy Arbuckle, Taadi Modipa
Groundtruth – Mark Graham, Simon Bruton, Michelle Browne (schools mapping and MiniSASS)
Department Water Affairs (Durban) – Bernice Cullis Becker, Chantelle Pillay
Umgeni Estuary Conservancy – Rosemary Harrison, Margaret Burger (in particular for the final function)
The Earth Organisation – Debbie Bennet
Imagine Durban – Hychinthia Naidoo
Umgeni Water (Durban) – Sunitha Doodhnath
Ethekwini Municipality (Coastal storm water management) – Mpume Gumede
Kobus Kruger
Department Water Affairs – Johan Blanche (Midmar open day)
DAEA – Nomalanga Hlope
Howick Municipality – Joyce Pope
Msinisi Holdings – Gerald Bruton, Thanda Zulu, Denise Govender, Happy Ndlovu (Inanda Dam and Nagle Dam open days)
Wildlands Conservation Trust – Graham Farley
Ezemvelo KZN Wildlife Stewardship Programme – Greg Martindale
Springfield Conservancy – Lorraine Ralph
Gary Cullen and the Durban Green Hub Staff – walk and education programme support, Umgeni River Valley trails and Beachwood Mangroves tour

Everything Else

And of course there are all the other bits and pieces:

Andrew Anderson, Midlands Conservancies – for your maps, advice and input and joining us in the Dargle
Andrew Booth – for all arrangements between Albert Falls and Nagle Dams; for bringing in paddlers to take the team (all of us non-canoeists) down the river below Albert Falls Dam; for safely paddling Pandora down the Grade A stretch of Cumberland river and for playing taxi
Bruce MacDonald, MacDonald's Seeds – for the wonderful fleeces
Clare Peddie and team, Share-Net – for all our printing
Gary Behn – for safely paddling me down the Grade A stretch of Cumberland river, and for your surprise visits during the walk
Amanda MacCarthy, Groundcover – for our comfy specially made boots
Danie Steyn – sunset boat ride the length of Inanda Dam
Lembethe Canoe Club Paddlers – for taking the team down the river below Albert Falls Dam
Doug Lang, Med-Wise – detailed first aid training that we thankfully never had to use
Duncan Paul – two-way radios, without which we may well still be stranded awaiting evening collection by the support vehicle
Hans Grobler and Piet le Roux, Ihlanze Wildlife Reserve – for safely navigating us past hippos and buffalo
Nikki Brighton – publicist par excellence, and for the long night time hours ensuring the daily blog went out
Owen Hemingway – for supplying canoes for the team when needed
Pastel Printers – for discounting the printing of our striking T-shirts
Robin Barnsley – for clearing the confusion of which landowner is where along the river
Sally Barrett – for designing our stunning logo

- Sally Barrett – for designing our stunning logo
- Jane Bain, Liz Gow, Liz Taylor, Debbie Farley – general and much appreciated support
- Angela Bownes, Agricultural Research Council - Plant Protection Research Institute – for assistance with indentifying plant species
- Alistair Hunter - Umgeni Water – for numerous trips to the back of beyond to collect water samples
- Dunlop Staff (Mathew Hyland and his team) for the tour of the hydroelectric station
- Russel Girls Choir of 2012 and choir mistress Ronel Wood – for serenading us to the ocean on the last day and Gertrude Tonsing for the river song lyrics
- Umgeni Water Dam Managers – for their guided tours of the dam walls
- Duzi Productions (Sphiwe Mazibuko and Nonto Mncwabe) for the remarkable documentary on the walk

Duzi Umgeni Conservation Trust

- Dave Still, our Chairman who believed in us and supported us right from the start and gave advice and encouragement
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- Doug Burden – DUCT General Manager
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- The Girls – Caroline Clover, Wendy Ngcobo and Jane Bain for doing all the odds and ends and bits and pieces
- Sibusiso Ntinga, Stembiso Sangweni, Falakhe Shozi, Zamani Mkhize and Herbert Chamane – for your turns in guiding us down the Valley of a Thousand Hills, into Durban and to the estuary
- Stembiso Sangweni – for joining us on the first four days
- Jean Lindsay – for all your advice and suggestions

Finally, thanks to our long suffering support crew – John Fourie and Hugh Raw for remarkable feats of navigation, changing umpteen flat tyres and daily fetching and carrying of the team; Wendy Ross who fed and mothered us all the way; the three of you did endless loading, offloading and meal preparations, always with a smile, laughter and good company.

And last, but by no means least, thanks to the team – Pandora Long, Penelope Malinga, Preven Chetty and Mike Farley. Spending 28 days and nights together constantly could become a strain, but not with this team. Neither heat nor cold, tiredness nor pain, had any effect on them – they never considered giving up, never once complained, and someone was always ready with a joke or a song, with encouragement or advice. I would take you to the ends of the Earth with me. Bayete!

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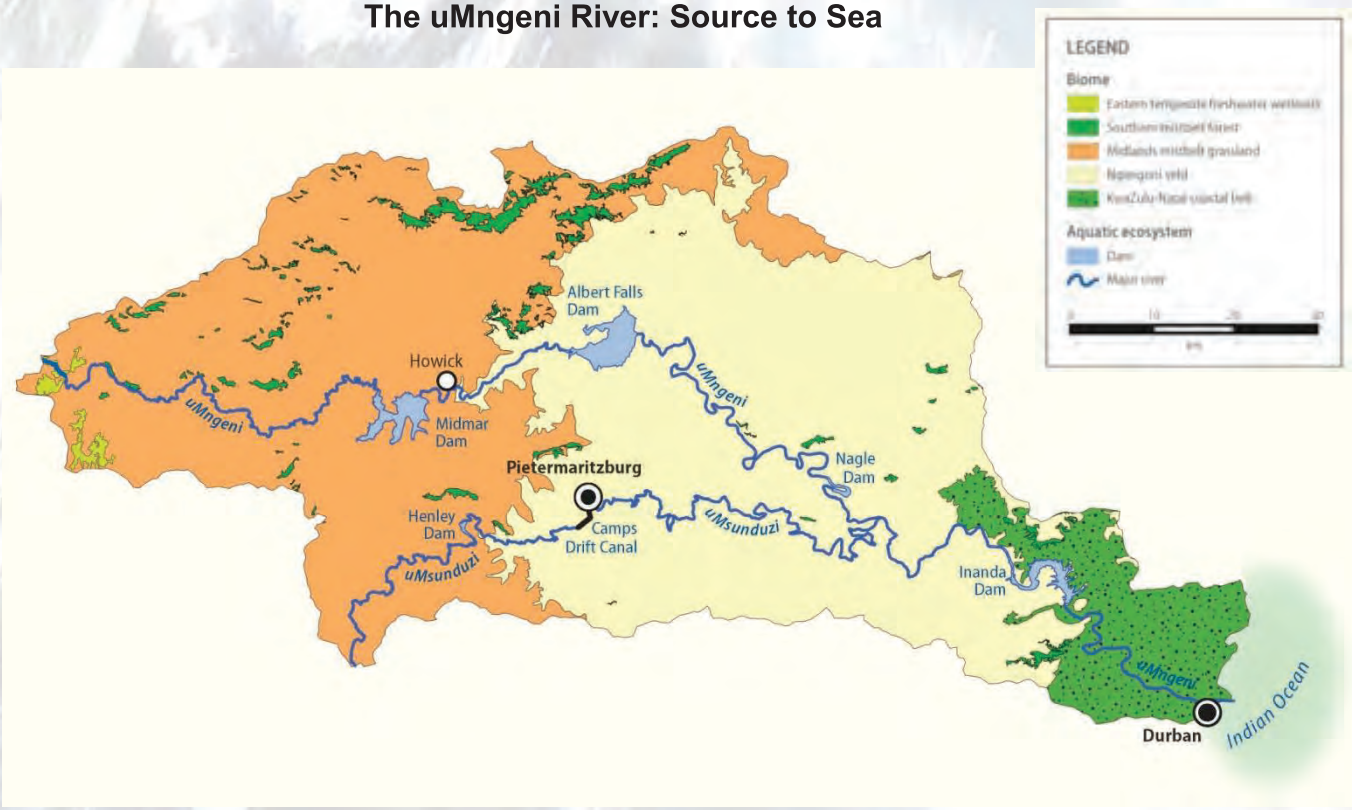

Over the course of four years, Preven Chetty and I, as colleagues who worked in close proximity to the uMngeni River, had often said, “One day we should walk the whole river!” One day we simply set the date and that was the beginning. The original intention was to raise public awareness regarding the state of the river. We soon realised that this would be a once in a lifetime opportunity to record as much as possible along the river, from its beauty to impacts that threaten its health. With all kinds of input from a large number of people who volunteered to assist in so many ways, the planning and execution of the walk become an wonderful team effort.

Considering autumn as a good time to be out walking a river, Preven and I pegged 1 May as a starting date. It seemed to follow naturally to call the project *Mayday for Rivers – the Fellowship*. Now there were just five months to arrange everything – find a team, raise funds, contact over 70 landowners, research the areas we would be passing through, arrange food supplies and accommodation, first aid training, acquisition of equipment, local guides where necessary…

The walk took 28 days and was undertaken by a team of five walkers with assistance from a support crew. The walking team comprised five people all of whom are passionate about the environment:

Pandora Long – DUCT’s Environmental Educator based in Pietermaritzburg: walk photographer
Penelope (Pens) Malinga – DUCT’s Environmentalist from Mpophomeni who does incredible work in the community and who has inspired so many people to become passionate about environmental matters: walk scribe
Preven Chetty – an Environmental Educator working at WESSA: walk technology whizz, operator of the GPS, path breaker
Mike Farley – DUCT manager of the Howick River Care Team, who has been involved in conservation his entire working career: walk plant and spoor identifier par excellence, path breaker
Penny Rees – DUCT Howick Co-ordinator, environmentalist and educator: team leader and operator of dictaphone.

Our support crew comprised three: alternating drivers John Fourie and Hugh Raw, with Wendy Ross, initially taken on as cook, who stayed with us the entire journey. I don’t think these three had any idea when they volunteered of the hard work ahead: they became the “invisible drive chain” that kept the

wheels turning – from sourcing power to recharging batteries, catering, transporting the team and many other mundane tasks. I suspect the walking team had a far easier 28 days than they did!

The final two team members comprised the film crew, Sphiwe Mazibuko and Nontokozo Mncwabe of Duzi Productions who were originally planning to meet us on only a few days and who ended up walking the entire river with us, and then still going home each night to edit the day's footage.

The daily routine comprised being dropped off at the river each morning at the point where we had finished walking the day before. The support crew loaded the vehicle and set off for the next overnight point, while the rest of the team would walk, following the river all the way, at times rock hopping or wading. The days start and end points were recorded on a GPS as were the many impacts observed. I recorded these on a dictaphone and took photos. Pens wrote notes as a backup. Much of the dictaphone recording was done as I walked as we did not have time to stop at every point. Mike would identify plants, animal sign and birds and Pandora took photos of everything we saw and did. Regular water tests were conducted as well as samples taken for laboratory analysis. Our evening activities included downloading all data, writing a daily blog and accessing reference books to confirm earlier identifications.

This report is divided into 9 sections of the uMngeni River, starting with its source. The map above will help to orientate readers. Each section is briefly described before the following are considered:

- Evidence of wild animals
- Vegetation
- Impacts including invasive alien vegetation, the impacts on river buffer zone (including water extraction pump stations, drainage ditches and dykes, sand mining), dams and weirs, litter and dumping
- Water quality observations using miniSASS and lab tests
- Finally each area is assessed for its potential to form part of a Green Corridor, or hiking way.

Each of these factors is described in general in this introductory section, before more details are provided for each of the river sections specifically:

- Section 1: uMngeni River Source to Midmar Dam
- Section 2: Midmar Dam
- Section 3: Midmar Dam to Albert Falls Dam
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- Section 5: Albert Falls Dam to Nagle Dam
- Section 6: Nagle Dam
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- Section 8: Inanda Dam
- Section 9: Inanda Dam to Estuary

The report is concluded with some findings and recommendations, followed by a brief discussion on its limitations, and finally a conclusion.

Wild animals

Fish Eagle were heard every day of the walk without fail, and otter sign was seen daily until we reached downstream of the confluence with the uMsunduzi River. This is not to say that there are no otter however, as from this section down to Durban we had local people as guides, and they did not always stick to the river bed or banks as we as a team did when finding our own way. Wildlife was more predominant up until Albert Falls, whereafter sightings and sign were less frequent with the exception of the Cumberland Nature Reserve.

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Birdlife was most prolific in the Dargle when in close proximity to the indigenous forests; and in the Valley of a Thousand Hills from Cumberland Nature Reserve down to Nagle Dam. In these areas, a multitude of bird calls could be heard constantly.

Due to the inconsistent water levels in the dams, there is little aquatic fowl habitat on the dams such as reeds, which cannot survive prolonged periods out of water. However, the aquatic invasive plants that flourish in some of the nutrient enriched bays of the dams create a habitat for water fowl. The floating masses of algae, water lettuce (*Pistia stratiotes*), *Nymphoides thunbergiana* (small flowering species of water lily) and other aquatic plants created a haven for birds on both Midmar and Albert Falls dams, unrivalled elsewhere on these dams.

We were informed of the occurrence of trout in the Dargle; Natal Yellow Fish (Scaly) downstream of Howick Falls; Tilapia (Bream) and Grass Carp at Ihlanze Private Game Reserve; Bass at Albert Falls Dam and barbel at Nagle Dam.

Vegetation

Grasslands and *Podocarpus* (Yellowwood) forests occur in the upper catchment, followed by Acacia grasslands and grassed floodplains close to Howick, with Valley Bushveld downstream of the Howick Falls, followed by some Lowveld species approaching Inanda, and finally coastal vegetation around Durban.

Top: Dargle view from the source plateau
Bottom: Outskirts of Durban prior to Coastal Floodplain

Impacts

Almost all negative impacts seen are in contravention of one or another South African law. Impacts along the river are many and include extraction, lack of environmental flows from the large dams, sand mining, soil erosion, invasive plants, disturbance of the riparian vegetation, illegal dumping, effluent from both industrial areas as well as intense agriculture such as dairy, poultry and piggery operations and excess levels of nutrients from both spewing sewers and farm fertilisers.

Invasive / alien vegetation

There are certain sections of the river banks that are invasive free (detailed in individual section reports). This is due to sterling work by either DUCT River Care Teams, Working for Water, some landowners and other invasive clearing operations / programmes. Without these clearing work parties, the entire river would most likely be smothered by invasives.

Control measures of the riparian invasives include ring barking (which often causes log jams in the river when the trees die and fall down), herbicides and manual removal. Aquatic invasives are dealt with manually, by aerial spraying and bio control. Prior to their release, bio control beetles are tested for long periods to ensure they are host specific and will eat only their host plants which do not have any resistance against the beetles and bugs. A typical scenario of the beetles is a lifecycle of three months. Multiply one hundredfold over three months and so 5 000 beetles released will produce 500 000 within three months and thus in six months there can be 5 million beetles. The bio control impact is visible – plants are stunted and turn yellow.

Top: The uMngeni River upstream of Nagle Dam
Bottom: The only water released into the river from Nagle Dam

Bottom left: North of Furth Stream, upper uMngeni catchment – cleared of invasive plants in 2010
Bottom right: South of Furth Stream, May 2012 – not cleared of invasives

Plants such as Hyacinth and Water Lettuce cannot be eradicated due to their seed banks so this is purely a method of control. As someone commented to us, “the aquatic invasives are here because of excess nutrients. We spend all this time and effort to research, breed and release the bio control bugs, when all we have to do is stop the eutrophication!”

Of concern was one area of timber planted in the upper catchment which is situated in an area inaccessible for harvesting due to the terrain. These trees have been in the ground for decades. I have witnessed similar inaccessible plantations in the Mpumalanga escarpment area, and was told at the time that some of the foresters of old would attempt to out-compete each through planting in the most difficult of places, resulting in timber whose harvesting was at best extremely difficult, and at worst, impossible. This then becomes a permanent seed source.

River buffer zone

Many areas in the Dargle have pastures that extend to the river bank edge. Today there is a legal buffer zone of 32 metres prohibiting disturbance to the riparian area alongside any river. Many of the pastures that extend right up to the river bank are on very old farms, and are “historical”, i.e. the lands predate the buffer legislation. In addition, from the Midmar Dam area to upstream of Cumberland Nature Reserve we witnessed some planted lands that were also within the legal buffer – whether historical or not is unknown. Various other buffer zone disturbances were observed.

Water extraction pump stations

Numerous water extraction pump stations were observed, predominantly in agricultural areas.

Drainage ditches and dykes

The majority of drainage ditches are upstream of Howick in many wetland areas adjacent to the river. These are also most likely historical and many are now vegetated and today have the appearance of small streams. In prior years, farmers were encouraged by Government to drain the wetlands. As one farmer commented to us: “30 years ago we were told to drain the wetlands, today they ask us to rehabilitate them…” It is now illegal to make any new drains.

Top: Historical pastures to river’s edge, Dargle
Bottom: Historical drainage ditch in previous wetland, Midmar area

Sand mining

As long as there is construction, there will be sand mines. Sand mining on the uMngeni River seems to be uncontrolled, and many of the mines are illegal. In addition, few seem to be rehabilitated (which is a legal requirement); many destroy the riverbank vegetation and build causeways across the river, which are both illegal activities, and disturbed areas in abandoned mines become a seeding ground for invasive plants which then spread to surrounding areas. Some mines have been rehabilitated. However, from the area around the uMsunduzi confluence all the way into Durban we logged 45 mines. Of these, possibly 10 were active, the others all mined out or abandoned – clearly with no rehabilitation whatsoever. Mining permits are issued by Department of Mineral Resources, with little or no consultation with the Departments of Water Affairs and Environmental Affairs. There does not seem to be any compliance monitoring nor law enforcement.

The sand comprising the beaches of our coastlines originates from our rivers. The construction of the dams on the uMngeni River thus prevents the sand from migrating downstream and renewing our beaches. A recommendation was made that an ideal area to mine sand is the inlet to Inanda Dam. This is an area that is already impacted, and removal of this sand would prevent it from entering the dam and causing loss of capacity through siltation. Sand mining below Inanda should be prevented, to allow whatever sand is left below Inanda Dam to be carried into the ocean to replenish the beaches of Durban.

The mining sometimes affects local communities – in some places, people can no longer get across the river due to the depth of digging, and thus cannot get to a shop or visit friends or family across the river. In other cases fishing, on which many depend for protein, has been negatively affected.

Top: Abandoned sand mine upstream of Inanda Dam
Bottom: Active sand mine near Durban

Dams / Weirs

Aside from the four major water supply dams and gauging weirs, we observed only three large dams in the vicinity of Umgeni Vlei (historical) and one historical weir in the upper catchment, and this latter dates back many decades.

The four large dams on the uMngeni River all have an impact on the river. At all four dams, water tests indicated a drop in water quality below the dam walls. This is for the following reasons:

- Release flows are not consistent with legal obligations – all dams are supposed to have correctly calculated environmental releases, in other words, sufficient water should be released at all times to keep the river healthy. This is not done from any of the dams on the uMngeni River, and the river below the dams thus suffers from extremely low water flows, which have an impact on the river. There is little fluctuation in water level aside from that brought in by tributaries or when there is so much rain that the dams overflow.
- There are various release levels on the dam walls. Midmar, for example, has four. Usually the upper two release points are used, as this dam water is the cleanest (pollutants, contaminants, silt and vegetation sink to the bottom of the dam). The lowest release point on a dam wall will be opened occasionally to "scour" the dam. This has a direct impact on the river downstream, and often during scouring there is a very strong smell of sulphur that emanates from the river (this smell is not dissimilar to the smell of rotten eggs).
- The temperature of the water layers in the dams tends to decrease with depth in the summer months so that the surface water is warmer than the water at the bottom of the dam. In the winter, the opposite occurs so that the warmer water is at the bottom. Dams experience what is known as "turnover" during Spring and Autumn when these water temperatures are shifting. When the dam is undergoing turnover, the water that is released is a different temperature to that of the river below.
- In general, the temperature of the water being released from the dam is different to that of the river, which then experiences a sudden temperature change.

This sudden change in water temperature affects the ecology of the river. The rotting detritus entering the river during scouring also impacts the river as does the turbidity during scouring and turnover during which the river looks as though it is filled with mud from floods. This blocks sunlight penetration of the water, impacting on the plants and creatures that live in the water.

After the walk, I returned to Albert Falls, Nagle and Inanda Dams and circumnavigated Albert Falls and Nagle by boat. Inanda's multiple bays defeated us, and we only managed to check a few of the bays on both banks close to the dam wall end of the dam.

Top: "Muddy" effect from turnover in Howick below Midmar Dam
Bottom: Illegal dumping, Howick

Litter / dumping

We were pleasantly surprised at the lack of litter and illegal dumping along the river excluding Howick and Durban. From the source to Cumberland Nature Reserve, the only litter and dumping observed was in urban areas or alongside roads from Albert Falls Dam down. From the uMsunduzi Confluence to Blue Lagoon, DUCT River Care Teams collect and remove any litter they come across. However, even these efforts are overwhelmed once in Durban, where dumping is apparently a continual problem.

General water quality observations

The occurrence of aquatic water invasive plants such as *Nasturtium officinale* (Watercress), *Pistia stratiotes* (Water Lettuce) and *Eichornia crassipes* (Water Hyacinth) are all a visual signal that the river water has excess nutrients. Without these excess nutrients, these plants would not flourish the way they do. These plants can smother entire sections of the river, blocking all sunlight which has negative effects on the river ecosystem. In addition many use up the oxygen in the water, thus robbing aquatic creatures of the ability to breathe. Lastly, they smother natural vegetation and take over completely. Their only advantage is that they are utilising the nutrients to grow, thus assisting in the removal of some of these nutrients. The Watercress is seen by some river ecologists as the lesser of two evils – it is shallow rooted and utilises the nutrients in the river bed as opposed to, for example algae, which robs the water of oxygen.

The miracle seen repeatedly along the river was the ability of the river to heal itself, or improve, given a long enough length without impacts. However, it should be kept in mind that with too much contamination, a tipping point would be reached whereby the river will be unable to heal itself.

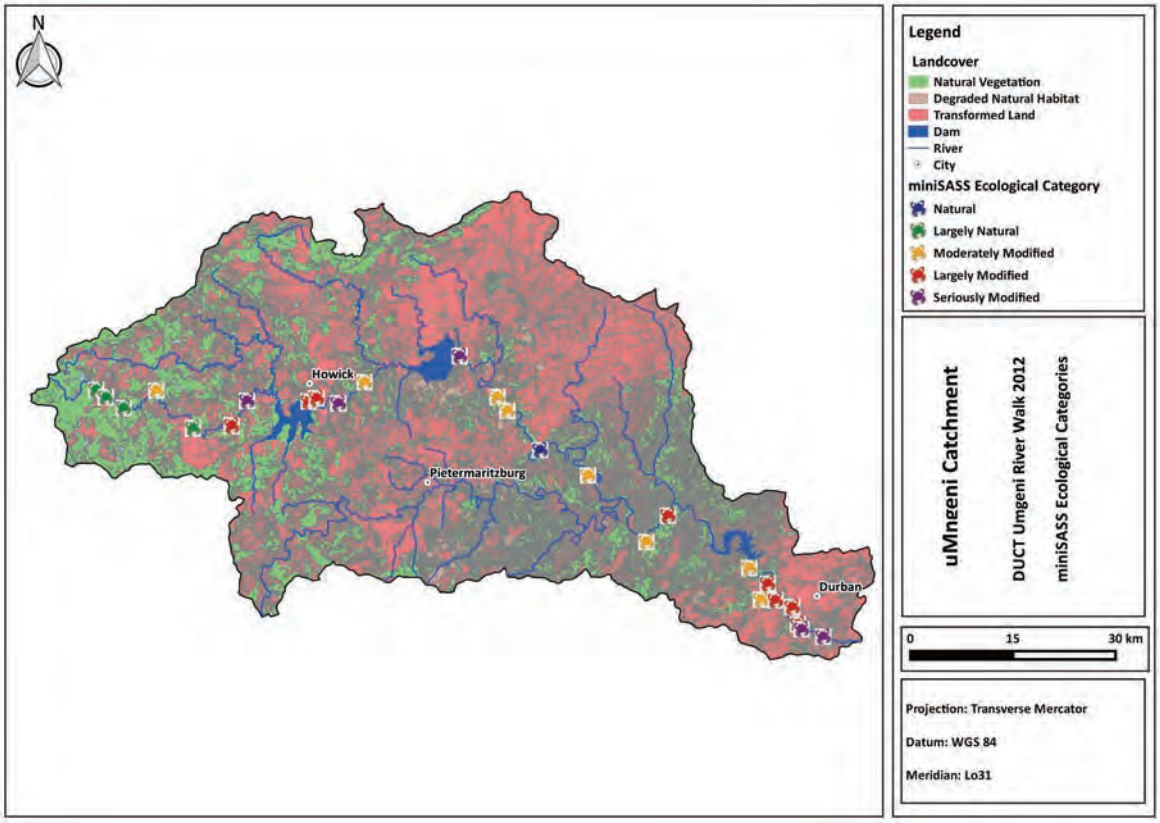
Top: Clear water, Upper Dargle
Middle: Murky water in vicinity of poultry farms, Dargle
Bottom: Watercress flourishing in Howick

Lab tests

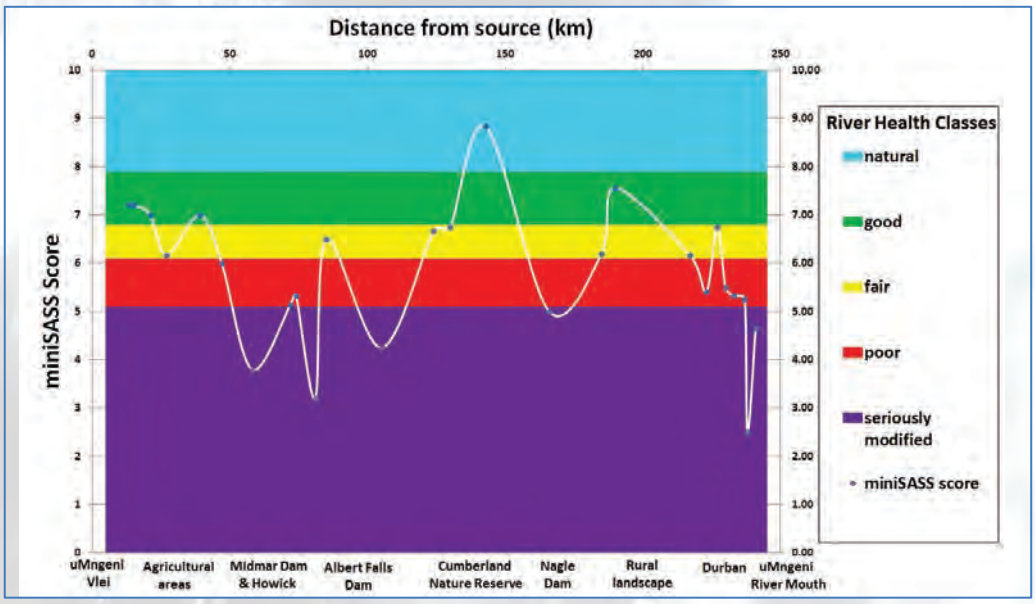
Water samples were taken regularly and sent to a laboratory for analysis. Tests included amongst others *E.coli*, oxygen demand, various elements and metals, pH and phosphates.

Mini SASS

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 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. A lab test, if taken say a week after a chemical contamination, may not reveal any chemicals whilst the Mini SASS gives an immediate overall picture of the river's health at any time.



Above: The locations of the MiniSASS sampling points during the uMngeni Source to Sea Walk, showing the changes in river health as the river encounters various impacts on its course to the sea
Below: A long section profile of the river showing the variations in river health as measured by the MiniSASS test.



Green Corridor

Prior to the walk, we were inspired by the dream of a “Green Corridor” running the length of the river, and we discovered that we were not alone with this dream. As the source of water to such a large percentage of KwaZulu-Natal’s population, and as pristine and near pristine areas become more and more scarce, the protection of the rivers remaining riparian areas needs to be guaranteed. We thus recorded areas that we considered worthy of either full Stewardship status (legal protection), or Conservancy or Community Conservancy status. We have discovered a remarkable number of people who share our vision of a hiking way that leads from the source of the uMngeni River to the ocean (or vice versa – Berg to Beach).

Photo: Mamba Gorge, upstream of Inanda Dam

Section 1: uMngeni River Source to Midmar Dam

1.1 Area description

GPS co-ordinates

Start: 29°28'09.67"S 29°49'11.53"E
Finish: 29°29'14.09"S 30° 9'53.08"E

Altitude drop

1,926m –1,053 metres above sea level

General Description

The source area comprises a plateau of high altitude grassland hills encircling the Umgeni Vlei. These hills are dominated by Drinkkop, the highest point at 1 920 metres. Many small seeps on all sides of these hills give rise to various small streams which feed into either the Umgeni Vlei or join up with the stream leaving the Umgeni Vlei which is destined to become the uMngeni River.

The plateau is interspersed with many wetlands of various sizes and three man-made dams, the largest of which is Lake Lyndhurst. As our starting point, we pinpointed one of the many seeps close to Drinkkop which feeds into the stream of water leaving the main wetland known as Umgeni Vlei.

At the escarpment edge, the small uMngeni River, still really a large stream, drops off from the grasslands in a spectacular gorge that descends from 1 775 metres altitude to 1 487 metres, winding through the gorge for approximately three kilometres. Steep valley sides rise up from the river which tumbles over boulders during the descent – initial giant boulders, some over three metres high give way to smaller boulders as the river's angle of descent lessens. At one stage the river disappears underground, its only indication a jumble of moss covered boulders with treacherous hidden holes between them, and the roaring sound of the water as it rushes past somewhere down below.

The lower reaches of this section are overlooked at Umgeni Poort by Mpulwane peak 1 854m whose steep forested slopes end in a promontory of sheer cliffs that face over the river, seeming to guard the access route to the upper catchment plateau. The river at this stage is crystal clear and burbles over black dolerite rocks and is still only a large mountain stream.

Top: Source of the uMngeni River
Middle: The gorge below the source
Bottom: Mpulwane Peak at Umgeni Poort

As the steep valley sides and angle of the river's descent lessen dramatically, the stream begins to meander across small, ancient floodplains, the water alternately rushing over the black dolerite rocks, flowing slowly through still pools whose surface mirrors the gentle hillside rising away from the river. In places, the river has high, vertical banks up to three metres in height on the outside bends. By the end of our third day the stream size had increased to that of a small river. This is farming country, predominantly pastures and veld grazing.

Thereafter the rivers meanders become larger as it winds across ancient floodplains with adjacent rolling grasslands rising up to distant hills which lie parallel to the river with Inhluzane Mountain looming up above the hills, a second sentinel over the area. This mountain became a presence which we felt and saw constantly for the remainder of the stretch to Midmar Dam. Generally the river twists and turns, comprising high (2-3 metres) vertical soil banks with slow flowing pools of water alternating with beautiful rapids over rounded dolerite rocks and cascades over dolerite dykes. The river eventually spills out over an enormous flood plain for almost a kilometre, at the foot of Sugar Loaf Mountain, forming a beautiful, large soggy wetland of sedges and reeds.

After more meandering the river drops over a 50 metre waterfall. From this point the wide open spaces from the source are replaced by a much narrower river valley. From here on we were in timber plantations, some areas of the river banks open to kikuyu, others so choked with invasives that we could not see further than the trees. Small stands of either indigenous bush or forest are dotted between the timber. After another stunning waterfall the terrain flattens out once again as the river nears Midmar Dam, and we again passed farms, large and small on the approach to the confluence with the Lions River which is situated about 3 kilometres upstream of Midmar Dam on a large floodplain which is about 2.5kilometres long. The river meanders here to such an extent that it covers a distance of approximately 6.7 kilometres. (See Appendix 1)

Top: Typical Dargle scene
Middle: Waterfall, Dargle
Bottom: A short way upstream of Midmar

1.2 Wild Animals

Signs of wild animals were most prolific in the upper reaches of the Dargle and thereafter on properties with sufficient grass cover or riverine bush. On the properties situated lower downstream towards Midmar, where most farms are large with intense agriculture, there was a definite drop in animal signs.

Animals

Ant bear digging
Baboon droppings
Blesbok
Bush pig – tracks, digging
Duiker droppings
Frogs – call
Jackal – call, scats
Mole – mole hills
Mountain Reedbuck – droppings
Oribi
Otter – midden, spoor, scats
Porcupine – scat quills, teeth marks
Reedbuck – male and female
Shrew – carcass
Springbok
Vervet monkey
Water mongoose – visual, tracks

Birds

African Black Duck
Black Tit
Brown Hooded Kingfisher
Bull Bulls
Cormorant
Crowned Cranes – heard
Doves
Egyptian geese
Emu
Fish Eagle
Fork Tailed Drongo
Giant Kingfisher
Hadedas
Half Collared Kingfisher
Hamerkop
Jackal Buzzard
Masked Weaver
Natal Francolin
Owl (pellet)
Purple Crested Lourie
Rameron Pigeon
Scimitar Bill Hoopoe
Swifts
Yellow Billed Duck
Waxbills
Weaver (nests)
Wood Hoopoe

1.3 Vegetation

Terrestrial vegetation

Indigenous vegetation on the plateau comprises mist belt grasslands interspersed with wetlands. These grasslands extend a long way down the length of the river, and extend from close to the river to all the way up the surrounding hill sides, with patches of indigenous Podocarpus forest in the protected hill valleys and gully's. This forest also continues in an unbroken stretch on the south side of the river from the top of the Umgeni Poort gorge until opposite the farm Furth.

Grasslands in the upper catchment area comprised grass species such as *Cymbapogon excavatus* (turpentine grass) and *Hyperhennia hirta* all of which were dotted with plant species such as Watsonia, Erica, *Widdringtonia*, Tree fern, Bracken Fern, *Kniphofia* (Red Hot Pokers), *Leonotis* (Wild Dagga) and *Leucocidia* (Ouhout), bright red *Helichrysum* – either *hadenocarpum* or *ecklonis* (everlastings), *Moreae* (Wild Iris), *Cucumis* and lilac *Wahlenbergias* nodding their dainty bell-like flowers in the breeze. The river banks here are home to *Widdringtonia*, *Hypericum*, *Polygala* and *Crocosmia* (Falling Stars),

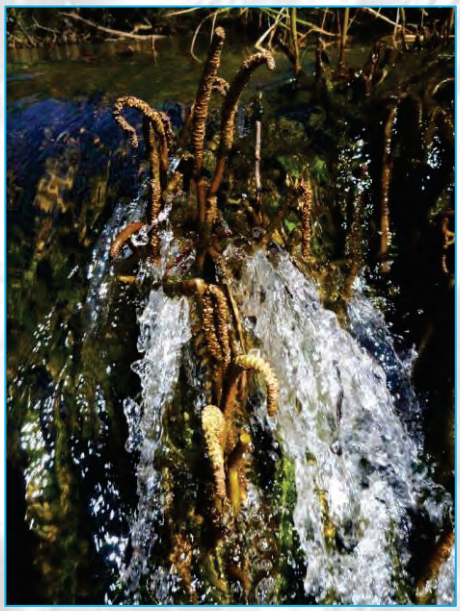
Bottom left: Helichrysum
Bottom right: Senicio

Below the source plateau the left river bank was blanketed in a swathe of seemingly pristine indigenous forest in which we could see no invasive or alien plants. Giant *Leucocidia* trees hung with Old Mans Beard lichen, *Podocarpus* (Yellowwood), small ferns, Buck Weed and giant *Celtis africana* (White Stinkwood). Mosses and ferns line the water's edge, with a few scattered *Hypericum*.

From the farm Furth, beautiful Watsonia covered grasslands with tiny *Protea drakomontana* (only about 30cm high) were followed by areas of grazed veld grasses, predominantly *Aristida* (Ngongoni).

Indigenous vegetation is scattered and patchy in the plantation areas although the wetlands seem to be in good condition. In the majority of the plantation buffer zones, even though no timber has been planted, many of the buffer zones and some tributary streams are choked with various invasives.

Downstream of the plantations, riverbank vegetation changes to include some valley Bushveld species such as large *Celtis africana*, *Salix mucronata* (Indigenous willow) and *Leonotis* (Wild Dagga), *Halleria lucida* (Tree Fuschia), *Buddleja* (Wild Sage), *Erythrina* (Coral trees), *Ziziphus mucronata* (Buffalo Thorn / Lahlankosi) and *Widdringtonia* in the riverine bush.
(See Appendix 4.)



Aquatic vegetation

Above Midmar dam, few aquatic plants were observed, and those which were seen seemed to occur in areas showing signs of possible nutrient enrichment.
(See Appendix 3.)

Hydrostachys polymorpha

We first observed this strange plant in the Dargle. It only grows on dolerite rocks in very fast flowing water on waterfalls and cascades, and is unable to survive without the turbulence of the water. It attaches itself to the rocks by numerous stiff, thread-like roots which "glue" the plant to the rocks. The multiple leaves are fern like and male and female flowers are borne on separate plants (plantzafrica.com). According to Scott-Shaw (1999), *Hydrostachys polymorpha* is vulnerable; the FAO Corporate Document Repository website states that this species is protected in South Africa.

Top: Podocarpus Forest
Middle: Indigenous bush along uMngeni, Dargle
Bottom: Hydrostachys polymorpha

Hydrostachys polymorpha is only found in South Africa in KwaZulu-Natal in some selected rivers mainly in the Midlands, and is not seen again until Angola on the Epupa and Ruacana Falls on the Kunene River (plantzafric.com).

We observed *Hydrostachys polymorpha* in two locations upstream of Midmar Dam, (although we suspect two additional locations); in four locations between Howick Falls and Albert Falls Dam; one just above of the Valley of a Thousand Hills, and one in the Valley of a Thousand Hills upstream of Nagle Dam.(See Appendix 3.)

1.4 Negative Impacts

Erosion

The main erosion impacts seen were cattle trampling wetlands and where they access the river to drink, old cattle paths, roads, disturbance or removal of river bank vegetation, overgrazing, silt from plantation areas and entering the river via the Lions River.(See Appendix 6.)

Invasive / alien vegetation

Some areas have been cleared of invasive vegetation by either landowners or Working for Water, however invasive vegetation along the river can only be described as heavy infestations in most places. Only a few areas have been cleared, or are totally clear, of invasive plants, notably the area from the source to Umgeni Poort where clearing was done up until two years ago and where this clearing ceased, the difference is marked. North of the stream where clearing stopped, is almost pristine, whilst south of the stream is heavily infested with particularly Bramble and Wattle, as well as large clumps of Bugweed.

From this point down, most of the river to Midmar Dam is lined with Wattle and Bramble, the former comprising the dominant invasive plant in the area, followed by Bramble. They form an almost unbroken belt along the river, with Brambles occurring in large impenetrable bands parallel to the river.

Top: Wetland trampled by cattle
Middle: Gully erosion – cattle access point
Bottom: Heavy bramble infestation

In addition, either large clumps or forests of Bugweed occur, the latter in many plantation watercourse lines. In the lower part of the catchment Mulberry, Privet, Indian Shot, Peanut Butter Cassia, Poplar, *Ipomea*, *Araujia sericifera* (Moth catcher) and Japanese Honeysuckle become more apparent. Most islands are choked with invasives.

Closer to Midmar, Mulberry, Privet, Indian Shot, Peanut Butter Cassia, Ipomea, Poplar, *Gleditsia triacanthos* (Honey Locust) and Wandering Jew occur in greater and greater frequency on the approach to the Dam. In addition there are a lot of stands of poplar trees which were planted under contract to Lion Matches decades ago, who no longer utilise this wood.
(See Appendices 3 and 5.)

32 Metre Buffer Zone from River's Edge

Construction / buildings

There was little impact in this sense. Four houses and a small dairy are in close proximity to the river, just outside the 32 metre buffer area. One floodplain had dykes constructed approximately 15 years ago in order to keep the water out, and an area of earthworks was seen – possibly the demolition and levelling of old buildings. The biggest single impact in this vein was the bulldozing of a new road within less than four metres of the river banks, which included bulldozing of small floodplains and some of the river banks. (See Appendix 6.)

Pump stations

A total of 26 water extraction pump stations were seen along the river, as well as two disused pump stations.
(Appendix 6)

Drainage ditches and dykes

Decades ago it was an accepted agricultural practice to drain wetlands and thus there are a number of historical drainage ditches in what were once wetlands (now pastures and arable lands) adjacent to the river. Most of these have been allowed to close up with indigenous grasses and did not seem to be functioning any longer as drains, although a few were still noted as being operational.
(See Appendix 6.)

Top: Bulldozed river bank
Middle: Poplars and maize in buffer
Bottom: Drainage ditch

Sand mining
No evidence.

Other
A newly bulldozed road, a few home lawns, and a dairy were observed inside the buffer zone.

Two areas of *Eucalyptus* (Gum) plantations were seen where the gums were planted within the buffer zone – in one, the trees were up to the water edge, in the other they were approximately five metres from the water edge.

Two areas of maize were planted in the buffer, one of which was on the river side of a dyke. These are possibly historic.
(See Appendix 6.)

Dams / Weirs
There are few dams and weirs on this stretch of the river: an Umgeni Water gauging weir; two low level bridges and only one other weir – a historical weir used to power a mill decades ago.
(See Appendix 6.)

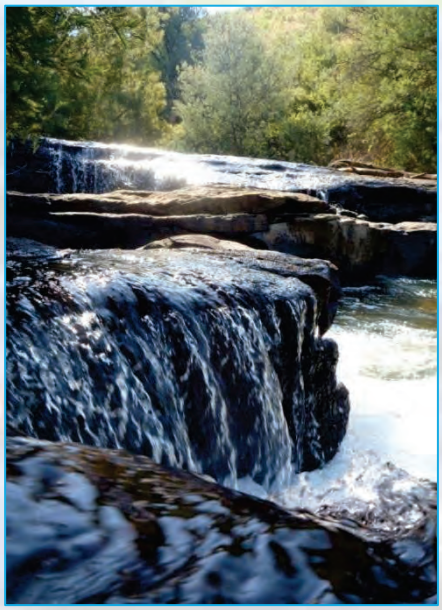
Litter / dumping
Generally the area was free of litter although occasional pieces of plastic were observed in the river in places. Two piles of garden waste, one rubbish pit and one pile of illegal rubbish dumping were observed.
(See Appendix 6.)

1.5 Water quality

Generally speaking, the areas near the source and downstream of timber plantations had the best water quality. Water quality dropped in areas of intensive farming and where there were heavy infestations of invasives (which often occur on the more heavily farmed sections). However when an impacted section of river was followed by a non-impacted area, the water quality would always recover. This ability of the river to heal was observed time and again along the entire length of the river.

Top: Crystal clear water in the source gorge
Middle: Turbid grey water – dairy farm
Bottom: Algal bloom – poultry farm

Impacted areas often showed signs of poor water quality such as silt on the river bed, white stains on the rocks; algae and aquatic water plants, algal “sludge” on the rocks and water with a grey green milky hue or general turbidity. (See Appendix 7.)



Mini SASS

The first Mini SASS score a few kilometres below the source on the edge of the indigenous forest was 7.1 (Largely natural, GOOD condition) – we suspect not as high as expected due to silt entering the river from a nearby road. Thereafter the score fluctuated from 6.0 (POOR condition) back up to 7.0 and then down to 6.2 FAIR condition, back up to 7 and then plummeted through 6 down to 3.9 (VERY POOR condition). The low scoring areas were all downstream of either major riparian disturbance or intense livestock farms whilst the higher scoring areas tended to have intact natural riparian buffers and good natural vegetation beyond.(See Appendix 7.)

Lab tests

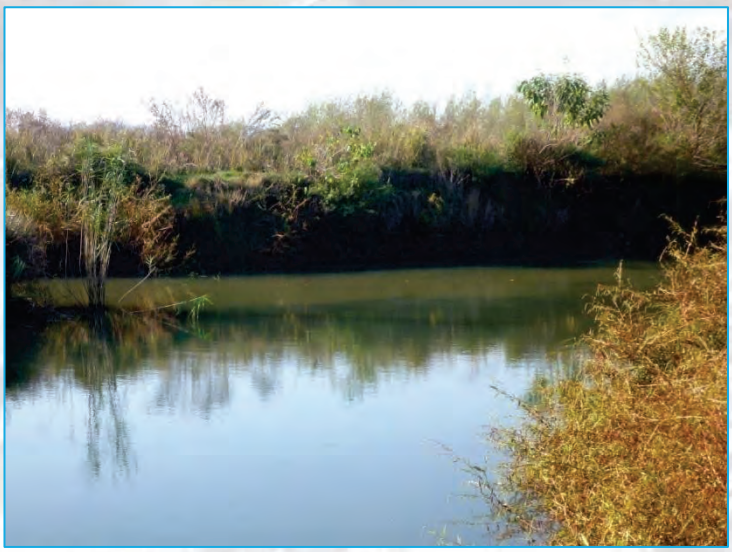
See Appendix 7.

1.6 Green Corridor

Potential stewardship sites

Umgeni Vlei is under protection by Ezemvelo Wildlife as a Nature Reserve.

Some farms, particularly in the upper reaches of the river, are in almost pristine condition and it would be extremely beneficial if they were Stewardship Sites. There are some other farms downstream with either large or small sections of exceptional beauty or patches of indigenous vegetation in stunning surroundings, which have the potential for Conservancy Sites. (For photos and more information, see Appendix 8.)



River hiking way potential

If landowners were to consent, the terrain from Umgeni Poort to Midmar Dam is suitable for this dream. There are however, a few areas that would not be accessible for one reason or another such as electric fences, bio control security, fire hazards, or extreme ecological sensitivity.

There are currently no camping facilities in the area; however there are bed and breakfasts and hotels spaced at regular intervals that could be used as overnight accommodation. (For photos and extra information, see Appendix 8.)

Top: Clear water, Dargle
Middle: Turbid water: Lions /uMngeni Confluence
Bottom: Good hiking terrain

1.7 Interesting information / history

- Lake Lyndhurst was, years ago, a farming area and the wetlands were drained. Today, under the management of Ezemvelo KZN Wildlife, the actual Umgeni Vlei is under protection and proper management, and the neighbouring area of Lake Lyndhurst, which has holiday homes on one side of the Lake, is also under good management. Plans are currently underway for a joint management plan for all land owners on the plateau and surrounding area.

  Past applications for more housing developments in the area have been refused. Having walked the length of the river, it is quite clear that any developments and "urban" type areas negatively impact the river. Considering the national and provincial importance of the Upper Catchment of the uMngeni River, the decision to deny development is encouraging.

- Part of the history of the Lake Lyndhurst area is reflected in a trout hatchery building on the plateau. The first trout were imported to South Africa in the 1800s, and trout hatcheries were set up in suitable areas to breed these fish. Many of the rivers in the Drakensberg and Midlands were then stocked with trout for fly fishing, which today plays a large part in the South African tourism industry. To this day, there are still trout to be caught in the upper uMngeni River.

- Not far below the wild Umgeni Poort, there is an old house which is currently being renovated. This house was originally a nunnery. It was sobering to imagine nuns that lived here so long ago, so far away from anywhere and anyone.

Photo: Lake Lyndhurst

Section 2: Midmar Dam

2.1 Area Description

GPS Co-Ordinates

Inlet: 29°29'15.60"S 30° 9'27.42"E
Dam wall: 29°29'44.76"S 30°12'11.42"E

Surface area

17.93 km^2

Total capacity

235 million m^3

General

Midmar Dam lies upstream of the town of Howick, and is adjacent to Mpophomeni township. The area surrounding the dam comprises rolling hills.

The dam surface and wall is owned by the Department of Water Affairs and the wall is managed for them by Umgeni Water. Some of the shore area is managed by Ezemvelo KZN Wildlife as a Nature Reserve and there are private properties on other areas of the shore.

Midmar Dam supplies water for purification to the Midmar Water Works in Howick from where an average of 220 million litres per day flow via a network of pipelines and reservoirs to an area bordered by Wartburg in the east and Vulindlela and Mfagathini in the west and Bothas Hill in the south. Howick, Hilton, Pietermaritzburg, and areas between them and Bothas Hill also receive their potable water from this water works.
(See Appendix 1.)

2.2 Wild animals

Initially we were puzzled as to the lack of water fowl on the dam, however as we approached a bay fed by a sewage contaminated stream, there was an abundance of birdlife feeding on the vegetation thriving in the nutrient enriched waters – hundreds of birds! This scene was repeated in the bay below Mpophomeni which receives sewage contaminated water from Mpophomeni via the Mthinzima Stream.
(See Appendix 2.)

Wild Animals	Wild Birds	
Hartebeest	African Black Duck	Egyptian Geese
Vervet Monkey	African Jacana	Fish Eagle
	Blacksmith Plover	Goliath Heron
	Darter	Spurwing Goose
	Cormorant	Yellow Billed Duck

2.3 Indigenous Vegetation

Terrestrial

Grasslands surrounding the dam shores.
(See Appendix 4.)

Aquatic

Small areas of sedges, and other aquatic plants occur on the water edge and in the shallows. Water lilies and multiple species of submerged aquatic plants grow in the two nutrient enriched bays. We identified the invasive *Myriophyllum aquaticum* (Parrots Feather) in one of the sewage contaminated bays. (See Appendix 3.)

2.4 Impacts

Erosion

Dam capacity when first measured in October 1963 was 177 million m³
When last measured in October 1983, capacity was still 177 million m³
Reduction in capacity due to siltation: 0.13%
This excludes the increased capacity since the raising of the wall in 2002. Siltation is possibly due mainly to the Lions River which is extremely silted at most times of the year, and which enters the uMngeni River approximately three kilometres upstream of Midmar Dam.
(See Appendix 6.)

Invasive / alien vegetation

We did not circumnavigate the entire dam, but paddled from the uMngeni inlet, across the opening of Pylon Bay into the next two bays downstream of Mpophomeni. Some invasives were observed in the Ezemvelo grasslands.
(See Appendices 3 and 5.)

Dam walls / weirs

The lack of environmental releases from Midmar reduces the river size below Midmar Dam wall.

2.5 Water Quality

The water in the bay fed by the uMngeni River was beautiful and clear. However, as we entered the bay east of Pylon Bay, the water grew steadily more murky. The source was found to be a stream that flows through a farm that lies to the west of the Boston / Bulwer Road and is situated downslope of and receives some of Mpophomeni's storm water. Water in the next bay (east) lies below Mpophomeni and was also extremely turbid (murky).
(See Appendix 7.)

Eutrophication signs

The extremely murky water in the two aforementioned bays is as a direct result of sewage contamination from Mpophomeni and is evident in both the shallow as well as deep water. The flourishing algal bloom, water lilies, and other aquatic plants here do not occur elsewhere in Midmar Dam. In places the water seems to be bubbling. Google Earth photos from 2008, taken at 6 kilometres above the Earth, show the turbid water even from that distance, as do the latest Google Earth satellite photos.
(See Appendix 7.)

Mini SASS

Not applicable in a water impoundment such as Midmar.

Lab tests

See Appendix 7.

Top: Clear water – uMngeni inlet bay
Bottom: Water in Mthinzima Bay

2.6 Green Corridor

Potential stewardship sites

Approximately half of the land area around Midmar Dam is part of an Ezemvelo Nature Reserve. There are some private farms, two of which have had approval for housing developments, and one farm belonging to Umgeni Water. There is also a small area of communal land. The Mthinzima stream rises in the hills above Mpophomeni, and after flowing through Mpophomeni enters a degraded wetland prior to flowing into Midmar Dam. This is also downstream of the planned Mpophomeni Waste Water Treatment works. This wetland is of critical importance to the purification of the streams sewage contaminated water, and urgent efforts should be made to restore and protect this wetland as a buffer for Midmar Dam as soon as possible.
(See Appendix 8.)

River hiking way potential

The walk around Midmar Dam is easy and only requires agreement from Ezemvelo KZN Wildlife. In order to avoid the Mpophomeni wetland on the southern side of Midmar Dam and the private properties on the eastern side of the dam, the best route would be on the Ezemvelo land to the west and north of the dam. Camping sites as well as cottages are available at Ezemvelo.
(See Appendix 8.)

Section 3: Midmar Dam to Albert Falls Dam

3.1 Area description

GPS Co-Ordinates

Start: 29°29'34.26"S 30°12'8.67"E
Finish:29°26'56.71"S 30°21'13.84"E

Altitude drop

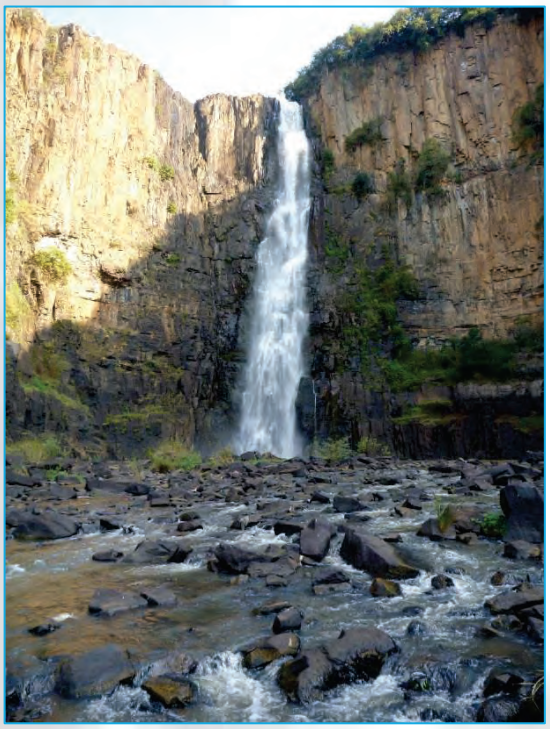
1 025 – 663 metres above sea level

General

The area immediately below Midmar dam comprises a floodplain / wetland, shortly thereafter lies the residential area of Howick on the left bank.
A mown path alongside the river is used by many residents to walk along this attractive stretch of river as it flows over shallow black dolerite rocks, spreads out lazily in big swimmable pools and then tumbles over the five metre drop of Mills Falls. On the right bank a farm has been subdivided and the first three homes are being built – the remainder is still grassland.

Some natural vegetation is situated between the low cost housing development of KwaMevana and the river but what could be a beautiful narrow floodplain is contaminated by sewage spilling from the KwaMevana sewer pump station. A light industrial area is situated atop the steep opposite bank.

The river flattens out above the Howick Falls into large shallow riffles before plunging over the 98 metre high falls which lie on a dolerite dyke which overlays sandstone layers. Climbing down a precipitous path to the foot of the Howick Falls, we finally left behind the open grasslands and rolling hills of the Dargle. The almost 100 metre high falls plunge into a deep pool which spills into a narrow gorge as the river carves its way between steep thickly vegetated slopes.



The terrain remains steep as the river gains momentum and rushes headlong down the valley over rocks, fast flowing rapids, still deep pools and cascades, the hillsides always rising up steeply to the grassland topped sandstone cliffs. The hotter slopes are dotted with grassland and tall aloes, whilst the cooler slopes are swathed in thick bush and indigenous forest.

Top: uMngeni River downstream from Midmar Dam wall
Middle: uMngeni River in Howick
Bottom: Howick Falls

Towards the downstream end of Umgeni Valley Nature Reserve, the valley widens out, with extensive savanna grassland areas to the left of the river which extend to the right of the river as one passes the Otto's Bluff hills. As the valley opens up and the gradient flattens out, one of the uMngeni River's larger tributaries, the Karkloof River, joins the uMngeni on the approaches to Albert Falls Dam, and the nature reserves are replaced with sugar cane and cattle farms. Upstream of the inlet to Albert Falls Dam the river is lined with reeds and the adjacent areas are dotted with flat crowned Acacia trees.

Approximately a kilometre downstream of the Howick Falls, the water looks cleaner for a short stretch, but then, as the steep sides of the valley climb higher and higher the outlet from the Howick Waste Water Treatment Works (WWTW – the sewage works) empties down the mountain side into the river. As this effluent is often not compliant with acceptable standards the river's health once again deteriorates. It is a few kilometres below the WWTW that the water finally looks healthy again after the impact of sewage from Howick town. (See Appendix 1.)

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Top: Gorge below Howick Falls
Middle: Bottom end of the steep valley
Bottom: Upstream of Albert Falls Dam

3.2 Wild animals

Animals
Ant bear – digging
Blesbok
Buffalo
Bushbuck
Giraffe
Hippo
Jackal
Nyala
Otter
Python
Wildebeest
Zebra

Birds
Fish Eagle
Fork Tail Drongo
Half Collar Kingfisher
Purple Crested Lourie

3.3 Vegetation

Indigenous Terrestrial Vegetation

The area immediately below Midmar dam comprises a floodplain / wetland, which is initially in a good state as the invasives are kept under control both by the Howick Conservancy and a DUCT River Care Team. Indigenous wetland and floodplain plants flourish, *Combretum* (river bush willow) abound and there are patches of indigenous bush along the river. *Widdringtonia* (Hare Bells), *Zantedeschia* (Arum Lilies) and *Kniphofia* (Red Hot Pokers) were seen. Near Mills Falls on a steep bank there is indigenous bush with *Acacia siberiana* trees.

In the gorge below the Howick Falls east and south facing slopes in Umgeni Valley Nature Reserve there are areas of forest and bush. Due to the lack of bulk grazers, over the last thirty odd years, many of the previously grassed slopes below the cliffs have become encroached with thick bush. The hotter north and west facing slopes are more open grassland are dotted with tall *Aloe ferox*. Towards the downstream end of Umgeni Valley Nature Reserve, the valley widens out, with extensive *Acacia siberiana* dotted grassland areas to the left of the river. These areas of grassland near the river were used, before the reign of Shaka Zulu, as tilled lands, and occasional terrace lines are still faintly visible. These extend to the right of the river as one passes the Otto's Bluff hills.

The giant Sycamore fig forests that used to line the river banks in this area were washed away in the 1987 floods. Twenty five years later, these forests are again taking shape, in the form of a number of young Sycamore figs that are growing alongside the river in many places. Some are very small, some already two to three metres high: the forest is returning. As the river levels out approaching Albert Falls Dam, areas not under sugar cane remain grassed with *Acacia siberiana* dotting the plains.
(See Appendix 4.)

Aquatic

The waterfalls and many rapids in the area are covered in swathes of *Hydrostachys polymorpha*, endemic to KwaZulu-Natal Midlands and only found growing on rocks in the turbulent water of waterfalls.
(See Appendices 3 and 4.)

Right: Acacia siberiana grasslands

3.4 Impacts

Erosion

The river in Howick was very turbid in places, due to turnover at Midmar Dam. It also showed signs of siltation in some areas, which grew worse the further downstream we went.
Below the town of Howick, some silt enters the river via some of the tributary streams that originate in the town, and further downstream, roads in close proximity to the river also add their silt load. The Albert Falls Dam inlet had silt on the river bed, and siltation stains on the rocks.
(See Appendix 6.)

Invasive / alien vegetation

Where the Howick houses are situated close to the river on the left bank, the natural bush is invaded in many areas by garden escapees and invasive plants. The Howick taxi rank area is choked with invasives such as Balloon Vine and Bugweed, and Periwinkles and Brambles are invading the river banks below the road bridge.

The first invasive *Nasturtium officinale* (Watercress) seen on the river was observed in Howick just above the Howick Falls, in the water enriched with nutrients from the regular sewer spills from Howick sewer pump stations. The Watercress increases in profusion reaching its peak downstream of the Howick Waste Water Treatment works where in places it is almost bank to bank on the rivers. Thereafter its occurrence does lessen, but it still occurs fairly constantly down the river until upstream of Albert Falls Dam.

Approximately half of the forest in the gorge immediately below the Howick Falls is completely smothered by the invasive *Cardiospermum grandiflorum* (Balloon Vine), which is accompanied by light to medium infestations of an additional twenty two different species of invasive (there may be more , this is what we counted). This seems to be the downstream gathering point of many of the invasives seen along the river in Howick and above. Thereafter we noticed the first *Caesalpinia decapetala* (Mauritius Thorn) in Umgeni Valley Nature Reserve.

Top: Invasives in riparian zone, Howick
Middle: Balloon Vine smothering indigenous forest in Howick Falls gorge
Bottom: Terrestrial and aquatic invasives

Working for Water were apparently clearing upstream from Mortons Drift up to two years ago and reached the upstream border of the Ihlanze Private Wildlife Reserve (Karkloof Spa). There is a distinct line here where the invasives suddenly appear in extremely high densities, and with lack of follow-up the previously cleared areas are once again becoming infested.

Many invasive species were seen below Howick Falls for the first time and the following were first noted between the Falls and just downstream of Mortons Drift:

- *Lantana camara* (Lantana)
- *Tithonia diversifolia* (Mexican Sunflower)
- *Solanum seaforthianum* (Potato Creeper)
- *Pistia stratiotes* (Water Lettuce) upstream of the Karkloof / uMngeni confluence
- *Colocasia esculenta* (Elephants Ears / Madumbi)
- *Eichornia crassipes* (Water Hyacinth)

Pistia stratiotes (Water Lettuce) was seen downstream of the Karkloof uMngeni confluence – a sign of increased nutrients in the water, possibly from the concentration of a pod of hippopotami in off stream dams close by. Lastly, Gooseberry which although not yet a listed invasive species, is clearly becoming an invader of some areas.
(See Appendices 3 and 5.)

32 metre river Buffer Zone

Construction / buildings

Hydroelectric pump station – historical: constructed 99 years ago
Game fencing across and in the river
Below Mortons Drift: either pump station or hydroelectric plant

Pump stations

No extraction pumps were seen. However, there are Water Purification and Waste Water outlets and four sewage pump stations next to the river serving Howick.
(See Appendices 6 and 7.)

Drainage ditches

On the Ihlanze Private Wildlife Reserve a series of dams interlinked with manmade wetlands are fed by a canal leading from the river. This system was originally built for irrigation, but with the formation of the Nature Reserve, it is a water bird paradise.
A cement irrigation canal leads off from the river below Mortons Drift for the use of the sugar can farms in the area.
(See Appendix 6)

Sand mining

No sand mining was observed in this section of the river.

Other

In the residential area of Howick, some of the older homes could well be within the buffer zone. In the industrial area of Howick although the high river banks make it difficult to estimate the buffer zone; some of the industries may also be well within this zone – their storm water drains empty into this section of the river.

Sugar cane is planted within the buffer between Morton's Drift and Albert Falls Dam.

Eskom lines are cleared into buffer area – all vegetation has been bulldozed.

Right: Sugar Cane and road in buffer

Upstream of Morton's Drift, the river has been fenced with impregnable game fencing both along the river bed, as well as on the river banks, due to the presence of buffalo and hippopotamus.

Dams / weirs

- Midmar Dam wall
  Due to the lack of environmental flows, the river level below Midmar Dam remains consistently low most of the year, the only exception being when Midmar overflows for typically a couple of months only in the late summer.
  At the time we walked through Howick, the dam was undergoing turnover, resulting in extreme turbidity of the river below the dam. This extended for approximately seven kilometres downstream of the dam wall to a point approximately one kilometre below the Howick Falls.
- Weir upstream of Howick Falls

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Litter / dumping

Between Midmar Wall and Howick we passed the first illegal dumping ground, next to the road below Midmar Dam with a well-worn access road: building rubble, cardboard, vehicle parts, general rubbish.

Once in the residential area we noticed various piles of illegal garden refuse which had been dumped next to the river.

In the residential area of KwaMevana dumping increased with a large pile of rubbish opposite Noqwasa School. Residents informed us that this is due to the fact that either rubbish is not collected timeously on schedule, or that there is no municipal collection.

The Howick taxi rank area is a mess of invasives and litter that blows into the river and DUCT have erected a trash boom on the river below the road bridge to stop this rubbish from being washed downstream.
(See Appendix 6.)

Top: Impregnable game fence
Middle: Weir above Howick Falls
Bottom: Illegal dumping, Howick

3.5 Water Quality

River water in the Howick area at the time of our walk was very turbid and generally a mud brown colour due to turnover of Midmar Dam and this extended to a short distance upstream of the Howick Waste Water Treatment Works (WWTW) outlet (about seven kilometres). Below the outlet, the turbidity again increased, although of a different nature due to sewage.

Algae was noted on rocks in various places through Howick and the first *Nasturtium officinale* (Watercress) was seen above the Howick Falls. A profusion of algal "sludge" was seen on the rocks below the Howick Falls. This disappeared upstream of the hydroelectric station and reappeared downstream of the WWTW outlet as well as an increased profusion of watercress. In addition to the above, sewer spills from overflowing sewer pump stations impact the river, along with possible contamination of storm water drains from the light industrial area.

The buffer provided by the three adjacent nature reserves below the WWTW (Umgeni Valley, Hilton College and Ihlanze) aids in the improvement of the water quality. Although the watercress still occurs, the sediment and algae eventually disappear in Umgeni Valley Nature Reserve and are not present in the river again until Albert Falls Dam. The manmade dams upstream of the uMngeni / Karkloof confluence showed signs of eutrophication – Duck Weed and other aquatic plants were flourishing. This could be attributed to the occurrence of hippo in the dams, and the fact that apparently the buffalo frequent the dams to eat the giant sedge that grows in the dams. Presumably the wetlands polish some of this water before it returns to the river; however there was a definite increase in invasive Duck Weed from this area down. The inlet of Albert Falls Dam shows signs of sedimentation (white stains on the rocks) and there is once again algae and some sludge at the top of the rapids at the dam inlet. (See Appendix 7.)

Mini Sass

Mini SASS score of 5.1 below Midmar Dam, due to a combination of the impacts from Midmar Dam (turnover, scouring, temperature of release water and constant extremely low water releases) plus sewage spills and dirty storm water. The WWTW outlet has an extremely negative impact on the river causing the Mini SASS score to plummet to 3.2 (VERY POOR condition) downstream of the Howick Waste Water Treatment Works. River health only began to improve approximately three kilometres below the Howick WWTW. (See Appendix 7.)

Lab test results

See Appendix 7.

Top: Turbid water and algae, Howick
Middle: Surcharge – KwaMevana Sewage pump station
Bottom: Howick Waste Water Treatment works effluent

3.6 Green Corridor

Potential stewardship and conservancy sites

- The Howick Conservancy, although not registered, looks after the area adjacent to the river in the Howick residential area very well. Discussions are underway to link this with the Beacon Hill Conservancy as well as with a planned protected area down the Symmonds Lane Stream which enters the uMngeni River below the Howick Falls.
- A block of land including the area surrounding the Howick Falls (a National Heritage Site) and the downstream nature reserves (Umgeni Valley and Ihlanze) would be beneficially protected as Stewardship Sites.
- Hilton College Nature Reserve was afforded Stewardship status recently.

(See Appendix 8.)

River hiking way potential

Although there are some potentially good areas for a hiking trail, some of the terrain in the area is not at all suitable due to its steepness. Other obstacles include properties with electric fences and a game reserve with buffalo and hippo and thus a detour would have to be found around these properties.

There are a number of bed and breakfasts and guest houses in Howick. In addition there are chalets, cottages and three rustic bush camps on Umgeni Valley Nature Reserve, as well as camping facilities on Hilton College Nature Reserve.
(See Appendix 8.)

3.7 Interesting information / history

- A hydroelectric station is situated next to the uMngeni River downstream of the Howick Falls. Built in 1913 to supply electricity to the factory that stood on the present day Sarmcol site, the excess electricity was used in the village of Howick, making Howick one of the first rural villages in KwaZulu-Natal to be electrified.

  A small channel leads off from the river at the top of the Howick Falls, from where the water is channelled into a pipe that runs straight down the 100 metre drop of the gorge side to the turbines below. The water is then released back into the river on exiting the building. This hydroelectric station still operates, supplying Sarmcol with electricity 99 years after it was constructed.

- Umgeni Valley Nature Reserve lies in the valley below the Howick Falls, and has been operating since 1974. The reserve was purchased by WESSA (the then Wildlife Society) by means of a massive public fundraising drive in 1973, and has for the last 39 years been an environmental education centre for school learners of all ages. WESSA moved their head office to the reserve a couple of decades ago.

- The Ihlanze Private Wildlife Reserve (previously Game Valley), was instrumental in the successful reintroduction of Oxpeckers some years ago, and there is now a stable population of these birds on the reserve.

Section 4: Albert Falls Dam

4.1 Area description

GPS Co-ordinates

River inlet: 29°26'56.71"S 30°21'13.84"E
Dam wall: 29°25'52.04"S 30°25'33.15"E

Surface area

23.5 km^2

Total capacity

290 million m^3

General

The dam surface and wall is owned by the Department of Water Affairs and the wall is managed for them by Umgeni Water. Some of the shore comprises Msinsi Holdings Nature Reserve and there are also privately owned properties.

The southern shore of Albert Falls Dam comprises low lying flat areas rising by means of rolling hills towards Pietermaritzburg. This shore area is part of the Msinsi Game Reserve, comprising mainly open grassland dotted with Acacia trees. The hill known as Otto's Bluff rises in the distance to the south west and between Otto's Bluff and the dam are game farms and small holdings situated in thorn veld. To the distant west lie the Karkloof hills which form an escarpment clad in indigenous forest, and from the uMngeni River inlet, one looks upstream into the valley leading from the Howick Falls. Visually, the area immediately adjacent to the inlet seems to comprise small holdings.

On the north west side of the dam, we were not always able to ascertain surrounding land uses as the banks are over five metres high in places. However, the north western shore seems to be predominantly timber plantations, although one gently sloping peninsula is grassland dotted with a few acacias with a distinct lack of timber escapes.

The village of Albert Falls and the dam wall lie to the east, bordered by small holdings and the Msinsi Game Reserve.
(See Appendix 1).

4.2 Wild animals

Animals
Blesbok
Dassie
Duiker
Impala
Otter
Zebra

Birds
African Jacana
Coot
Darter
Cormorant
Crowned Cranes
Egyptian Geese
Fish Eagle
Goliath Heron
Hamerkop
Moorhen
Pied Kingfisher
Sacred Ibis

The area where the most aquatic birdlife was seen was at the uMngeni inlet, where a mass of algae, duck weed and water lettuce occurred. Here, Coot/ moorhen, Jacana and others were seen in large numbers.

Photo: Indigenous bush on Albert Falls Dam shoreline

4.3 Indigenous Vegetation

Terrestrial indigenous Vegetation

The southern shores alternate between areas of open savanna and thorn veld. On the north west shore, some citrus orchards occur in the grassland / thorn veld areas, and there are some beautiful clumps of Valley Bushveld on the steep banks of the dam, with reed beds in the shallow bays and inlets. However, these are all interspersed with patches of invasives. The Msinsi area seems to be clear of invasives.
(See Appendix 4.)

Aquatic vegetation

Some shore areas are lined with reeds, which also occur on either side of the uMngeni inlet and in small shallow bays.
(See Appendices 3 and 4).

4.4 Impacts

Erosion

Capacity when first measured in June 1975 was 292 million m³
When last measured in March 1993 it was 289 million m³
Reduction in capacity: 1.24%

The water in the north western area was turbid – this could possibly be due to the wave action on the steep shore line. As the dam water levels fluctuate, the shoreline in most areas comprises bare earth that is not stabilised by any vegetation and any waves would wash this soil into the dam.
(See Appendix 6.)

Invasive / alien vegetation

The shores of Albert Falls vary from having indigenous bush to areas choked with terrestrial invasives. Aquatic invasives (water lettuce) were seen in the bay fed by the uMngeni River, as well as in a small bay to the west of the uMngeni River inlet bay, likely to have been blown here from the uMngeni inlet. It seems that the water lettuce has come down the uMngeni River, and our suggestion to erect a boom across the inlet to prevent the influx of the water lettuce into the dam has already been implemented.

There is clearly no attempt made to ensure that the buffer of 32 metres from the high water level is kept invasive free. Some plantations reach the high water mark, either planted or escapes. Some water courses that comprise tributaries of the dam are completely choked with invasives – again, usually either planted or escaped timber.
(See Appendices 3 and 5.)

32 metre River Buffer Zone

Construction / buildings
Various houses, small holdings and farms are situated on the shore of the dam.

Pump stations
Only two pump stations were observed, although there may well be others

Drainage ditches and dykes
None noted

Sand mining
None

Litter / dumping

None noted.

Photo: Invasive vegetation on shore

Dams / Weirs
Albert Falls Dam is purely a reservoir for Nagle Dam which is the next dam on the river. The amount of water released from Albert Falls depends on how much water is needed by Nagle which is kept at around 88% full in order to supply water to Durban.

4.5 Water quality
Water quality varied from crystal clear to turbid, the latter closer to the steeper shores, possibly from wave erosion action.

Eutrophication signs
The uMngeni inlet comprises a small sheltered bay, with rapids at its upper end. Heavy sediment and heavy infestations of algae were seen on the rocks of the rapids, the submerged river rocks and in the river water itself and fertiliser stains were observed on exposed rocks. The bay of the inlet had very turbid water with a lot of algae, duck weed and water lettuce in a floating "raft".

The Doringspruit, which enters Albert Falls Dam south of and almost adjacent to the uMngeni inlet showed signs of eutrophication – algae on the rocks and stream banks, as well as extremely turbid water. (See Appendix 7.)

Mini SASS
Not applicable in a water impoundment such as Albert Falls

Lab tests
No samples were taken.

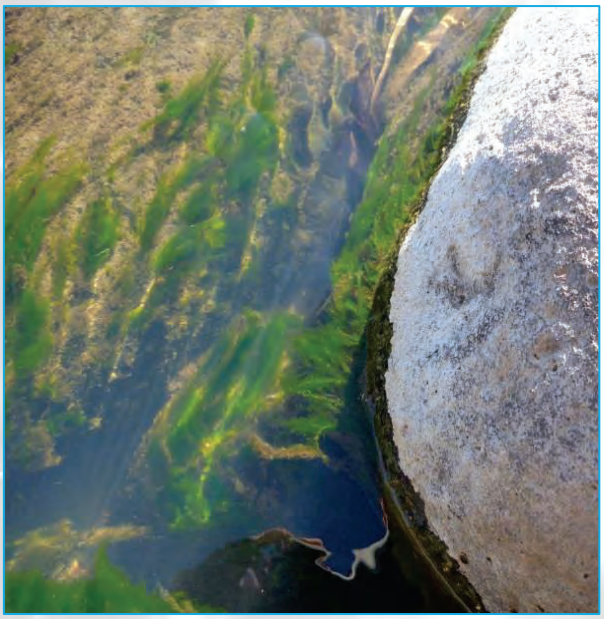
4.6 Green Corridor
Potential conservancy sites
Due to the strategic importance of the dam, and the pressure for housing developments in its vicinity, is would seem sensible to map out areas that need protection of some sort around the dam before the entire shoreline towards Pietermaritzburg and Otto's Buff is developed.

- An area of the southern and south western shore is under the protection of Msinsi Game Reserve.
- There are possibly a few smallholdings that would warrant conservancy status on the shores of the dam.

(See Appendix 8.)

River hiking way potential
Albert Falls Dam's southern and south western boundaries comprise Msinsi Holdings Nature Reserve which could facilitate hiking and would provide overnight accommodation. The game fencing would however be a barrier for exiting the reserve. Should the north west side of the dam to be considered, there are numerous private properties whose owners would have to be approached.

Msinsi Albert Falls has cottages and camping facilities.
(See Appendix 8.)



4.9 Interesting information / history
The original dam at today's Albert Falls dam was known as Peeties Lake. This was inundated with the construction of Albert Falls Dam.

Right: Fertiliser stains and algae – Albert Falls Dam headwaters

Section 5: Albert Falls Dam to Nagle Dam

5.1 Area description

GPS Co-Ordinates

Start: 29°25'51.96"S 30°25'40.35"E
Finish: 29°34'51.11"S 30°37'25.86"E

Altitude drop

632m – 409 metres altitude above sea level

General.

The actual Albert waterfalls lie a few hundred metres below the Albert Falls Dam. A dolerite ledge across a wide stretch of the river makes for a beautiful wide waterfall. The path leads one downstream towards a public picnic site, and thereafter lie the houses of Albert Falls village, with lawns and gardens up to the river edge on the left bank and indigenous bush on the right bank.

Gone are the great meanders of the area above Midmar, and gone are the steep sided gorges below the Howick Falls. We passed rapids and still pools. Below the Pietermaritzburg / Greytown Road Bridge on the right banks lie large commercial farms – grass (lawn), vegetable, poultry, maize, sugar cane, and on the right bank is communal land and the river, although not straight, does not meander as it does above Midmar. This is lowveld type country, with reeds along the river edge, dotted acacias and high termite mounds and a profusion of indigenous bush on the river banks.

Near the Pietermaritzburg / Wartburg Road bridge, the wattles of the Dargle have been replaced by enormous gum trees that line the river and mark its course – and block out many views beyond the river channel, including that of a feedlot.

We passed more commercial farms on the right bank whilst on the left bank properties are smaller, and apart from the huge gums and patches of elephants ears, the vegetation is indigenous bush alongside the river, and seems well tended by landowners. The terrain is undulating, and the river spreads out wide, with some rapids, but no cascades. We were fast approaching the Valley of a Thousand Hills.

Top: The Albert Falls
Middle: Typical scene upstream of the Valley of a Thousand Hills
Bottom: Cumberland Nature Reserve

Lowveld plants abound, and reeds grow in the river, until suddenly the right bank begins to steepen into high hills, and after a sharp corner, the same happens on the left bank – the start of the Valley of a Thousand Hills at Cumberland Nature Reserve. The river plunges deeper and deeper with impenetrable bush stretching from the river's edges all the way up the steep extremely thickly vegetated slopes to the sandstone cliffs far above that comprise landforms known as mesas. The mesas are, like the area below Howick Falls, topped with grasslands.

After approximately 10 kilometres the valley sides again widen slightly as the river, now crystal clear, takes on the form of a giant stream, rushing over rounded black dolerite rocks. It was in this area that we found the most pure river water on the whole walk. The geology began changing approximately halfway between Cumberland and Nagle Dam. The dolerite river boulders and rocks we had seen in the river since the start of the walk were suddenly interspersed with a variety of other rocks including conglomerate, tillite, granite, quartz and gneiss.

Although still deep down in the valley, the sides opened up somewhat, the bush and hillsides around us echoing with the sound of birdcalls, notably Purple Crested Tauraco, and we felt as if we were the only people in the world. No roads or houses, no electricity pylons or telephone lines to be seen anywhere. Approximately thirty kilometres of almost pure wilderness – totally surprising!
(See Appendix 1.)

5.2 Wild animals

Albert Falls to Cumberland

Animals

Otter – scats
Porcupine – scats, digging
Termite mounds – high
Vervet Monkey

Birds

Cormorant
Egyptian Geese
Fish Eagle
Giant Kingfisher
Pied Wagtail

Cumberland to Nagle

Animals

Bush pig
Blesbok
Dung beetle
Giraffe
Golden Orb Spider
Kudu
Otter – scats
Porcupine – scats, digging
Python
Termite mounds – high
Various antelope
Vervet Monkey

(See Appendix 2.)

Birds

African Hoopoe
Brown Hooded Kingfisher
Black Duck
Cormorant
Egyptian Geese
Fish Eagle
Giant Kingfisher
Mourning Dove
Pied Wagtail
Purple Crested Lourie
Yellow Breast Canary
Quelia

5.3 Vegetation

Terrestrial

Vegetation comprised typical Valley Bushveld species and closer to Nagle Dam some Lowveld species began to occur.
(See Appendix 4.)

Aquatic

Various reeds and *Phoenix reclinata.*
(See Appendices 3 and 4.)

Right: Scene upstream of Nagle Dam

5.4 Impacts

Erosion

From an area downstream of the Pietermaritzburg / Wartburg road bridge the river showed no signs of sediment on the river bed, nor stains on the rocks. From Cumberland the water at all times was crystal clear with no turbidity.
(See Appendix 6.)

Invasive / alien vegetation

The municipal owned public picnic site between the Albert Falls and the gauging weir is apparently leased to a private person who runs the picnic site. The entire area is heavily infested with invasives.

From the Pietermaritzburg / Wartburg Road Bridge area, giant blue gum trees line the river as far as Cumberland Nature Reserve, and clumps of Elephant Ears grow in the river. At Cumberland Nature Reserve the majority of the large blue gums along their side of the river (right bank) have been cleared; however, the left bank is heavily infested with very large gums.

The area downstream of Cumberland Nature Reserve was cleared of invasives by Working for Water a couple of years ago, resulting in close to 30 kilometres of almost invasive-free river banks. However, not far upstream of Nagle dam, un-rehabilitated sand mining sites have high invasive plant infestations. The area approaching and around Nagle Dam is choked with invasives, notably *Lantana* and *Chromolaena*. Dense thickets forced us either to make detours or spend long periods of time hacking our way through or following cattle paths bent over double.(See Appendices 3 and 5.)

32 metre River Buffer Zone

Construction / Buildings

- There is a public picnic site upstream of the Pietermaritzburg / Wartburg Road bridge, where the river banks have been planted to kikuyu and mulberry trees are carefully pruned for shade. The entire section is fenced off, preventing access to the river except on payment of a fee.
- There is a holiday cottage under construction close to the river banks where the riparian vegetation (excluding some large trees) has been removed up to the water edge, leaving bare earth that is in the early stages of being colonised by weeds.
- Bulldozing of an old building was evident, possibly a pump house in the buffer area, leaving a pile of rubble and tyres in the buffer as well as in the river.

(See Appendix 6.)

Pump stations

A total of 11 water extraction pump stations were seen.

Drainage ditches and dykes

None were noted – there were very old contour irrigation swales below Cumberland, covered in veld grass and almost invisible.

Sand mining

Along the stretch of river downstream of Cumberland Nature Reserve and as far as Nagle Dam one operational and three abandoned, un-rehabilitated sand mines were recorded. We saw repeated signs of non-rehabilitation where the old flood plains are like the surface of the moon, filled with craters, piles of boulders and the occasional small hillock which is home to a large tree. Some of these hillocks stand over 2 metres above the rest of the area, indicating the depth to which the sand was

Right: Sand Mining

removed. Veld condition here varies between areas choked with invasives, to areas with a mixture of pioneer plants and invasives and even some areas where the vegetation succession is more progressed. The un-rehabilitated sand mining sites definitely have higher invasive plant infestations than other areas, and seem to be promoting colonisation by invasive plants.
(See Appendix 6.)

Dams / weirs

Albert Falls gauging weir
Nagle Dam gauging weir

Litter / dumping

- At the Albert Falls and the Albert Falls picnic area, litter was seen, and graffiti was painted on the rocks of the waterfall.
- Five broken abandoned canoes were seen in the river.

(See Appendix 6.)

5.5 Water quality

Although the water looked reasonably healthy between Albert Falls and Cumberland Nature Reserve, the mini SASS scores did not confirm this. Water colour at times in the deep pools was a green grey whilst it was clear in the shallower areas. However downstream of Albert Falls dam lies Albert Falls village, and often invisible from the river banks are cattle feed lots, a crocodile farm and intense agriculture.

Thereafter on the uninhabited 30 kilometre section comprising Cumberland and communal areas, river health improved so dramatically that the river condition reached natural condition. No aquatic water invasives were noted between Albert Falls and Nagle apart from Elephant Ears (Madumbi).
(See Appendix 7.)

Mini SASS

Mini SASS tests were at times predictable, and at times extremely surprising. As was the case below Midmar Dam, the water quality in the river dropped below the Albert Falls Dam wall (4.2 VERY POOR condition). There were no signs of heavy invasive vegetation in the immediate area nor any other indication of potential causes aside from the dam just upstream of the Falls.

Downstream of the intensely cultivated area, the Mini SASS score improved slightly to 6.4 after a series of small unfarmed properties. Thereafter, in the long stretch of wilderness below Cumberland we measured the highest score on the entire river length (8.8 NATURAL condition). Approximately 30 kilometres of uninhabited, untouched valley was all that was needed for the river to recover completely.
(See Appendix 7.)

Lab test results

See Appendix 7.

Right: Upstream of Cumberland

5.6 Green Corridor

Potential stewardship, conservancy and community conservancy sites

This area has properties with the potential for Stewardship sites as well as Conservancies and Community Conservancies.
(See Appendix 8.)

River hiking way potential

- The terrain below Albert Falls Village as far as Cumberland is suitable for a hiking trail. A potentially difficult section which is very steep and with thick bush needs to be negotiated in order to reach the Cumberland plateau from the river, and thereafter there are trails on Cumberland, and foot paths and cattle paths most of the way to Nagle Dam. Entering the Msinsi Nature Reserve at Nagle Dam will require a gate if the game fencing is repaired. There is accommodation at Cumberland in the form of cottages and a camp site and the Msinsi Nagle Dam has camping facilities. However there is a long stretch in between the two where there are no facilities.
- The Gcinvema Community Trust has a magnificent hand shaped set of valleys that join into the uMngeni Valley near Nagle Dam. Their area already has some hiking paths laid out which could possibly be connected to the main river hiking trail.
  (See Appendix 8.)

5.7 Interesting information / history

Cumberland Nature Reserve

Cumberland was, until the 1960s, heavily sand mined. Almost all available sand on the plateau was removed, with only a few hillocks left under large trees. A neighbouring farmer purchased the property when it came up for sale, stripped of all its soil. Since then, the family have worked at restoring the land, and some 40 odd years later, the scars are barely visible. Only a very close look reveals the tree hillocks. The surrounding veld grasses and vegetation provide a stable, climax vegetation and habitat for a variety of game species and birds. This site is a wonderful example of what can be achieved with time, effort and land care.

Crocodile farm

A crocodile farm, situated near the river downstream of Albert Falls Dam, is thought to be the origin of the crocodiles that are occasionally seen on the uMngeni River. It is thought that some of the crocs escaped during the 1987 floods. We did not have the fortune of seeing any crocs during the walk.

Right: Rehabilitated sand mine, Cumberland

Section 6: Nagle Dam

6.1 Area description

GPS Co-ordinates

Inlet: 29°34'51.11"S 30°37'25.86"E
Dam Wall: 29°35'35.52"S 30°37'33.39"E

Surface area

1.56 km^2

Capacity

23 million m^3

General

Nagle dam was completed in 1950 as a supply dam for the Durban Heights Water Purification Works. Water is carried via 13 kilometres of underground tunnels and 38 kilometres of pipe to Durban Heights. The dam was originally under ownership of the then Durban Corporation. Ownership of the dam was later transferred to Umgeni Water. Hence, unlike the other dams on the uMngeni River, Nagle dam is owned and run entirely by Umgeni Water.

Nagle Dam is surrounded by steep vegetated hills with Mkhambathini (Table) Mountain as sentinel. The area around the dam is an Msinsi Holdings Game Reserve. We noted the first sightings of granite-gneiss below Mkhambathini Mountain sandstone cliffs, the first signs of the depth of the river through the millennia.
(See Appendix 1.)

6.2 Wild animals

Animal	Bird
Impala	Fish Eagle
Giraffe	
Mole – carcass	
Zebra	

(See Appendix 2.)

6.3 Vegetation

Indigenous Terrestrial Vegetation

The bush in the area is very thick. Tree species noted were similar to those seen upstream of the dam. Unfortunately, there are extremely heavy infestations of *Lantana* and *Chromolaena* on the nature reserve, which have choked out much of the natural bush.
(See Appendix 4.)

Top: Nagle Dam
Bottom: Indigenous vegetation, Nagle Dam

6.4 Impacts

Erosion

Capacity:
October 1963: 23 million m³
October 1987: 23 million m³
Reduction in capacity: Nil

Nagle dam is situated on a horseshoe bend of the uMngeni River. At the inlet a silt weir has been constructed, preventing silt from entering the main body of the dam. Once a year, large sluice gates to the side of the silt weir are opened up and the silt is released into the uMngeni River below the dam wall. We were informed that up to now this has resulted in a dam free of silt. However, a tributary stream entering the dam not far downstream of the silt weir is apparently bringing in a lot of silt, which we observed – much of it seems to be the type of sand used for building sand.
(See Appendix 6.)

Invasive / alien vegetation

Of interest was that all the terrestrial invasive plants around the shore line grew in the deep soils occurring on fairly level areas. All the steep slopes with shallow, rocky soils seemed to have only indigenous vegetation. All the sections of nature reserve that we saw were choked with predominantly *Lantana* and *Chromolaena*.
(See Appendices 3 and 5.)

Drainage ditches

None noted

Construction / buildings

A high dyke is situated behind the Msinsi picnic site as a preventative measure for flooding.

Dams / Weirs

Nagle Dam inlet wall and dam wall
Hydroelectric station

Litter / dumping

Aside from litter left behind in the picnic site, which was cleared the following day, none was noted.

Pump stations

Water supply for Durban at dam outlet – gravity fed
.

Buffer zone: 32 metres from river edge

Indigenous vegetation or invasives grow to the water's edge.

Top: Nagle silt sluice gates
Middle: The uMngeni River upstream of Nagle Dam
Bottom: The only water released into the river from Nagle Dam

6.5 Water Quality

Eutrophication signs

Some algae was noted in the water just inside the inlet wall in the still water, and in the water at the dam wall.
(See Appendix 7.)

Mini SASS

Not applicable in a water impoundment such as Nagle Dam

Lab test results

See Appendix 7.

6.6 Green Corridor

Potential community conservancy sites

Although Msinsi Nagle Dam is a game reserve in stunning surroundings, almost the entire property upstream of the dam inlet is completely choked with invasives, and seems to be a grazing area for cattle. If managed properly this could be another invaluable stewardship site which could extend upstream via stewardship / community conservancies / conservancies in an almost unbroken belt to close to the Wartburg Road Bridge.
(See Appendix 8.)

River hiking way potential

Aside from the potential access problem if the game fencing were to be repaired, this has good potential for a hiking way, with accommodation also available.
(See Appendix 8.)

Section 7: Nagle Dam to Inanda Dam

7.1 Area description

GPS Co-Ordinates

Start: 29°35'35.52"S 30°37'33.39"E
Finish: 29°39'4.53"S 30°48'7.45"E (bridge over inlet)

Altitude drop

410m – 151m altitude above sea level

General

The uMngeni River immediately below Nagle Dam has dried up totally, and the old river bed comprises a magnificent forest of enormous *Phoenix reclinata* (Wild Date Palms). Large quantities of water are released via pipeline from the dam wall to the Durban Heights water purification works in Durban, so that the only water release into the river is piped to approximately 500 metres downstream of the wall, where it is used to power a small hydroelectric plant and is returned thereafter to the river. The water temperature was tepid. An additional pipe releases a very small amount of water into the river.

A sudden change in geology was very evident. The steep sided slopes reaching up to vertical sandstone cliffs that had been a constant sight since below the Howick Falls gave way to granite, and the hillsides became more rounded, with smooth granite sections outcropping on the slopes. The valley widened somewhat, although it was still very deep.

On approaching the uMsunduzi confluence, aquatic vegetation (mostly invasive) was observed alongside the river as a bright green stripe along the banks. This verdant Irish Green ribbon was to continue all the way to Durban – evidence of the excess nutrients in the water.

Mamba Gorge is spectacular – the river has carved deep down through the granite so that the gorge sides are steep but convex, dropping away to a jumble of boulders in the narrow area where the water gushes through the gap.

Top:Nagle Dam wall
Middle: uMngeni River downstream of Nagle Dam
Bottom: Mamba Gorge

There is a reasonable density of homesteads, schools and infrastructure downstream of Nagle Dam, however from above Mamba Gorge this thins out to the occasional isolated homestead.
(Appendix 1)

7.2 Wild animals

Animal signs were not as prolific as previously, however the bird life in the second half of this section was rewarding.

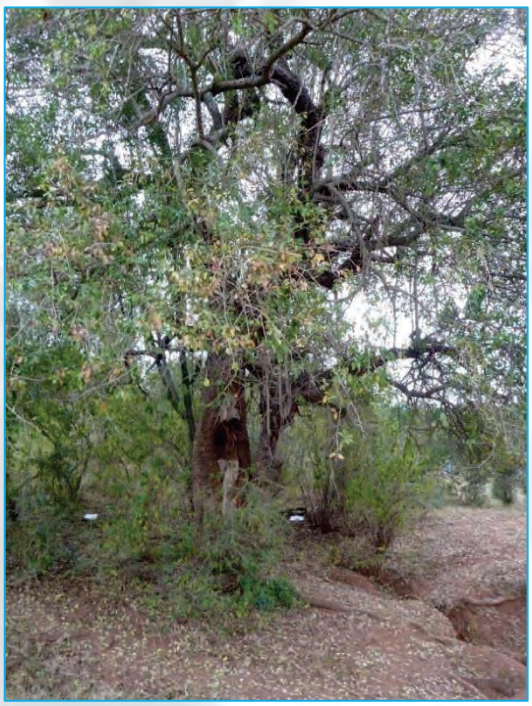
uMsunduzi Confluence to Mfula Store

Otter - sign
Black Duck
Goliath Heron
Fish Eagle

Mfula Store to Inanda Dam

Otter - sign
African Hoopoe
African Jacana
Blue Waxbills
Egyptian Geese
Fish Eagle
Hamerkop
Purple Crested Lourie
Wood Hoopoe

(See Appendix 2.)



7.3 Vegetation

Indigenous terrestrial vegetation

The vegetation type progresses from Valley Bushveld to Lowveld species. Some stunning Tambuti forests were seen. (See Appendix 4.)

Aquatic vegetation

Reed beds and *Phoenix reclinata* continued to line the river edge in places.(See Appendix 3.)

7.4 Impacts

Erosion

There was little siltation noted during this section of the walk. Below the uMsunduzi confluence, however, siltation during summer months is apparently a serious problem when heavy loads of silt are brought down the uMsunduzi River.
(See Appendix 6.)

Invasive / alien vegetation

A couple of kilometres below Nagle Dam, the tar road crosses the river by means of a low level bridge. From this point down, all the way to Durban, DUCT River Care Teams have been working the last 18 months to clear the invasive vegetation in the 32 metre buffer zone, and there were thus few invasives along the river. However this will continue to be a problem as all tributaries that we passed are choked with invasives.

Top: Magnificent Tambuti tree
Bottom: Water hyacinth

In addition, areas beyond the buffer zone are often infested with invasives, and un-rehabilitated sand mining sites definitely have higher invasive plant infestations than other areas, thus promoting the spread of invasive plants.

The amount of aquatic vegetation increased enormously once we reached the confluence with the uMsunduzi River and continued all the way into Durban. There are a number of aquatic invasives: Elephant Ears, Water Lettuce, Hyacinth and Blue Ageratum to name but a few. Control measures include aerial spraying as well as bio control.
(See Appendices 3 and 5.)

32 metre River Buffer

Construction / buildings
None

Pump stations
Hydroelectric station
As mentioned above (see section 7.1), the water released from the hydroelectric plant into the river from Nagle Dam is tepid. The release point is on a bend in the river, with the right bank being high and steep. In the early morning cold, the air temperature around the release was warmer, and the outlet created large amounts of airborne water that had the appearance of mist – albeit very warm mist. This warm mist has created an unnatural micro climate, and as a result, the area that, prior to the construction of the dam was part of the river bed, is now vegetated. A riverine forest has taken hold, however it does not comprise species that would normally occur in hot Lowveld valleys – this is a Yellowwood forest, with numerous young Yellowwood trees now established. These trees do not occur naturally in the Lowveld, and in this area would naturally occur in the sheltered east and south facing valleys higher up the mountains.
(See Appendix 6.)

Drainage ditches and dykes
None noted

Sand mining
The stretch between Nagle and Inanda Dams is littered with sand mines, some legal, some illegal, some active and some abandoned. Abandoned mines are not rehabilitated as per the law. A total of 32 sand mines were recorded in the area between Nagle and Inanda Dams.

The active mines vary between excavators dredging in the river and heaping mountains of sand on the river banks awaiting removal, to earthworks and digging of the actual river banks, often within the 32 metre buffer area, which in some places has been stripped bare. We witnessed rock causeways that have been built across the river, some with only three pipes to allow for water flow, and these causeways act as small dams. Earth moving equipment moves haphazardly up and down the river banks, destroying all riparian vegetation.

Top: Young Podocarpus *(Yellowwood) forest*
Bottom: Abandoned sand mine and causeway

If there are any mines no longer functioning that have been rehabilitated in the area, these have been rehabilitated so well that we saw no sign of them. Again, along this stretch of river we saw repeated signs of mines abandoned and un-rehabilitated where the old flood plains are like the surface of the moon, filled with craters, piles of boulders and the occasional small hillock, each home to a large tree. Some of the hillocks stand over two metres above the rest of the area, indicating the depth to which the sand was removed. Veld condition here varies from bare sand and rock in the case of newly abandoned mines, to areas choked with invasives.

In mines that were abandoned a longer time ago, pioneer plants were witnessed along with some invasives. The un-rehabilitated sand mining sites definitely have higher invasive plant infestations than other areas, and seem to be promoting colonisation by invasive plants. Locals complained to us that the excavations in the actual river mean that they can no longer cross the river to visit shops and other communities.
(See Appendix 6.)

Dams / Weirs

Gauging weir above Foley Mariani Bridge (more commonly known as Mariani Foley Bridge)

Litter / dumping

None on the river banks – DUCT River Care Teams collect any litter they come across when working along the river.
We did, however spot a number of abandoned canoes sunk in the river. All had stickers indicating various canoe races. Apparently the rudder wires are often raided to be used as poaching snares. A pile of broken canoes removed from the river were seen behind Mfula Store.
(See Appendix 6.)

Top: Abandoned sand mine infested with Peanut Butter Cassia
Bottom: Broken canoes collected from the river

7.5 Water Quality

Eutrophication signs

Infestations of the invasive aquatic species mentioned in section 7.4 are all indicators of eutrophication in the water. These decreased as we approached Inanda Dam, and then began increasing rapidly as we approached the headwaters of the dam.

As observed in other areas of the river, below Mamba Gorge, where there is little habitation in the surrounding areas, the river quality improves. The aquatic invasives decreased, and it was here, below Mfula Store, approximately 15 kilometres downstream of the uMsunduzi confluence, that once again the Mini SASS test indicated that the water had improved. Not far downstream from this point, as we approached the Inanda Dam headwaters, the quantities of aquatic invasives again increased – predominantly Water Hyacinth. As the valley winds tend to push this floating weed upstream, much of the Hyacinth on Inanda Dam gets pushed into the narrow headwaters of the dam and is trapped there.
(See Appendix 7.)

Mini SASS

This stretch of the river upstream of Nagle Dam proved to be the second healthiest section of the entire length of the uMngeni River. Below the Nagle Dam wall and silt outlet, water quality dropped, even though the area immediately around and upstream of the test site is a nature reserve, albeit with heavy infestations of invasive plants; neither are there any homesteads in the area. Thereafter, homesteads increased, although they were scattered. Below Mamba Gorge, the river health had improved to 6.2, and further downstream close to Mfula Store we had the second highest score (7.57) on the entire river's length. This site is approximately 15 kilometres upstream from Inanda Dam.
(See Appendix 7.)

Lab test results

See Appendix 7.

7.6 Green Corridor

Potential community conservancy sites

This section is fairly built up with scattered homesteads dotted all over the area. However, Mamba Gorge would be well worth some type of protection as would the area around Mfula store.
(See Appendix 8.)

Top: Water Hyacinth upstream of Inanda Dam
Bottom: The second healthiest stretch of the entire uMngeni River, near Mfula Store

River hiking way potential

The bush below Nagle is extremely dense for a couple of kilometres. Thereafter, there are no shortages of paths to Inanda.

There are potential accommodation sites at iSithomba (a guest house and a Durban Green Corridor overnight point), as well as at Mfula Store.
(See Appendix 8.)

7.7 Interesting information / history

Mfula Store, set beside the uMngeni River in the heart of the Valley of a Thousand Hills, is one of the trading stores on whose verandah Ian Player slept during his first paddle down the uMngeni River shortly after the end of the Second World War. Today it still seems to be in the middle of nowhere with only a few scattered homesteads evident in the area.

The store and house were purchased a few years ago by the current owners who have renovated the house into a delightful thatch bungalow that sleeps 12, making it the perfect hideaway for relaxing weekends. They are now renovating the original store itself, which will be a wonderful venue for functions. The newer, smaller store has for many years been a favourite watering hole of paddlers visiting that section of the valley on day trips. Although the store itself has lost much of its business as the people living in the area migrated over the years to be closer to opportunities and services in Durban, Mfula is now used as an overnight stop for the Duzi2C cycle race, and mountain bikers looking for challenging training routes.

Section 8: Inanda Dam

8.1 Area description

GPS Co-Ordinates

River inlet: 29°39'40.53"S 30°48'7.45"E (bridge at headwaters)
Dam wall: 29°42'34.02"S 30°52'7.26"E

Surface area

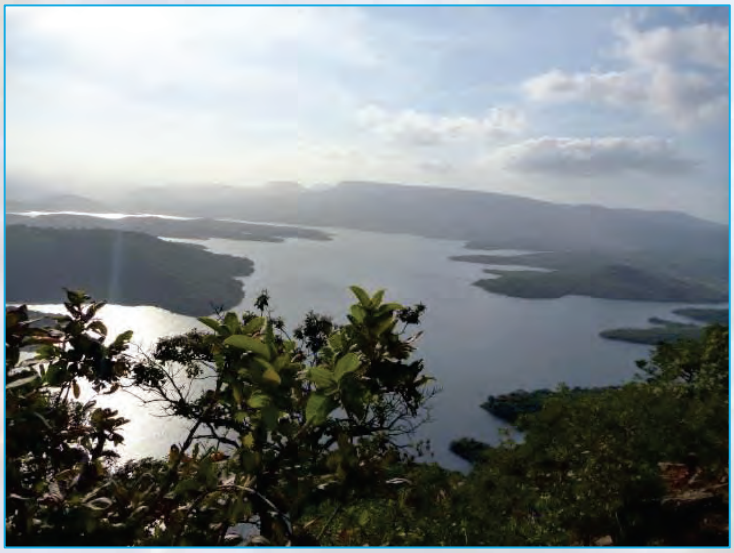
14.63 km^2

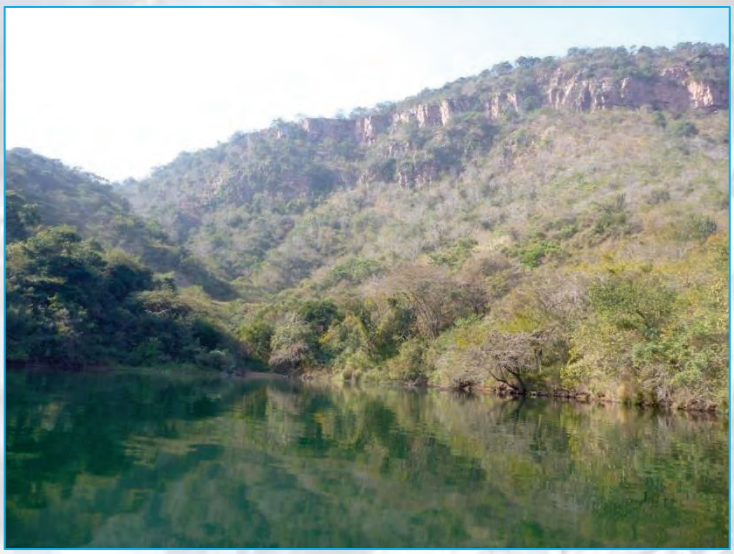
Capacity

251 million m^3

General

Inanda Dam supplies water to the Reservoir Hills Purification works in Durban. It is set deep in the Valley of a Thousand Hills, and is a large dam with many bays, coves and inlets. The surrounding hillsides comprise thick bush alternating with scattered homesteads, heavily built up areas and an Msinsi Nature Reserve on the southern shore. There are some seemingly untouched bays and steep areas which rise up above the dam to cliff faces of spectacularly eroded monoclines (folded) rock and cliff faces. (See Appendix 1.)





8.2 Wild animals

There were no signs of wild animals.

8.3 Vegetation

Indigenous Terrestrial Vegetation

A mix of Valley Bushveld and Lowveld species were observed and mirror the species seen upstream of Inanda. (See Appendix 4.)

8.4 Impacts

Erosion

Capacity when first measured in October 1990 was 251 million m^3
When measured in April 2009 capacity was 246 million m^3.
Reduction in capacity:
2.02% over 20 years

Top: View of Inanda Dam
Middle: Thickly bushed hillside
Bottom: Built up area near dam

Invasive / alien vegetation

The shores of Inanda Dam have areas of indigenous bush alternating with heavy infestations of invasive plants. Tributary streams are also choked with invasives such as *Lantana*, *Chromolaena* and Mexican Sunflower, as are some entire hill slopes around the dam. This latter serves not only as a seed bank and user of water, but also eliminates a vast area of potential grazing for livestock.

The surface of the water was, in some areas, heavily infested with Water Lettuce, Water Hyacinth, and other invasive aquatics. A hyacinth boom (floating steel cable) at the entrance to the dam, intended to assist with control of these aquatic invasives by stopping their entry into the dam, had recently been cut. This happens periodically and Umgeni Water staff then re-instate the boom. Eradication control methods for aquatic invasives include aerial spraying and bio control co-ordinated by Working for Water assisted by Umgeni Water and DUCT. (See Appendices 3 and 5.)

32 metre Buffer Zone

The buffer zone, is, by and large un-impacted, with most homes and other infrastructure well away from the water.

Construction / buildings

None noted

Pump stations

None noted

Drainage ditches and dykes

None noted

Sand mining

Although we did not circumnavigate the dam thoroughly, extensive sand mining activities were observed along the last 5 kilometres of the approach to Inanda Dam, with associated causeways and disturbance of riverine vegetation.

An additional sand mine was observed in the hills above Inanda on the road leading to the Shembe Church property. (See Appendix 6.)

Dams / weirs

Inanda Dam wall

Litter / dumping

Very little litter was seen around the more populated north shore of the dam. Walking between homesteads and through built up areas, the lack of litter and dumping was evident. This could possibly be attributed to the fact that eThekwini Metro distributes free rubbish bags, and there are regular weekly rubbish removal services. Piles of bottles at some shebeens seem to indicate that attempts are being made at recycling. (See Appendix 6.)

Top: Water Hyacinth in Inanda Dam headwaters
Bottom: Triffid weed infestation

8.5 Water Quality

Eutrophication signs

It seemed incongruous walking alongside such an enormous dam to realise that this water is, by and large, off limits to the communities that live alongside – the water is destined for the greater Durban area. Potable water is supplied by eThekwini Municipality to homes around Inanda, for a fee of R450 to connect. Outside each house, a 200 litre drum (200 litres per day) is set on a plinth with inflow controlled by a ball valve. Water is often disconnected to prevent over utilisation, and thus we observed some of the many residents who still walk to the dam to bathe or wash their clothes.

All homes in the area utilise double vault urine diversion toilets. According to our local guide these have not been entirely successful. They fill up over a number of years (typically four to six,depending on the number of users) and thereafter have to be emptied. Many home owners have been reluctant to perform this task and have reverted to the old pit toilets when their urine diversion toliets are full. The eThekwini Metro is however planning to commence a routine latrine emptying programme for all at the city's expense commencing in 2015.

Thus, possibly surprisingly, we did not see eutrophication signs such as algae or sediment in the dam, although the infestation of water invasives would not be possible without enhanced nutrient levels. Water in the shallows was clear, algae free and not turbid in most of the bays we saw.
(See Appendix 7.)

Mini SASS

Not applicable in a water impoundment such as Inanda Dam.

Lab test results

Not applicable in a water impoundment such as Inanda Dam.

Top: Domestic water supply
Bottom: Double vault urine diversion toilet

8.6 Green Corridor

Potential community conservancy sites

None noted – the area around the dam is populated from sparse to dense. There are possibly some areas in untouched bays and up some tributary streams that may have conservancy potential. Msinsi Holdings manages the game reserve on the south side of Inanda.
(See Appendix 8.)

River hiking way potential

The Durban Green Corridor project has initiated the first phase of a beach to berg hiking trail that extends thus far from Blue Lagoon upstream to Inanda Dam. At the time of our walk, this trail was badly marked so that at times one was unable to identify the correct path when different paths intersected, or when the path came to a road. With some work on signposting this will be operational for hikers, as the paths are apparently all in place around the north side of Inanda Dam.

Camping accommodation is available at the Durban Green Corridor base in a lovely bay near Inanda Dam wall. Msinsi Inanda also has camping accommodation and chalets on the south side of the dam in the nature reserve.

8.7 Interesting information / history

During construction of Inanda Dam in the 1980s, the local communities who lived alongside the dam were moved away to their current location around the dam. We were informed by one community member that the issue has never been settled as they still do not have the land or money they were promised. The community feels they were better off previously as they had unlimited access to the river, could grow crops and graze cattle, which they are now unable to do. We have been informed that compensation was in fact paid by the government, but was embezzled and never reached the community. The community want Government to pay compensation again, but Government declines, stating they have fulfilled their responsibilities. In addition there has been a significant extension of services in the area since the dam was built, including:

- Tar road access
- Better district roads
- Piped potable water
- Sanitation
- Electricity

Section 9: Inanda Dam to Blue Lagoon Estuary

9.1 Area description

GPS Co-Ordinates

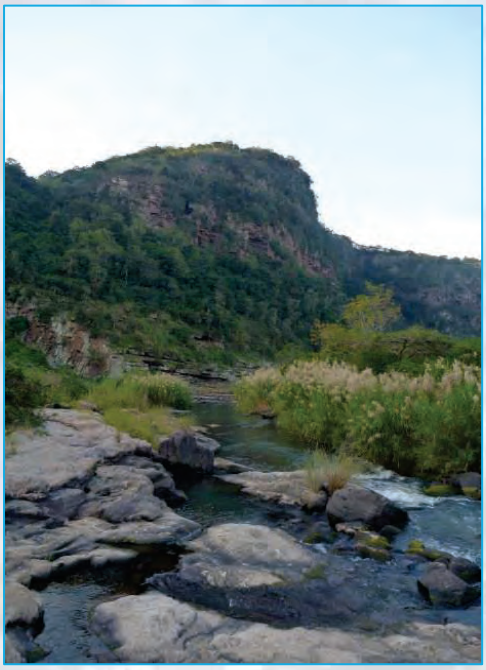
Start: 29°42'34.02"S 30°52'7.26"E
Finish: 29°48”36.18"S31° 2'22.48"E

Altitude drop

151m – 0m altitude

General

A tinge of the sea became evident in the air below Inanda Dam – a faint smell or the feel of the breeze. The walk from Inanda Dam to KwaDabeka in Durban was an extremely pleasant surprise. Although the river showed some signs of eutrophication below Inanda, it was by no means as unpleasant as we had anticipated. Below Inanda, the river starts taking giant curves left and right, the channel becoming wider and wider, the shallow outer bends lined with reeds as the river carves out its last valley before the coastal plain. This wide deep valley has a grassed floodplain belt alongside the river and steep forested slopes topped with sandstone cliffs. The built-up environment of Durban lies above the cliffs, and was not apparent down at the river. We had no idea that we were already in Durban until we climbed out of the valley and entered KwaDabeka on the third last day of the walk. In addition, the riparian vegetation was still in good condition, thanks to the DUCT River Care Teams who have cleared all the invasives but there are signs in many places of past sand mining operations.



Past folding and faulting make for bizarre cliff rock formations near Inanda Dam wall, with a “point” known as Tops Needles that reaches up to the sky. Downstream of the dam beautiful folded mountain cliffs comprising layers of folded sandstone seem to reach almost into the river. On the horseshoe bend that wraps around the Molweni Cemetery, the high cliffs on the right bank comprise multiple layers of sandstone that has been folded and carved by the river over the aeons, resulting in layers of shallow “caves” alternating with ledges. Jumbled large dolerite rocks lie in the river bed below Inanda Dam wall.

Top: Below Inanda Dam
Middle: Hard to believe this is in Durban
Bottom: Upstream of N2 highway bridge

Just downstream of the cemetery near Molweni (west of Ntuzuma), the river bank is dotted with scattered Acacia trees growing in grass looking like mown lawn. A past sand mining site, what a stunning picnic area this would make today. At Molweni causeway we passed two sangomas with clients in the river, carrying out cleansing ceremonies. Downstream of the causeway, the river, looking murkier and murkier, continued to twist from side to side in a narrow, steep sided valley. Storm water drains and spilling sewer manholes, illegal dumping and sand mining all take their toll. While the 32 metre buffer zone stays clear of invasives thanks to DUCT River Care Teams, beyond that the natural vegetation is choked with invasives, and the river has, in places, almost closed up under all the Water Lettuce and Hyacinth. The construction of the new extremely high road bridge in KwaDabeka has left “scorched earth” with erosion gullies and invasive plants.

Past Reservoir Hills, the valley opens up as the river, with water now a turbid grey colour and smelling of sewage, enters the coastal plain, its last stage before the estuary. Originally, the river here would have meandered across and spread out over its last floodplain, however through Durban’s history the channel has been changed so that the river now resembles a vegetated earth canal – wide with steep vertical banks, until it spreads out into Blue Lagoon and enters the sea. On the floodplain, is a small marigold farm and on a steep sided section of the river, properties adjacent to the river have illegally backfilled their premises – straight onto the river bed, in some cases with what looks like landfill site rubbish. Then as the river reaches its last stage on the coastal plain before the sea, again we walked through grassed areas where DUCT has planted indigenous trees after removing the invasives. At the N2 North Coast highway bridge, a Shembe baptism was taking place, and below the bridge, a Shembe healing ceremony.

Top: Stream of sewage heading for river
Middle: Historically straightened section of the uMngeni
Bottom: Scrap dealer on the river bank

East of the N2 bridge we entered the industrial area, where the storm water drains emptying into the river stink of sewage, are filled with litter and engine oil. The narrow belt at the back of the factories, leading to the edge of the river, initially choked with castor oil trees, gradually changed to a neat belt of lawn, free of litter and invasives. A few neat vegetable gardens and "pretty" gardens were seen on the level section above the river bank followed by lawns in front of the Umgeni Bird Park and Blue Lagoon. From the Bird Park the path winds through mangroves and other indigenous coastal forest plants until, after crossing under the final road bridge, the roar of the city's traffic gives way to the roar of the ocean, as the uMngeni River finally meets the ocean. (See Appendix 1.)

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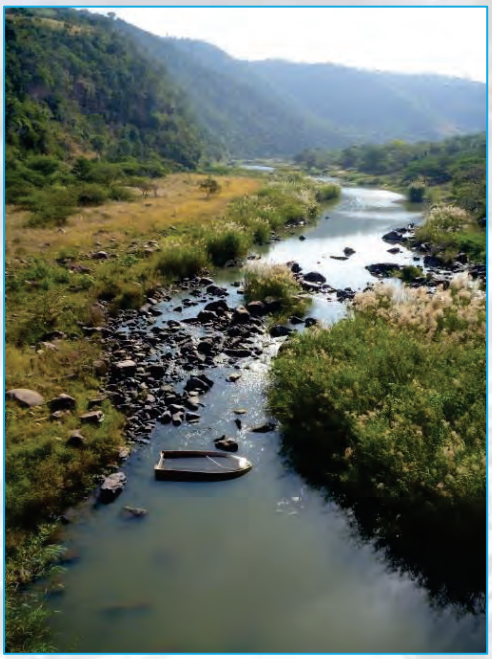
9.2 Wild animals

Egyptian Geese
Fish Eagle
Crowned Eagle
Jacana
Martial Eagle
(See Appendix 2)



9.3 Vegetation

Indigenous terrestrial vegetation

Vegetation in this area included Valley Bushveld followed by indigenous coastal bush. (See Appendix 4.)

Aquatic

Many of the river areas have indigenous water plants and thick reed beds on the sides of the river. Possibly in days gone by, before the construction of Inanda Dam, when water levels were higher there would have been fewer reeds. This situation will have been exacerbated by the extinction in the area of hippo, whose amblings on river beds help keep the reeds at bay and the water flowing freely. (See Appendix 3.)

9.4 Impacts

Erosion

From Inanda Dam to the cemetery near Molweni, all soil erosion was as a result of un-rehabilitated sand mining, and comprised both sheet and donga erosion. The water was clear enough in places to see to the bottom of the river, where silt deposition was visible.

Top: Where the uMngeni meets the ocean
Middle: Reed beds along the river
Bottom: Erosion at the KwaDabeka Bridge site

Siltation from various sand mines, bridge and other construction sites increased the deeper we went into the Durban city area. Turbid water and sediment on the river bed became more and more apparent, the farther downstream we went. Below Molweni Causeway, approximately 20 kilometres upstream of the estuary, the water finally become so turbid – a dirty grey colour – that it was not possible to see if there was any silt as the rocks and river bottom were no longer visible. This continued until the estuarine section of the river.
(See Appendix 6.)

Invasive / alien vegetation

The river's 32 metre buffer area is clear of invasives, thanks to the hard work of DUCT's River Care Teams. However, beyond this area, the natural vegetation is completely smothered and choked in invasives, such that it is impossible to see what plant species are growing underneath. As stated previously, un-rehabilitated sand mining sites definitely have higher invasive plant infestations than other areas, and seem to be promoting colonisation by invasive plants.

Watercress and Water Hyacinth are the most evident invasive plants in the river, floating on the water surface.

The construction site of the new road bridge east of KwaDabeka has not been rehabilitated and a multiple array of invasives are now growing on the disturbed ground below and near the bridge.
(See Appendices 3 and 5.)

32 metre Buffer Zone

As in areas upstream of Durban, the DUCT River Care Teams keep the buffer areas clear of invasives. However, beyond this buffer area, no attempt is made at invasive clearing, and the indigenous bush is smothered by various invasives.
(See Appendix 6.)

Top: Grey, turbid water
Middle: Invasive Balloon Vine smothering indigenous vegetation
Bottom: Water Lettuce smothering the river

Construction / buildings

The un-rehabilitated construction site of the KwaDabeka road bridge mentioned in Section 9.4 above has created a mess of sheet and donga erosion.
(See Appendix 6.)

Some businesses adjacent to the river have illegally extended their properties by backfilling the river banks with what looks like landfill rubbish. The toe of these fills is on the edge of the river, and no doubt, under flood conditions, this will be washed away.
Various road and pipeline bridges cross the river.
(See Appendix 6.)

Pump stations

One pump station was noted.

Drainage ditches and dykes

None noted

Sand mining

Eleven sand mines were identified between Inanda Dam and the N2 bridge, some active, some un-rehabilitated. The mine at the N2 bridge is legal. As stated previously, un-rehabilitated sand mining sites promote colonisation by invasive plants.

One mine was operational in an area where the water was still a beautiful clear green-blue colour, and the river bed could be seen. A Fish Eagle called from a tree high up on cliffs rising out of the water on the left bank. On the right bank, the riverine bush is being hacked out, and excavation machinery has been used to flatten and seemingly clear the vegetation. The river banks are destroyed, and a deep pool has been dug in the river during the process of sand extraction.
(See Appendix 6.)

Top: Illegal backfilling into river
Middle: Illegal sand mine
Bottom: Illegal dumping

Dams / Weirs

Inanda Dam wall

Litter / dumping

From the area below Inanda Dam wall until the Cemetery Causeway at Molweni, no litter or illegal dumping was seen aside from the site of an active sand mine. As before, this is due to the DUCT River Care Teams that operate in the area. Thereafter, we passed various extended sites that are used for illegal dumping, which seemed to be mainly construction rubble. It was often easy to identify what alterations had been done – piles of paint tins; broken tiles and bathroom fittings etc. In addition bulk advertising pamphlets, still in their wrappers were observed. A shooting range uses an area close to the river for target practice, and a carpet of plastic shotgun cartridges was evident on the grass near the river.

The frequency of dumping increased as we went downstream, and was most often in areas with dense vegetation and accessible by road. Near the North Coast Road, DUCT and the eThekwini Municipality have jointly successfully stopped some dumping by the strategic placement of large concrete barricades or cables preventing access across road and track routes.

A large amount of litter is picked up on a daily basis by the DUCT River Care Teams whilst they are working alongside the river. Between the SPCA and Connaught Bridge, 500 bags were collected in one day recently, from car parts to garden waste and general rubbish. Prior to the 2012 Dusi canoe race 2 200 bags of rubbish were collected and removed by DUCT from the Blue Lagoon area.

In the industrial area around Springfield Park most storm water drains were depositing litter into the river, and we were informed by the beach clean-up teams that we spoke to that during periods of heavy rains, the river is filled with plastic rubbish which is then deposited on the beaches. Apparently from the air during floods, the litter looks like thousands of plastic streamers entering the ocean. DUCT has erected a trash boom across a section of Blue Lagoon in an attempt to trap some of the rubbish. This is cleared regularly, however, during flooding events it is unlikely that this will be sufficient.
(See Appendix 6.)

Top: A day's litter collection by DUCT River Care Team, Springfield Park
Bottom: Engine oil and litter in storm water drain

9.5 Water Quality

Initially, river water below Inanda Dam was clear, although algae were seen on the rocks. From the Molweni Cemetery access causeway algae were seen regularly and as we progressed, from somewhere downstream of the new KwaDabeka road bridge the water lost its clarity permanently, taking on a grey hue. This worsened the further we went into Durban. A water pump leaking diesel into the river was seen near the new KwaDabeka road bridge and various storm water drains collectively deposit sewage, engine oil and other contaminants into the river. An "oil slick" was seen in the river downstream of one of the storm water drains.
(See Appendix 6.)

Eutrophication signs

Just below Inanda Dam there were signs of eutrophication – algae on the rocks and in the water. This seemed to clear up and then reappeared from the Molweni cemetery access bridge. Large quantities of Water Lettuce and Water Hyacinth indicated the presence of excess nutrients, and some algal sludge was present until turbidity prevented visibility.
(See Appendix 7.)

Mini SASS

Once again, the Mini SASS indicated a drop in water quality below Inanda Dam (6.2). Then upstream of Durban the water improved slightly (6.75), but thereafter the health of the river went into steady decline with the lowest score being 2.5. The final surprise was the area adjacent to the Papwasewgolum Golf Course. The left river bank has been restored and a sports area (soccer and cricket fields) on the right bank upstream of the Golf Club enabled the health of the river to improve fractionally, to a Mini SASS score of 4.67.

Sadly, thereafter the river's health was not able to improve properly before the river entered the industrial area of Durban east of the North Coast Highway Bridge. As this is also the start of the area influenced by tides, we were unable to do any further mini SASS tests, but visual evidence pointed to the worst contamination along the entire length of the river, and, we suspect that if we were able to conduct Mini SASS here, the score would have been significantly worse.
(See Appendix 7.)

Top: Algae and clear water below Inanda Dam
Middle: River contaminated with sewage
Bottom: Rehabilitated river banks in area where river health improved slightly

9.5.3 Lab test results

See Appendix 7.

9.6 Green Corridor

Potential conservancy sites

There are currently two conservancies along the uMngeni River in Durban: Springfield Park is a wonderful example of a conservancy in a built-up commercial environment which could be duplicated by the industrial areas. The Umgeni Estuary Conservancy is situated on the left (north) bank from the Umgeni Bird Park to the estuary and includes the mangrove forest at the estuary.

Due to the built up area, there are no candidates for stewardship sites, although there are some beautiful areas that would benefit as conservancies, notably the area from Inanda Dam wall to the bend of the river below the cemetery.
(See Appendix 8.)

River hiking way potential

The Durban Green Corridor project apparently has a path that leads from the Enanda Adventure Centre near the dam wall to the estuary. The path was not always in evidence nor clearly marked, but with a small amount of work, walkers would be able to follow this path easily. Some sections would run adjacent to the river, whilst others may have to be on the higher ground. Thus, the first leg of the uMngeni River Green Corridor is basically in place from the Umgeni Estuary up to and including the length of Inanda Dam.

Accommodation is available at Inanda Dam at the Durban Green Corridor Centre, the Inanda Adventure Centre situated near the Inanda Dam Wall.
(See Appendix 8.)

Findings and Recommendations

Findings

Impacts

Over the 300 kilometres we walked along the uMngeni River, almost every impact observed is in contravention of one or other law, and in many cases the worst offenders are the municipalities. Co-operative governance ensures that DWA or DAEA are unable to take the offending municipalities to task. All they can do is issue directives – written warnings, which, if ignored, can be pursued no further.

Of the ten categories of impacts seen on the river, eight are illegal activities which continue to be problematic, often due to lack of monitoring and enforcement of the laws by the relevant authorities:

- Sewer contamination from failing sewerage infrastructure
- Illegal sand mining
- Causeways (with respect to sand mining)
- Buffer zone disturbances (clearing of riparian vegetation for various reasons)
- Litter / dumping
- Non historical drainage ditches
- Soil erosion (emanating from illegal sand mining and development construction which is not correctly monitored and enforced)
- Environmental flows

Of the remaining impacts,

- Soil erosion will most likely always be problematic. Poor agricultural practices such as overgrazing and badly planned and drained dirt roads are extremely difficult to monitor or control.
- Although much of the sewage contamination is from failing infrastructure which could be addressed, there is another cause – that of a lack of education regarding waterborne sewage disposal.
- Storm water drains in Howick are known to have contaminated the river with milk, heavy detergents, sewage, turpentine and other substances, whilst in Durban downstream of the N2 in the industrial area we witnessed engine oil, litter and sewage emerging from the storm water drains. This is an enormous problem which is difficult to address.
- Invasive / alien vegetation and its eradication is being undertaken by various organisations and private landowners, however there are still enormous gaps, particularly on the uMngeni Rivers tributaries and areas outside of the 32 metre buffer zone.
- Over abstraction/exploitation is a long term concern. It should be addressed when the Department of Water Affairs completes the long awaited classification and Reserve Determination for the uMngeni River (perhaps in 2015).

Water quality

Mini SASS

Mini SASS tests are an effective means of monitoring river health and can be carried out by almost anyone if they have had training. Additionally, they are ideal for inclusion in the school curriculum and schools should be encouraged to routinely monitor the health of the section of river closest to them.

Catchment management

Lack of adequate catchment management has meant that terrestrial invasive plants have become rampant near the river. These plants utilise ground water which could otherwise enter the river system, and in many cases block the sunlight from the river, changing the whole ecology of the river and damaging biodiversity.

Recommendations

Buffer zones (lengths as opposed to buffer widths)

As noted time and again, given enough space, the health of the 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.

The city of Durban is downstream of all the contamination of the uMngeni River. Some 70% of the water abstracted from our dams for purification ends up in the sewer network. By the time it gets to the sea some water will have been abstracted, purified, flushed and re-purified more than once.

Recommendation 1:
It would thus make sense to implement buffer *lengths* (in addition to the current 32 metre buffer width) in all planning programmes (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 areas we noted suitable for this purpose include:
Source to Wakefields Farm, Dargle: protection of the upper catchment
Umgeni Valley Nature Reserve to and including Ihlanze Private Wildlife Reserve: needed to clean up Howick contaminations
Cumberland to Nagle Dam: needed to clean up intense agricultural pollution upstream
Mamba Gorge to Inanda Dam inlet: rejuvenate uMngeni River water contaminated by the uMsunduzi River
Inanda Dam wall to Molweni cemetery: final buffer length prior to Durban

Recommendation 2:
In addition, due to the strategic importance of the Albert Falls and Midmar Dams, as well as the pressure for housing developments in their vicinities, it would seem sensible to map out areas around the dams that need protection of some sort. This needs to be done before the entire shoreline becomes developed. Of all the major dams in the catchment Inanda is perhaps at greatest risk as development around the dam is poorly controlled.

Recommendation 3:
Finally, the Mthinzima Wetland between Mpophomeni and Midmar Dam is in urgent need of rehabilitation to assist in the cleaning of the regular sewer spills from Mpophomeni, as wetlands have the ability to remove contaminants from water. This rehabilitation will also be useful after the completion of the new Waste Water Treatment Works and will be invaluable in the protection of the waters of Midmar Dam.

Sewage education

A large contributor of sewage contamination is due to a lack education regarding waterborne sewage disposal. Many of the overflowing manholes have become blocked due to all manner of items being flushed down toilets. Ethekwini has run a successful sewage education project which DUCT duplicated in Mpophomeni, also with great success.

Recommendation 4:
We would recommend the sewage education project be continued and intensified. In addition, it would be advisable for all new users of waterborne sanitation to receive appropriate education.

Recommendation 5:
Another cause of blockages is due to manhole lids being removed and rubbish, bricks and other items being thrown into sewers – often in a misguided attempt to stop overflows. The lids are also often stolen to sell as scrap metal. If the manhole lids could be made of composite polymer concrete or able to be locked down, this cause of blockages would be eliminated.

Stewardship and conservancy sites

Recommendation 7:
The formation of Stewardship, Conservancy or Community Conservancies will assist in the protection and care of the buffer lengths mentioned in Section 10.4 above, as well as the 32 metre buffer width.

In communal areas, communities could be empowered through tourism related job creation and other related activities. There are stretches of the river that have enormous potential for tourism – hiking / cycling paths, fly fishing, white water rafting and tubing, spiritual retreats and cross cultural experiences to name only a few.

Poplar trees

Recommendation 8:

Historically, Lion Matches contracted Dargle farmers to grow groves of Poplar trees beside the river as this was the wood used in the manufacture of matches. Poplar wood has now been replaced by Eucalyptus for match production and thus poplar plantations in the Dargle are no longer needed for this purpose. As these trees are all planted very close to the river and they utilise a lot of water, it is recommended that farmers are encouraged to remove these trees.

Albert Falls *Pistia* (Water Lettuce) boom

Recommendation 9:

In order to prevent Albert Falls Dam becoming infested with Water Lettuce from upstream, we recommended a "trash" boom across the inlet to prevent the Water Lettuce from entering the dam. DUCT has since installed this.

Invasive plants

Dams

Recommendation 10:

A good job creation opportunity would be the formation of teams to manually clear aquatic invasives from the dams (as well as rivers). Apparently the Hartebeestpoort Dam has finally been cleared of aquatic invasives, and this could be used as a template, especially for clearing the heavily infested Inanda dam, and possibly also the river below Inanda in Durban. The programme could entail:

- Manual clearing of aquatic invasives
- Installation of floating wetlands as filters
- Rehabilitation of eroded shoreline
- Disposal of invasive plants using composting via vermiculture (locals have started vermiculture farms in the vicinity).

Tributaries and areas adjacent to tributaries and dams

Recommendation 11:

The benefit from the clearing of invasive plants along the main river will be limited as long as tributary rivers and streams, hillsides and dam verges are ignored. Many of the tributaries are choked with invasive plants and thus carry a constant load of invasive seeds and plants which will continue to replace those removed by any clearing teams. Urgent attention needs to be given to these areas to remove this problem. There does not seem to be any effective buffer whatsoever above the high water level at Albert Falls, Nagle and Inanda dams. The mandate of Working for Water should be extended to cover all areas, and work should begin in all upper catchments moving downstream.

Recommendation 12:

Co-ordination between organisations clearing invasives seems essential, as there are currently many different groups 'jumping on the band wagon' under the guise of job creation. This is having disastrous results in some areas, where staff have not been trained and in some cases are using herbicides incorrectly, as well as cutting down indigenous trees; alternately different groups are targeting the same areas instead of covering new ground, which is a waste of time, effort and money. There have been instances where new groups have come into areas already cleared by others, and have thus simply cleared whatever else is left, resulting in the destruction of indigenous vegetation.

Municipal areas

Recommendation 13:

The worst areas for terrestrial invasive plant contamination are located in the municipal areas:

- The riverine belt in Howick (Umgeni Municipality)
- The Gorge below Howick Falls (a National Heritage Site in the Umgeni Municipal area)

- The Albert Falls picnic site (uMshwathi Municipality)
- The riverine forest beyond the 32 metre buffer in Durban (Ethekwini)

We would suggest that municipal staff need to understand the impact that these invasives are having on the river, and need to include eradication programmes in their planning.

Large invasive trees

Over-enthusiastic felling of all large invasive trees down the river needs to be approached with caution. Due to development, be it urban or for agricultural purposes, suitable nesting sites are disappearing or have already disappeared, particularly for raptors, and in some cases the large invasives along the river are the only suitable nesting sites as they are the only large trees left in some areas. Thus the wholesale removal of all large trees could result in the disappearance of the raptor species in particular.

Recommendation 14:
Teams who work the river clearing invasives should be trained to find and identify raptor nests, and scientific guidelines should be drawn up with criteria for the eradication choices concerning these large trees. 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 of the Fish Eagle nests seen during the walk were placed in large gum trees, and many of the raptor sightings were of these birds perched in the large trees.

Inaccessible timber plantations

Recommendation 15:
In the early 1980s, timber companies had stable yards of mules that were used to harvest timber in areas inaccessible to mechanised harvesting equipment. This may be an option worth investigating for the area of inaccessible timber we observed in the upper catchment.

Sand mining

Sand mining licences are issued by the Department of Mineral Resources (DMR) with no prior consultation or agreement with and by either the Department of Water Affairs (DWA) nor the Department of Environmental Affairs (DAEA), and thus no consideration whatsoever of sensitive sites, potential damage or impacts is taken into account with the licensing process. In addition there does not seem to be any compliance monitoring or law enforcement with regard to sand mining. This was evident by the large number of un-rehabilitated and illegal mines we passed.

Sand mining seems to be out of control. There are illegal mining operations that are apparently run mafia style. Environmental Management Plans are supposed to be kept on site. Some who have requested these have been chased away with firearms; in other instances, the staff on mine sites had no idea what an Environmental Management Plan was.

Mines that are licensed have co-ordinate points demarcating the area where mining is permitted, however the mined area is at times extended beyond the allowed boundary without permission.

Recommendation 16:
The current sand mining situation needs to be rectified urgently with the different government departments working together in order to improve compliance and enforcement.

Recommendation 17:
A public campaign should be launched to encourage buyers to enquire as to the origin of sand. Buyers also need to ensure that suppliers have the knowledge and proof that the sand is sourced from legal mines.

Recommendation 18:
As mentioned in the introductory pages of this report, the construction of the dams on the uMngeni River prevents sand from migrating downstream and renewing our beaches. A proposed sustainable area for mining sand is near the headwaters to Inanda Dam which is already impacted. Removal of this sand would prevent it from entering the dam and causing a loss of capacity through siltation.

Conversely, sand mining below Inanda should be prevented, to allow whatever sand is left below Inanda Dam to be carried into the ocean to replenish the beaches of Durban.
With better equipment (for example dredgers) it may be possible to meet all demands from this particular area and to proclaim the rest of the uMngeni River as well as the uMsunduzi River off limits for sand mining.

Broken canoes

Recommendation 19:
Many broken canoes were observed in the river from the Cumberland area down to the estuary. The KwaZulu-Natal Canoe Union should use the dry winter months to search for and remove broken canoes from the river.

River custodians

Recommendation 20:
Groups of inspired, concerned citizens should get together to form River Custodian groups, who collectively assist with monitoring and reporting on sections of the river, as well as work towards the healing of their sections of the river. These people could be urban or rural adults, school learners or youth groups. DUCT Howick currently runs such a monitoring programme in Howick, and would be happy to co-ordinate and assist people interested in taking the idea to their communities.

Limitations

- This was not primarily 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, and two sections of the river (below Albert Falls and on Cumberland Nature Reserve) were canoed due to the almost impenetrable riparian vegetation there, which restricted our ability to keep records.

- The length of the uMngeni River is said to be 265 kilometres. With time constraints of a deadline of 28 days to walk the entire length of the river, we averaged 10 to 12 kilometres per day and walked a total of 311 kilometres. This made it impossible to physically record and photograph every single negative impact seen, although by means of continuous recording on the dictaphone, the majority of impacts were recorded.

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

Conclusion

Dr Ian Player told us before the Mayday Walk that rivers are the arteries of the Earth, and that if we abuse our rivers, nature will “kick back at us”. He believes that we have lost *Hlonipha* (Respect) for Nature, for ourselves and for each other. This just about sums up the story of the uMngeni River.

We need to regain that respect for our rivers, and the team trusts that the record of the uMngeni River in this report will not only highlight the problems experienced along the river, but will assist in action and initiate a restoration of our river’s health, as well as a renewal of *Hlonipha* for our rivers in general. The journey of the uMngeni River is far from over, and it is up to each of us to take part in looking after this river.

Penny Rees
December 2012
pennyduct@vodamail.co.za

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& environmental affairs
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& Environmental Affairs
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PARTNERSHIP FUND

WILDLANDS
CONSERVATION TRUST

UMGENI
WATER · AMANZI

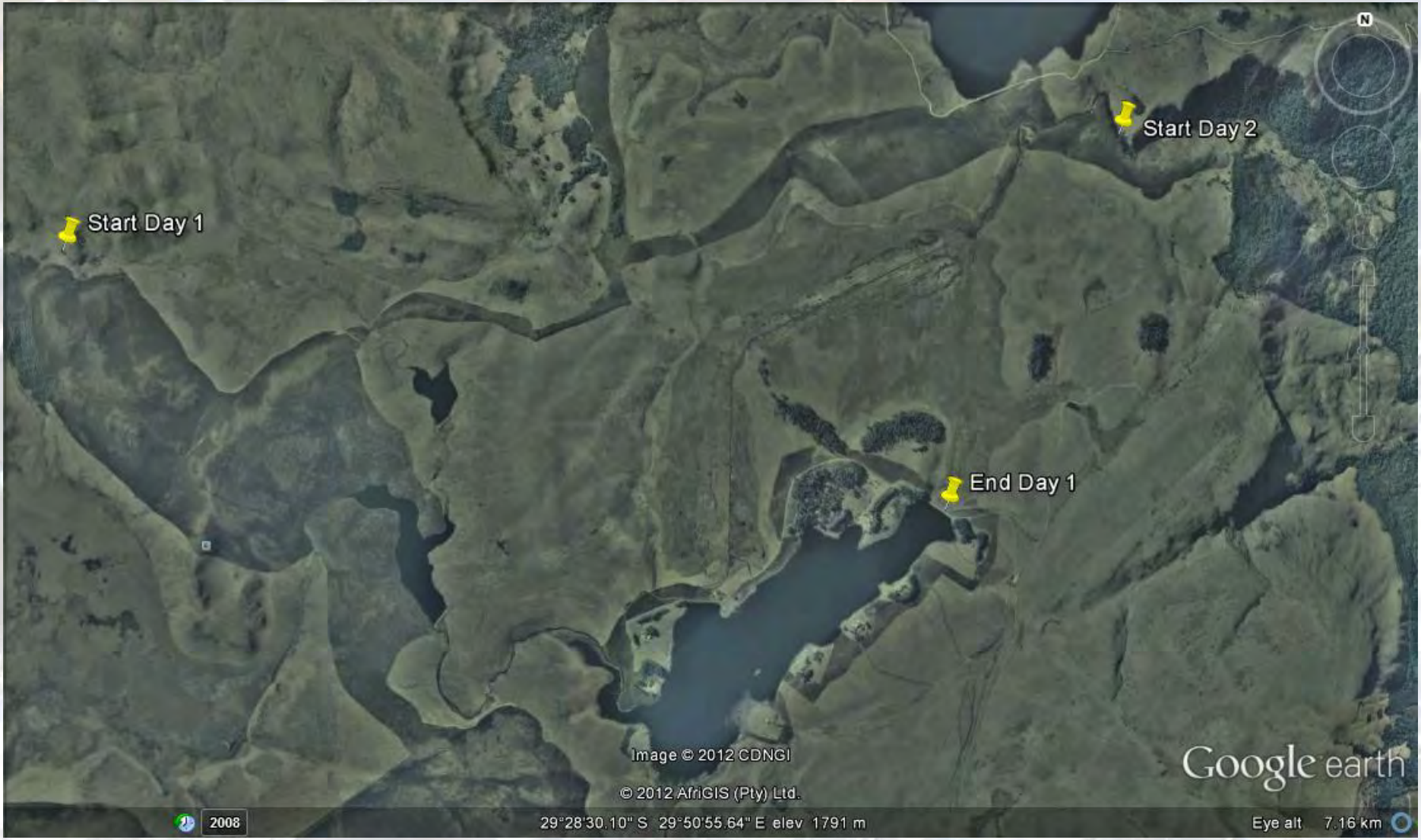
uMGUNGUNDLOVU
DISTRICT MUNICIPALITY

Appendix 1

Area Descriptions:

Google Earth Views of area walked each day

Section 1: Source to Midmar - Day 1



Day 2


Start Day 2
Start Day 3
Image © 2012 CDNGI
© 2012 AfriGIS (Pty) Ltd.
2008
29°28'07.57" S 29°53'03.03" E elev 1681 m
Eye alt 4.98 km
Google earth
N

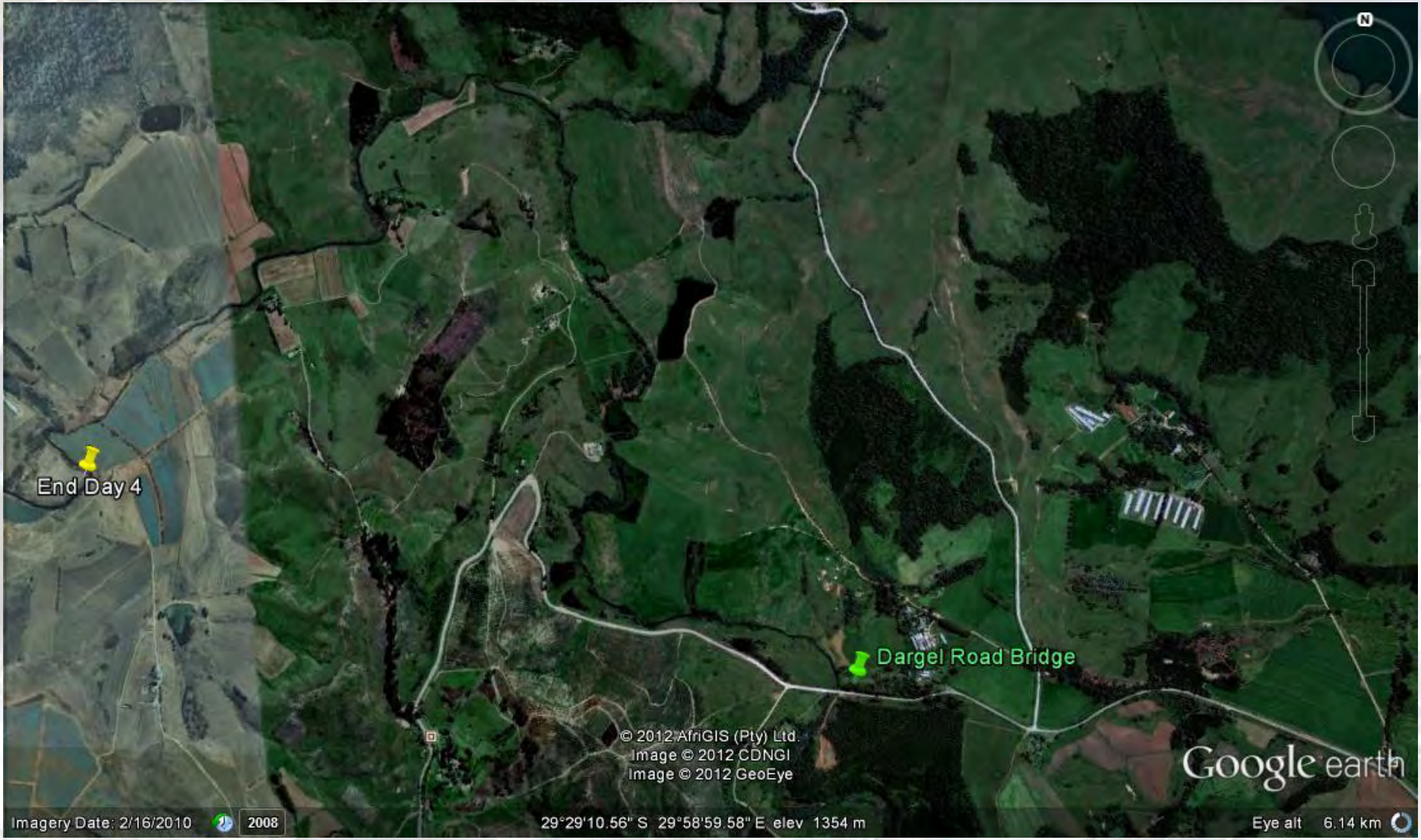
Day 3


Start Day 3
End Day 3
Image © 2012 CDNGI
© 2012 AfriGIS (Pty) Ltd.
Google earth
2008
29°28'56.12" S 29°54'13.67" E elev 1527 m
Eye alt 4.98 km

Day 4


End Day 3
End Day 4
Image © 2012 GeoEye
Image © 2012 CDNGI
© 2012 AfriGIS (Pty) Ltd.
Google earth
2008
29°29'32.77" S 29°55'49.12" E elev 1388 m
Eye alt 6.40 km

Day 5 – First Half



Day 5 – Second Half

Day 6


End Day 5
End Day 6
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 2/5/2011
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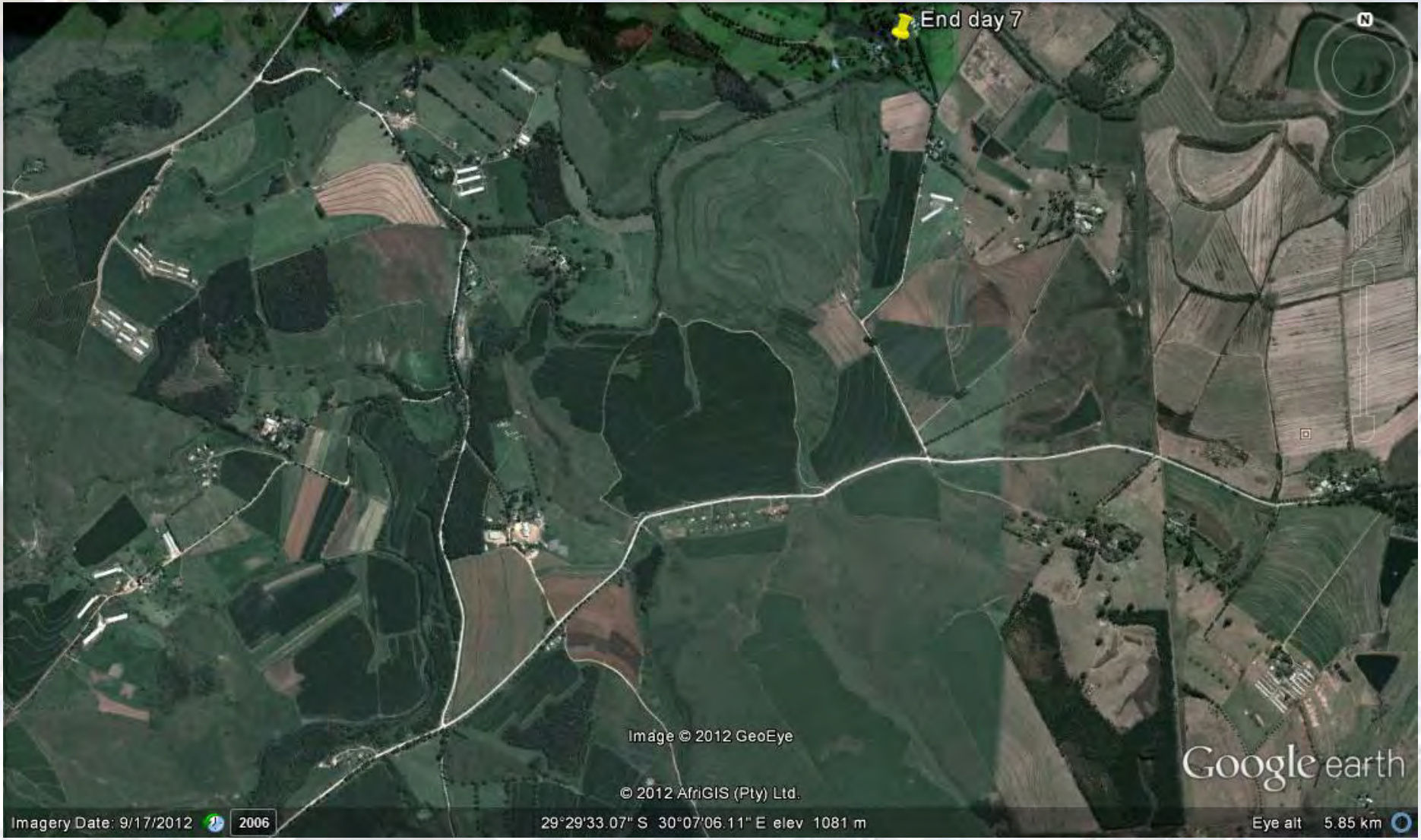
Eye alt 6.37 km

Day 7 – First Half

Day 7 – Second Half



Day 8


Lions River
End day 7
End day 8
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 9/17/2012
2006
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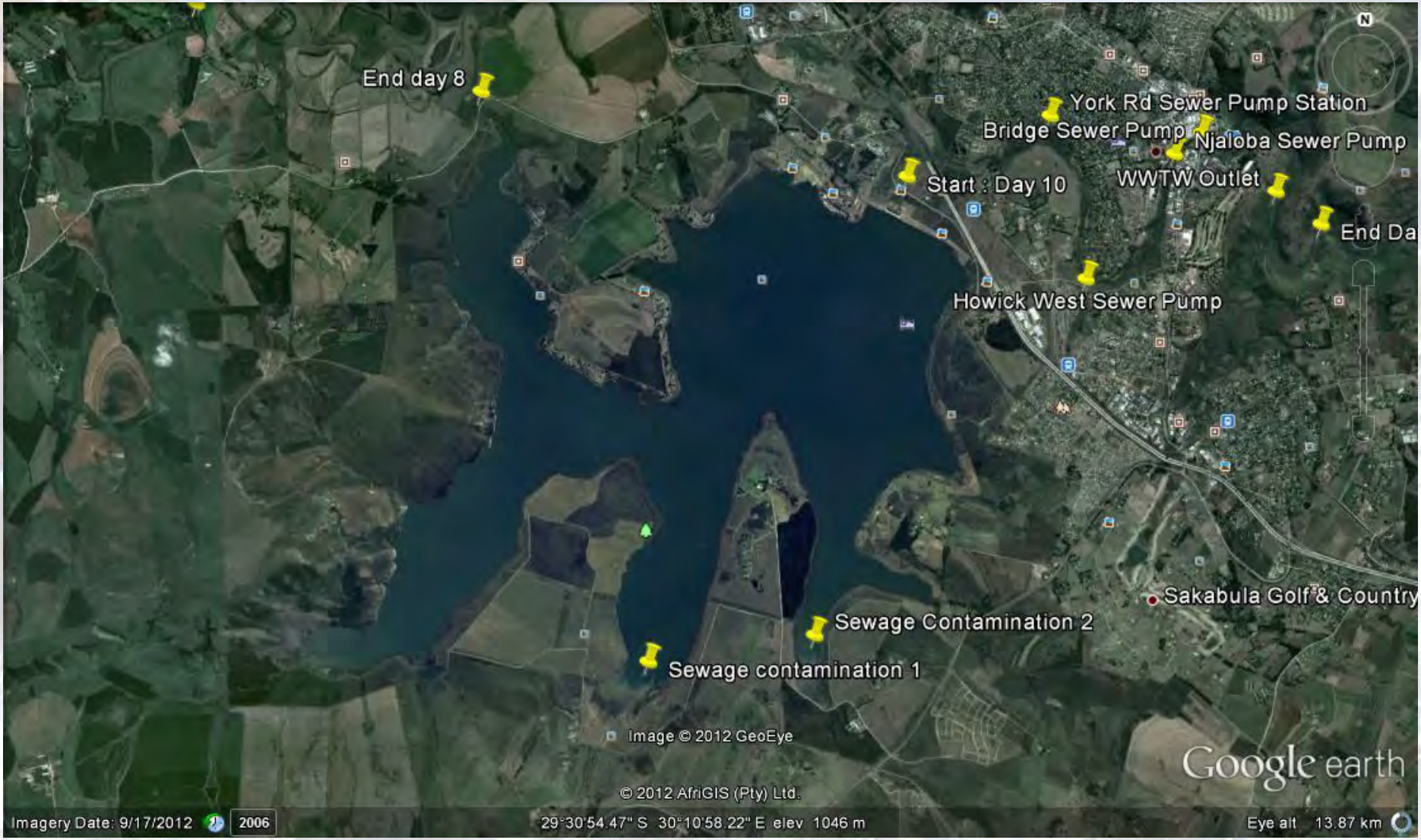
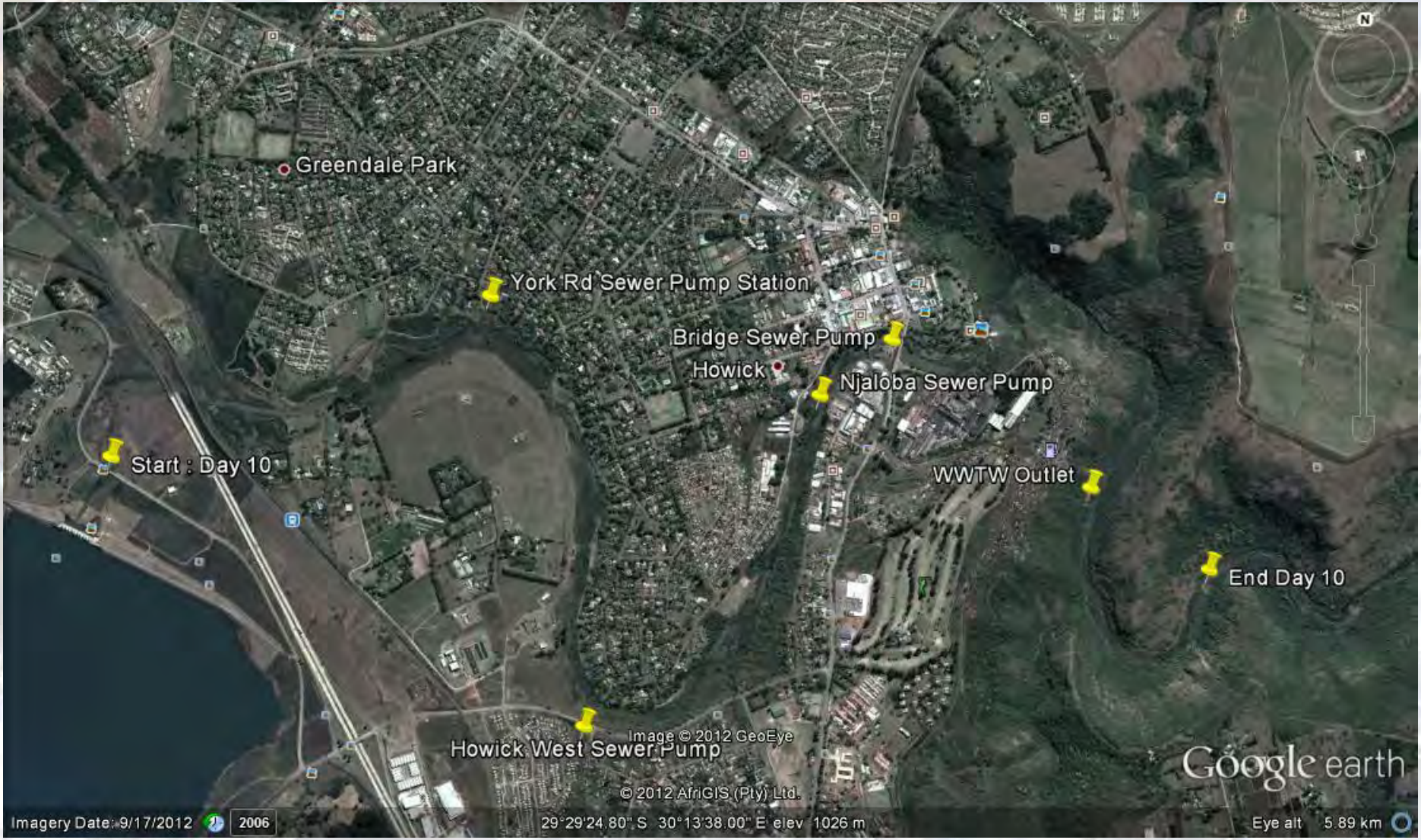
Eye alt 4.79 km

Section 2: Midmar Dam



Section 3: Howick to Albert Falls - Day 10, Howick



Day 11


End Day 11
End Day 10
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 9/17/2012
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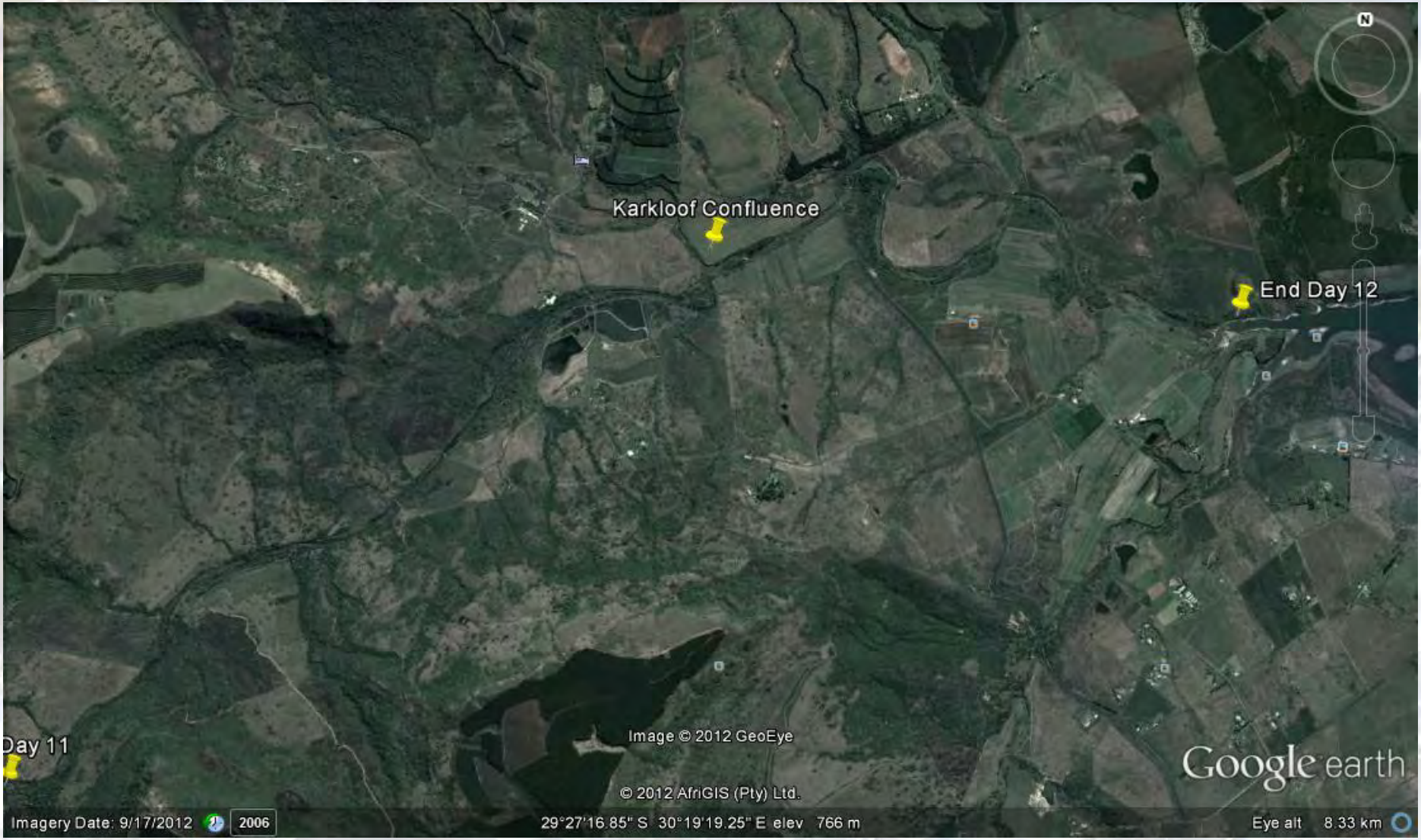
Eye alt 5.01 km

Day 12


Karkloof Confluence
End Day 12
Day 11
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 9/17/2012
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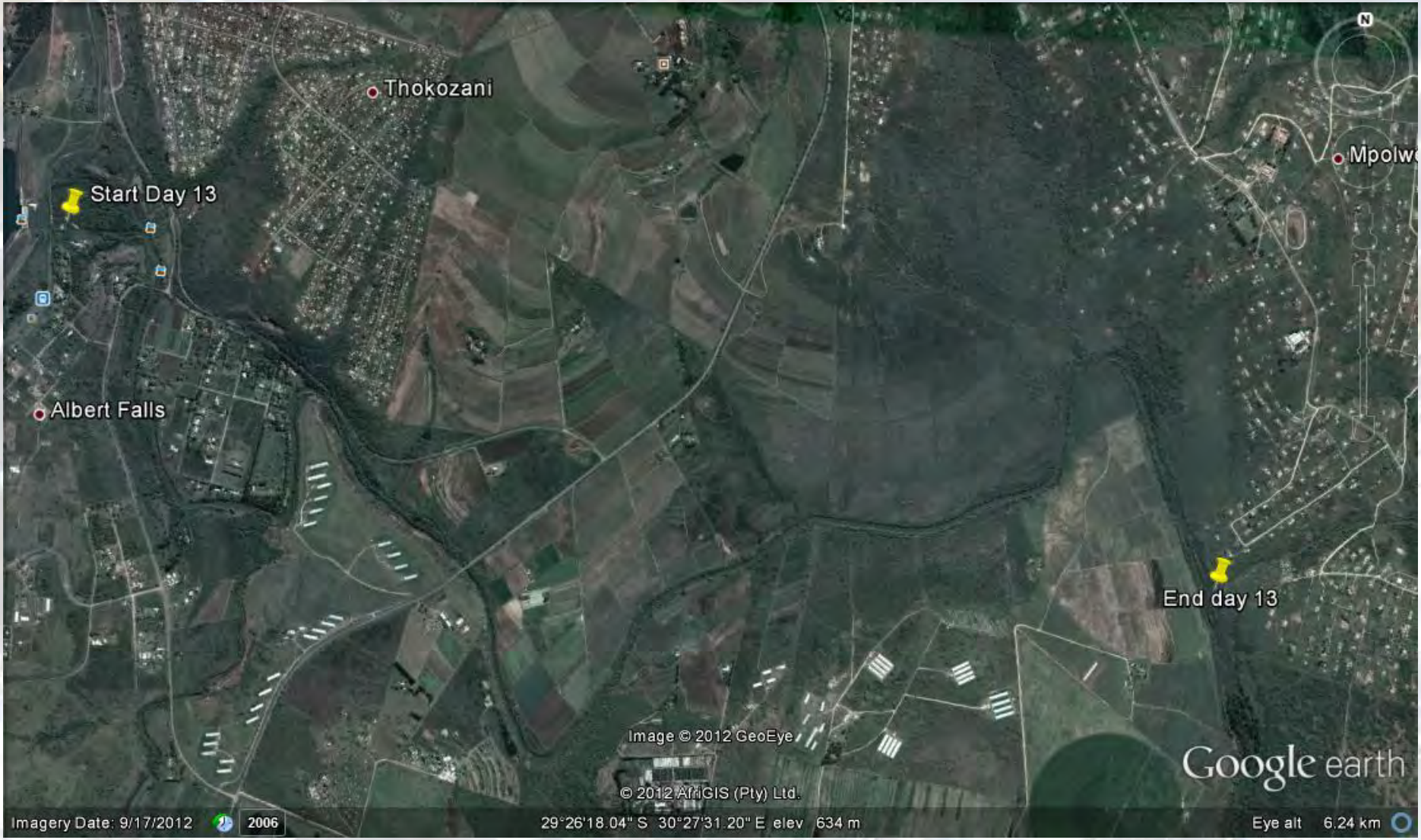
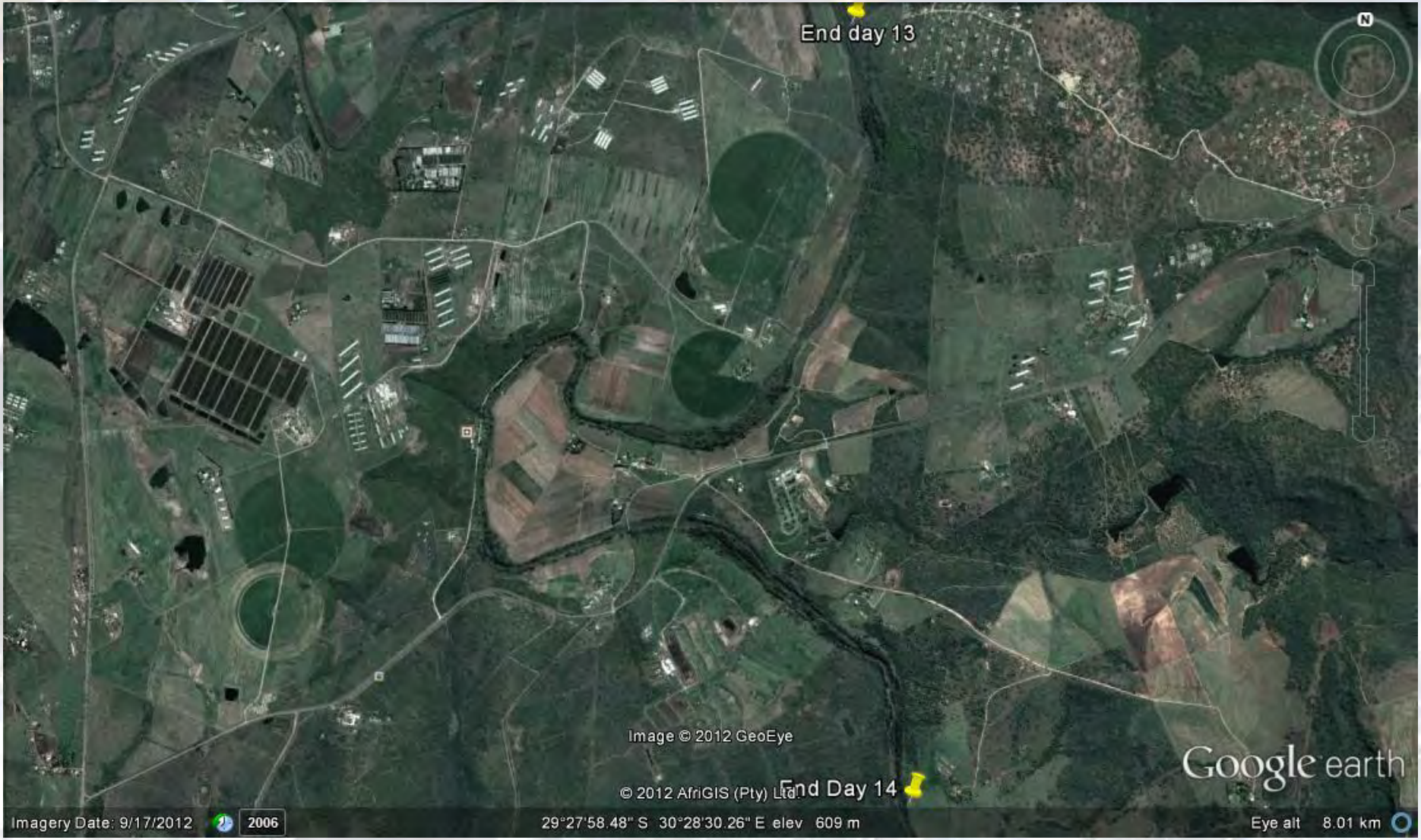
Eye alt 8.33 km

Section 5: Albert Falls Dam

Section 6: Albert Falls Dam to Nagle Dam - Day 13



Day 14


End day 13
N
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd
End Day 14
Google earth
Imagery Date: 9/17/2012
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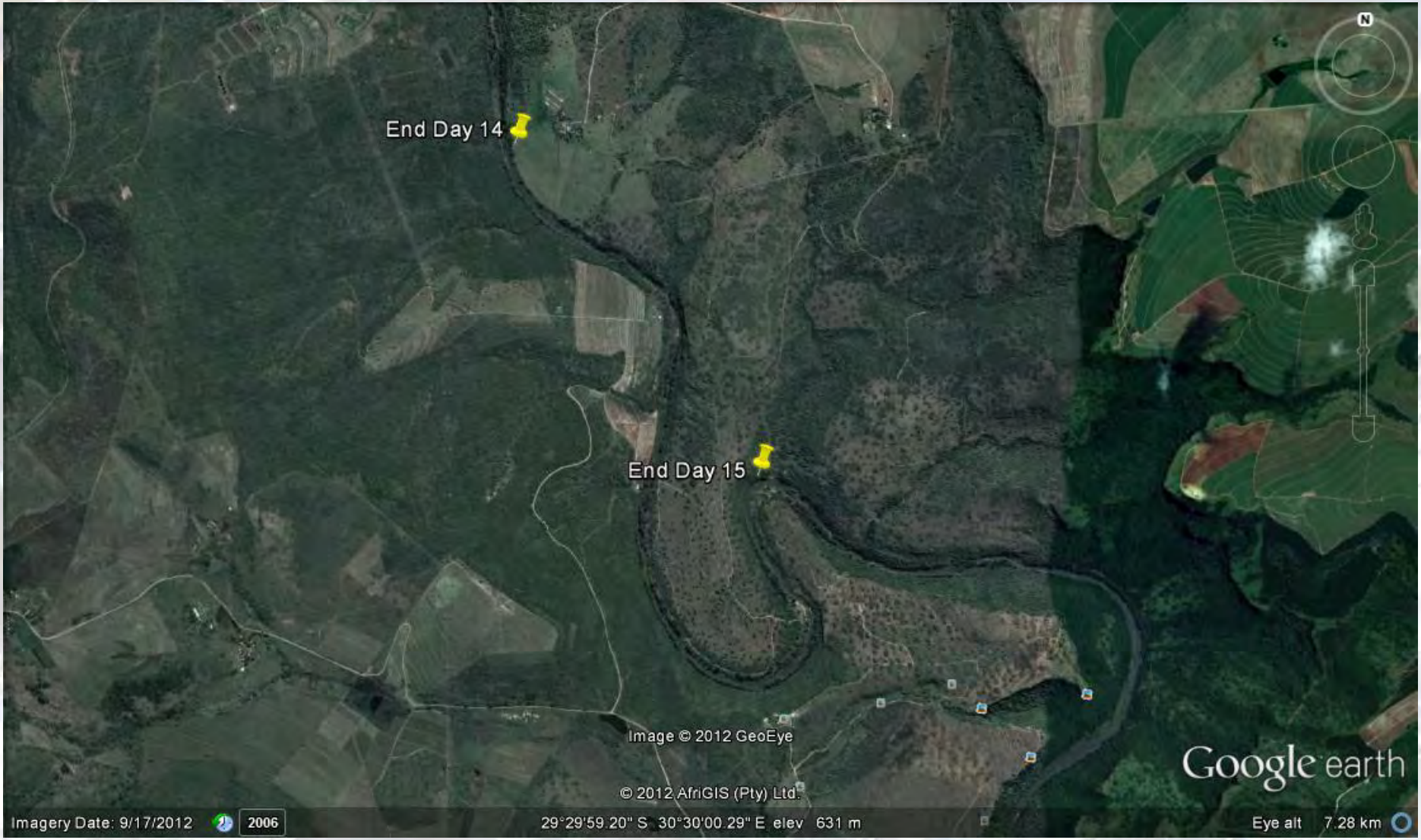
Eye alt 8.01 km

Day 15


End Day 14
End Day 15
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 9/17/2012
2006
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Eye alt 7.28 km
N

Day 16


ay 15
N
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
End Day 16
29°31'15.09" S 30°32'22.69" E elev 871 m
Google earth
Imagery Date: 9/17/2012
2006
Eye alt 7.28 km

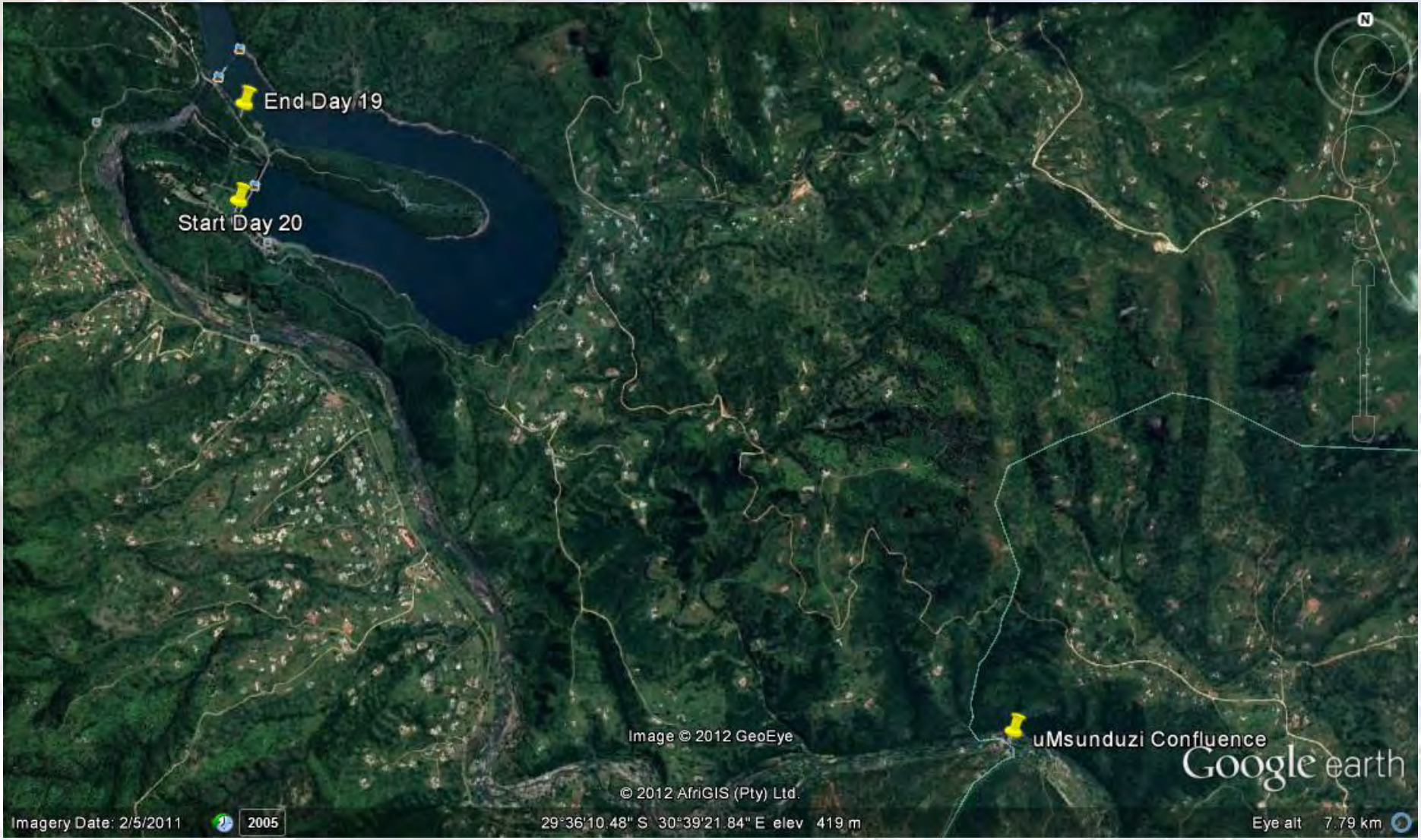
Day 18


N
Vuka
End Day 18
Start Day 18
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 2/5/2011
2005
29°33'33.97" S 30°33'46.77" E elev 681 m
Eye alt 5.69 km

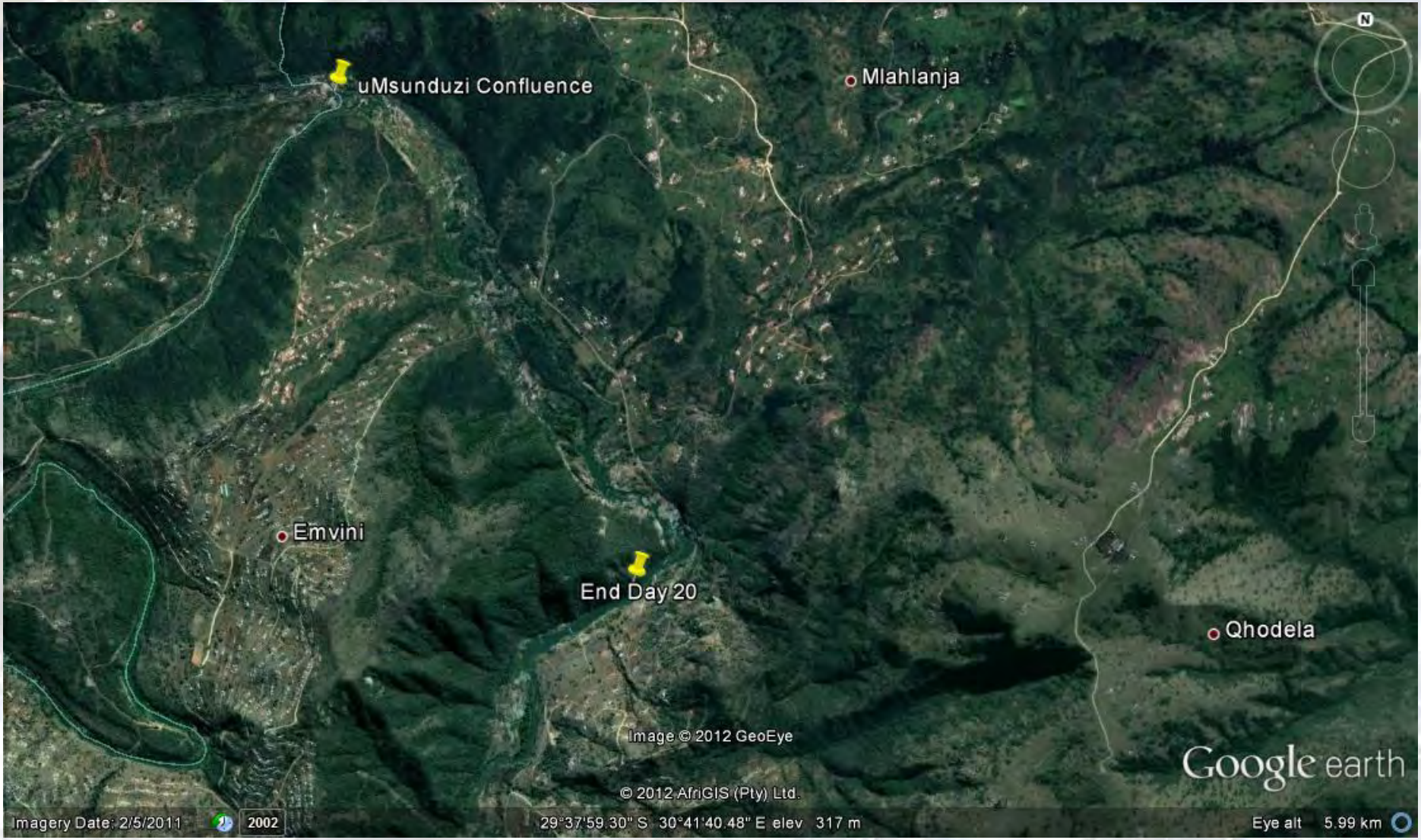
Day 19


End Day 18
N
Maqongqo
Image © 2012 GeoEye
End Day 19
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 2/5/2011
2005
29°34'03.59" S 30°37'03.44" E elev 427 m
Eye alt 7.79 km

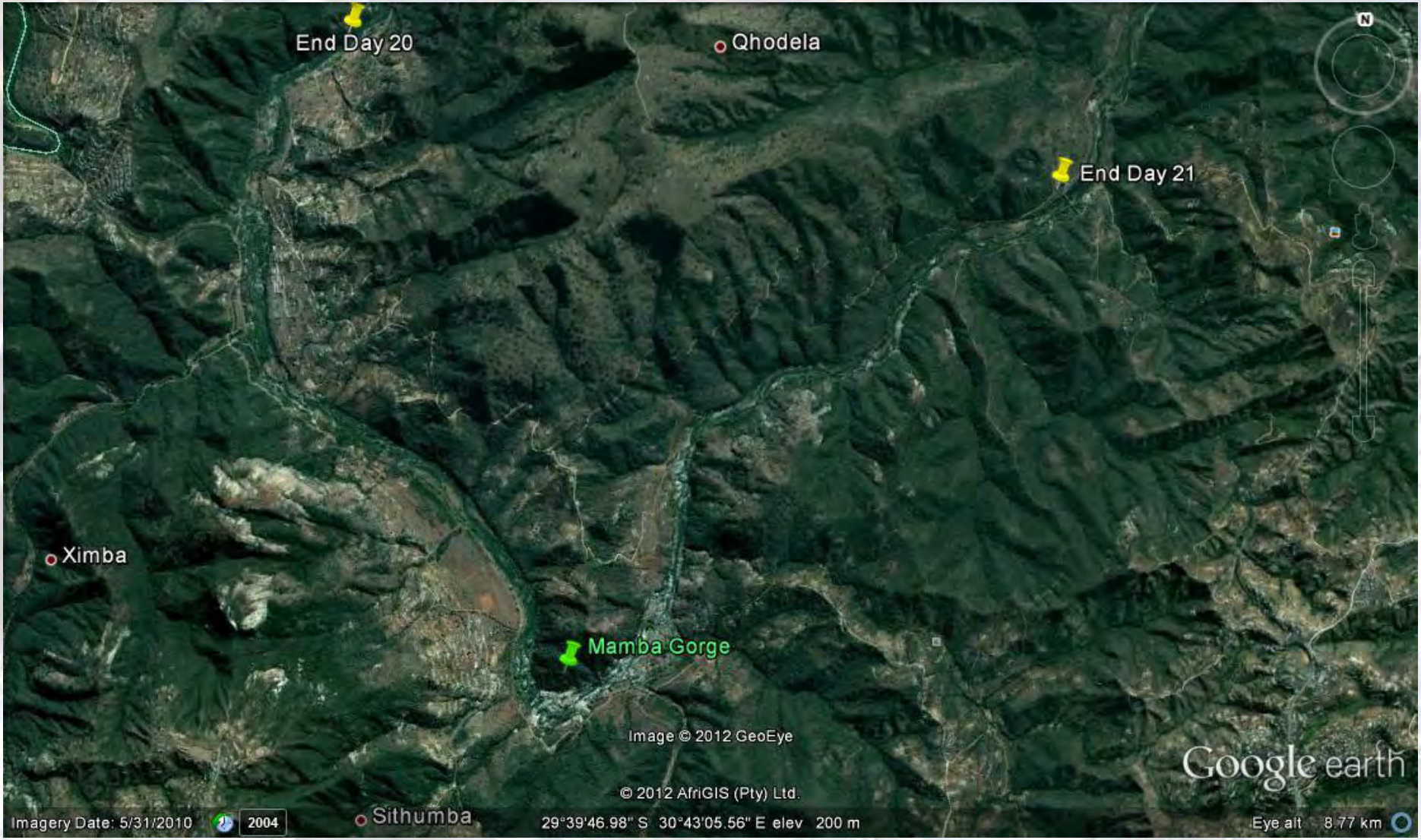
Sections 7 & 8: Nagle to Inanda - Day 20, First Half to uMsunduzi Confluence



Day 20 – Second Half



Day 21


End Day 20
Qhodela
End Day 21
Ximba
Mamba Gorge
Image © 2012 GeoEye
Google earth
© 2012 AfriGIS (Pty) Ltd.
Imagery Date: 5/31/2010
2004
Sithumba
29°39'46.98" S 30°43'05.56" E elev 200 m
Eye alt 8.77 km

Day 22


Imbozamo
End Day 21
End Day 22
Image © 2012 GeoEye
Image © 2012 DigitalGlobe
© 2012 AfriGIS (Pty) Ltd.
Google earth
Imagery Date: 6/22/2011
2004
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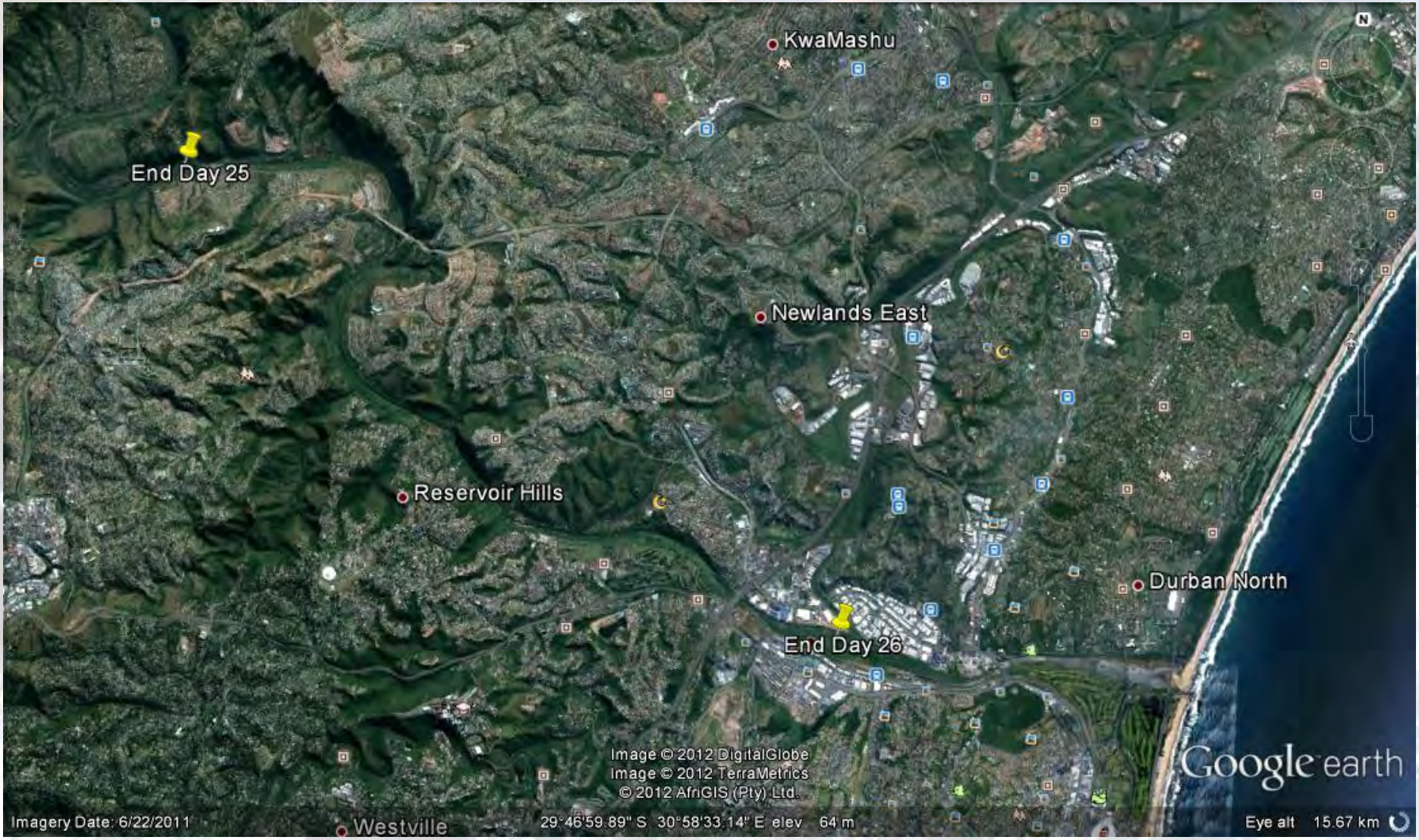
Eye alt 8.00 km

Section 9: Inanda Dam

Section 10: Inanda Dam to Estuary - Day 25

Days 26 & 27 - Durban



Appendix 2

Wild Animals and Birds Recorded

Wild Animals and Birds

Source to Midmar

Ant bear digging
Baboon droppings
Blesbok
Bush pig – tracks, digging
Duiker droppings
Frogs – call
Jackal – heard, scats
Mole – mole hills
Mountain Reedbuck - droppings
Oribi
Otter – midden, spoor, scats
Porcupine – scat quills, teeth marks
Reedbuck – male & female visual
Shrew – carcass
Springbok
Vervet Monkey
Water Mongoose – visual, tracks

African Black Duck
Black Tit
Brown Hooded Kingfisher
Bull Bulls
Cormorant
Crowned Cranes – heard
Doves
Egyptian Geese
Emu
Fish Eagle
Fork Tailed Drongo
Giant Kingfisher
Hadeda Ibis
Half Collared Kingfisher
Hamerkop
Jackal Buzzard
Masked weaver

Natal Francolin
Owl – pellet
Purple Crested Lourie
Rameron Pigeon
Scimitar Bill Hoopoe
Swifts
Yellow bill Duck
Waxbills
Weaver nests
Wood Hoopoe

Midmar Dam

Hartebeest – visual
Vervet Monkey - visual

African Black Duck
African Jacana
Blacksmith Plover
Darter
Cormorant
Egyptian Geese
Fish Eagle
Goliath Heron
Spurwing Goose
Yellow Billed Duck

Midmar Dam (Howick) to Albert Falls Dam

Ant bear – digging
Blesbok
Buffalo
Bushbuck
Giraffe
Hippo
Jackal – visual
Nyala
Otter
Python
Wildebeest
Zebra

Fish Eagle
Fork Tail Drongo
Half Collared Kingfisher
Purple Crested Lourie

Albert Falls Dam

Blesbok
Dassie
Duiker
Impala
Otter
Zebra

African Jacana
Coot
Darter
Cormorant
Crowned Cranes
Egyptian Geese
Fish Eagle
Goliath Heron
Hamerkop
Moorhen
Pied Kingfisher
Sacred Ibis

Albert Falls Dam to Cumberland

Otter – scats
Porcupine – scats, digging
Termite mounds - high
Vervet Monkey - visual

Cormorant
Egyptian Geese
Fish Eagle
Giant Kingfisher
Pied Wagtail

Cumberland to Nagle

Bush pig
Blesbok – visual
Dung beetle
Giraffe – visual
Golden Orb Spider
Kudu – visual
Otter – scats
Porcupine – scats, digging
Python – visual
Termite mounds - high
Various antelope
Vervet Monkey - visual

African Hoopoe
Brown Hooded Kingfisher
Black Duck
Cormorant
Egyptian Geese
Fish Eagle
Giant Kingfisher
Mourning Dove
Pied Wagtail
Purple Crested Lourie
Yellow Breast Canary
Quelia

Nagle Dam

Impala
Giraffe
Mole – carcass
Zebra

Fish Eagle

uMsunduzi Confluence to Imfula Store

Otter - sign

Black Duck
Goliath Heron
Fish Eagle

Imfula Store to Inanda Dam

Otter sign

African Hoopoe
African Jacana
Blue Waxbills
Egyptian Geese
Fish Eagle
Hamerkop
Purple Crested Lourie
Wood Hoopoe

Inanda Dam to Durban

Egyptian Geese
Fish Eagle
Jacana
Martial Eagle

Appendix 3

Aquatic Vegetation

All confirmed aquatic invasives 

All first sightings in red text
Some identifications are uncertain.

Section 1: Source to Midmar Dam

Umgeni Vlei: 1st Lake

Lagarosiphon muscoides (Fine oxygen weed - indigenous)

Umgeni Poort Gorge

Overabundance of diatoms

Dargle: Near Poultry sheds

Algae

Dargle: D/s poultry, dairy, house

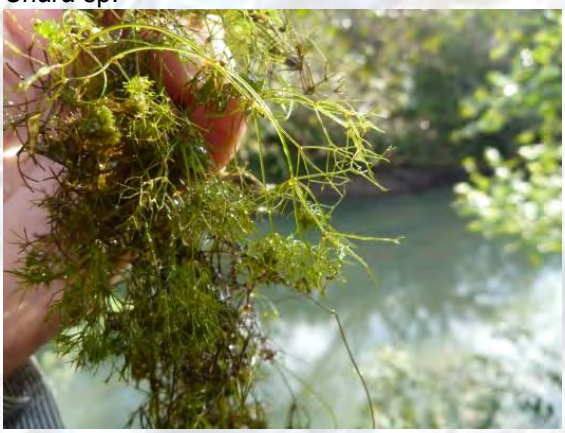
Algae

Dargle: below Nguni cattle camp

Nguni camp - Possibly *Potamogeton pectinata* (pondweed)

Dargle: Intense Poultry / Cattle Farm - downstream of first sheds

Chara sp.



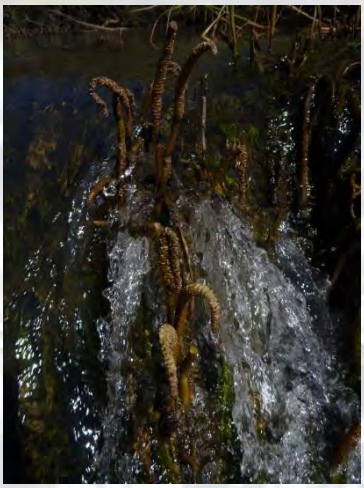
Hanbury (1) *Chara* sp. (a type of stonewort)(cosmopolitan)

Dargle: Intense Poultry / Cattle Farm - downstream of all sheds

Dargle: near Corrie Lynne

1st *Hydrostachys polymorpha*

Hydrostachys polymorpha



Dargle: D/s & adjacent to vast arable lands

Long (3) *Potamogeton pectinatus*

Dargle: Between 2 houses, d/s of arable lands & dairy

Type of algae

Dargle: D/s of small holdings

Robartes Fine oxygen weed

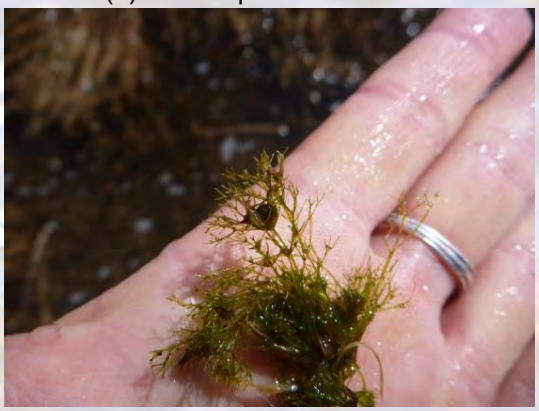
Downstream of Lions River Confluence

Possibly *Ranunculus multifidus* (African buttercup)

Section 2: Midmar Dam

Midmar Dam

Midmar (1) *Chara* sp.



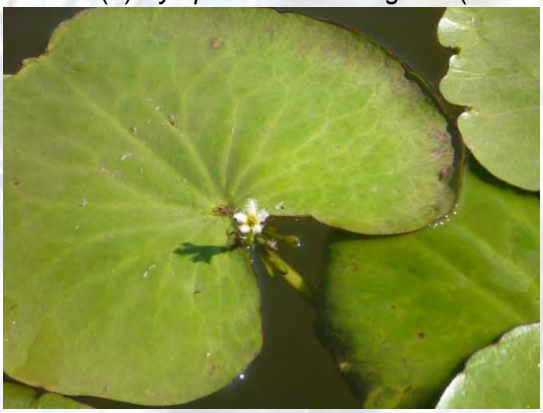
Possibly a species of *Triglochin*

Midmar (2) *Egeria densa* (Dense water weed)

Dense water weed

Midmar (3) *Chara* sp.

Midmar (4) *Nymphoides thunbergiana* (Floating heart) (indigenous)



Myriophyllum aquaticum (Parrot's feather)

Midmar (6) *Myriophyllum aquaticum* (Parrot's feather)

Possibly a *Persicaria* species

Section 3: Howick to Albert Falls dam

D/s of gauging weir below Midmar Dam wall

Midmar weir *Potamogeton thunbergii* Floating pondweed (indigenous)

Howick Residential area

Howick Road Bridge near Howick Falls

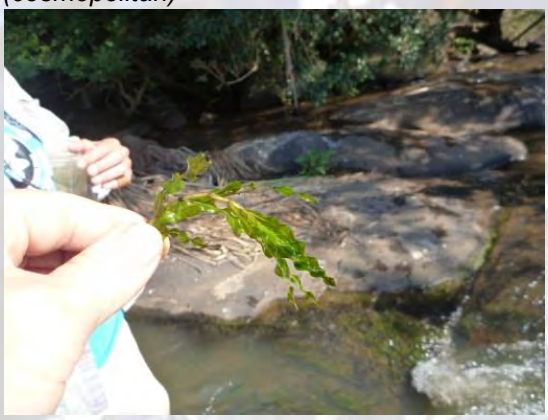
Top of Howick Falls

Below Howick Falls - near Symmonds Lane Stream confluence

Howick (3) looks like hornwort

D/S of Howick Waste Water Works outlet

Fish jump. *Potamogeton crispus (*Curled pondweed*)*
(cosmopolitan)



Nasturtium officionale

Hydrostachys polymorpha

Nasturtium officionale

Old irrigation dams u/s of Karkloof confluence

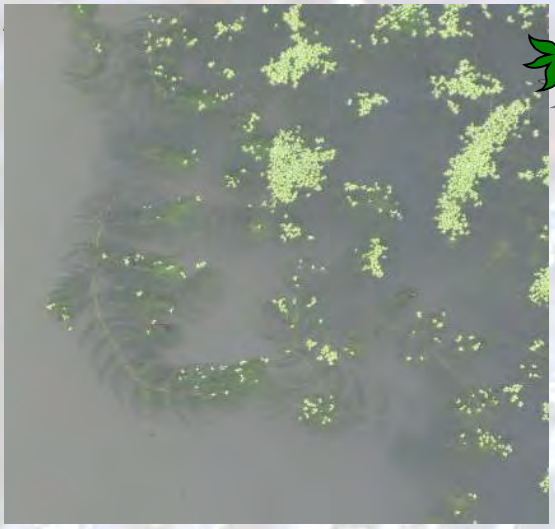
1st Duck Weed. Possibly a *Lemna* species

Hippo pool (1) *Ceratophyllum demersum* (Hornwort) (cosmopolitan)

Karkloof River just upstream from uMngeni confluence

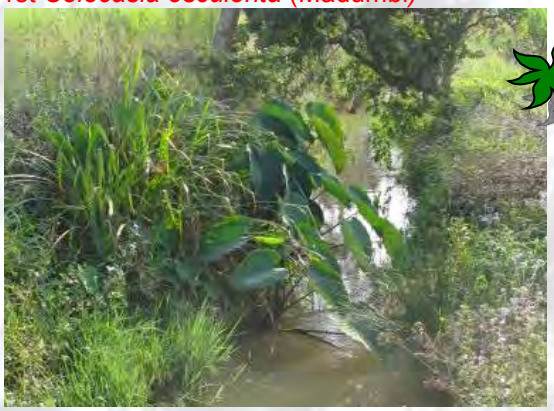
Hydrostachys

Mortons Drift



Between Mortons Drift and Albert Falls Dam

1st *Colocasia esculenta* (Madumbi)



1st *Pistia stratiotes* (Water Lettuce)

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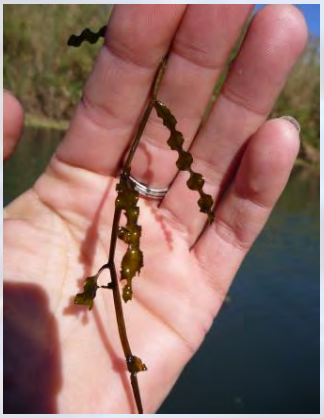
uMngeni River prior to entry into Albert Falls Dam

Potamogeton crispus



Section 4: Albert Falls Dam

Albert Falls Dam inlet

Pistia stratiotes (Water Lettuce)

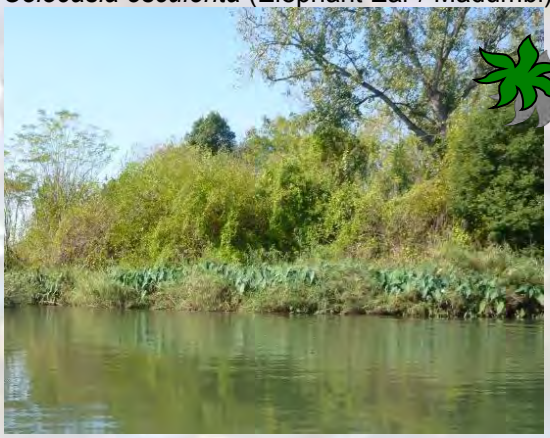
Pistia, Duck Weed, algae+E114

Close up of jelly-like algae

Section 5: Albert Falls to Nagle Dam

Albert Falls Village

Colocasia esculenta (Elephant Ear / Madumbi)



Wartburg Road Bridge

Colocasia esculenta (Elephant Ear / Madumbi)

Cumberland Nature Reserve

Hydrostachys polymorpha

Section 6: Nagle Dam

Algae inside silt weir

Section 7: Nagle Dam to Inanda Dam

Downstream of Nagle Dam

Colocasia esculenta (Elephant Ear / Madumbi)

1st road bridge d/s of Nagle Dam

Algae on rocks

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uMsunduzi Confluence

Colocasia esculenta

1st *Eichornia crassipes* (Water Hyacinth)

Algae

Nasturtium officionale

Marian Foley Bridge Area

Eichornia crassipes

Pistia stratiotes

From the confluence of the uMsunduzi all the way to and through Durban, all aquatic invasives were seen regularly and were added to with the following:

Section 8: Inanda Dam

Inanda Dam Inlet

Azolla filiculoides (Red Water Fern)

Myriophyllum aquaticum (Parrots Feather)

Mass of various invasives

Algae

Appendix 4

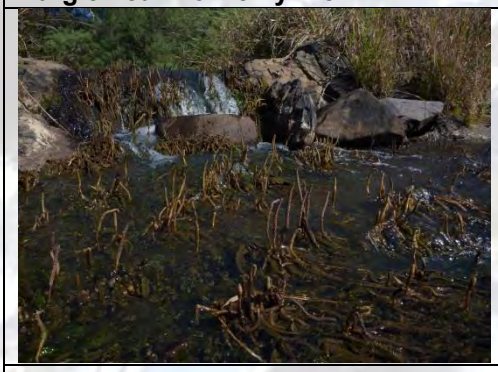
Indigenous Vegetation

Hydrostachys polymorpha

Probably the rarest, most unusual and most interesting plant we recorded on the river is *Hydrostachys polymorpha*, which we saw in a total of eight locations during the walk: in two locations upstream of Midmar Dam; in four locations between Howick Falls and Albert Falls Dam; one just upstream of the Valley of a Thousand Hills, and one in the Valley of a Thousand Hills upstream of Nagle Dam. In addition, we suspect two more locations in the Dargle that we were unable to get close to.

Dargle, Near Corrie Lynne:		
Hydrostachys on a small waterfall on a dolerite dyke in fast flowing water	29.31.421	30.05.473
Small island, less than 100m downstream of previous *Hydrostachys*. Lower end of island has more *Hydrostachys*. Less silt in water, leaves a lot greener		
Howick area:		
Top of Howick Falls		
Upper Fish Jump Falls, lots of *Hydrostachys* looks very healthy	29.29.200	30.14.640
Fish Jump Falls	29.29.744	30.14.892
Karkloof river:		
Upstream of confluence with uMngeni River on dolerite rocks	29.26.708	30.21.54
Just downstream of Mpolweni confluence d/s of Wartburg road bridge:		
Few hundred metres downstream of Mpolweni confluence. *Hydrostachys* on rocks of river	29.27.033	30.29.---
Cumberland downstream of Aasvoelkranz cliffs:		
Downstream of Cumberland's Aasvoelkranz before valley widens out		

Dargle near Corrie Lynne

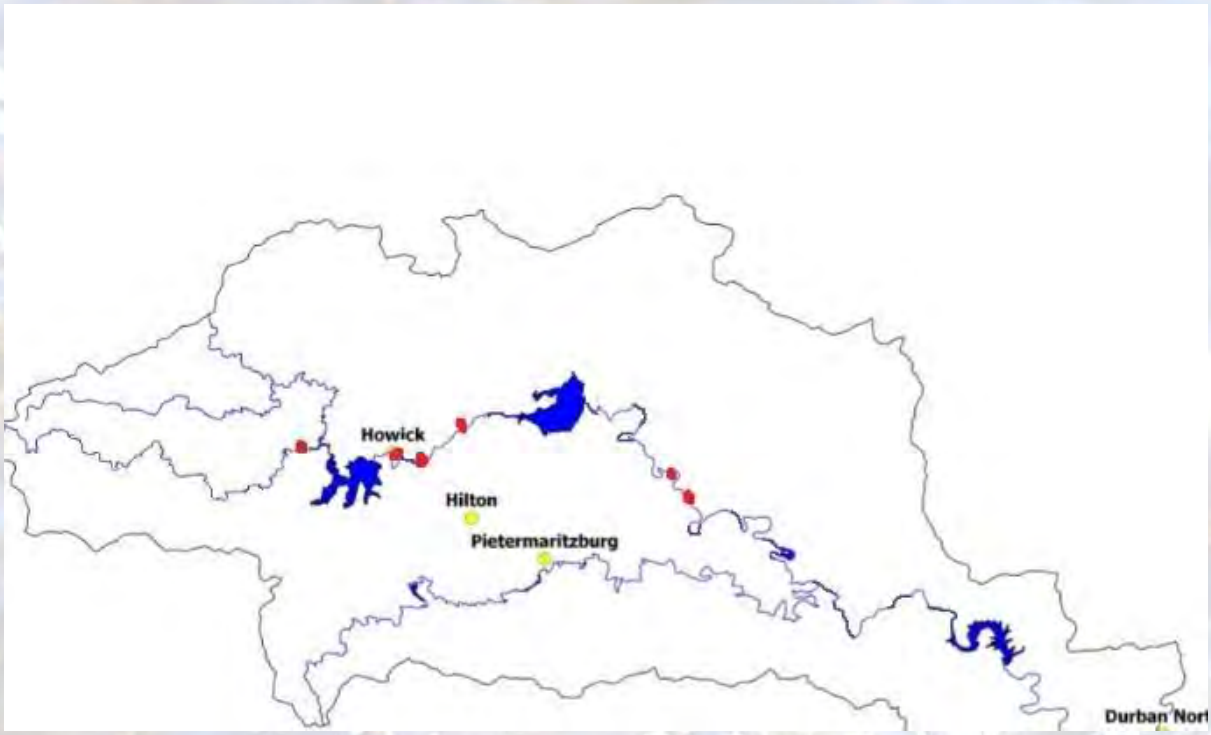


Umgeni Valley Nature Reserve

Karkloof River near confluence

Valley of a Thousand Hills: Cumberland N/Reserve

Location of *Hydrostachys polymorpha*



Plant lists in order of sighting

Section 1: Source to Midmar Dam

Upper catchment (Source until end of belt of *Podocarpus* forest)

Grasslands

- *Cymbapogon excavatus* (Turpentine Grass)
- *Hyperhennia hirta* (Common Thatching Grass)
- Wetland grasses and sedges
- Beautiful Watsonia dotted grasslands with tiny *Protea drakomontana* (only +- 30cm high) and Bright red *Helichrysum* (Everlastings) - either *hadenocarpum* or *ecklonis*
- *Erica* spp – tiny plants no higher than +-10cm with dainty pink bell shaped flowers
- *Widdringtonia*
- Tree Fern
- Bracken fern
- *Kniphofia* (Red hot pokers)
- *Leonotis* (Wild Dagga)
- *Cucumis*
- Lilac *Wahlenbergias* nodding their dainty bell like flowers in the breeze
- *Polygala*

Riparian zone

- In the forest, mosses and ferns line the waters edge, with a few scattered *Hypericum*
- In the grasslands the river banks are home to *Widdringtonia*, *Hypericum*, *Leucocidia* (Ouhout), *Polygala* and *Crocosmia* (Falling Stars)

Indigenous forest

- Giant *Leucocidia* trees hung with Old Mans Beard lichen
- *Podocarpus* (Yellowwood)
- Small ferns and buck weed
- Giant and small *Celtis africana* (White Stinkwood),
- *Grewia, Euclia undulate, Carissa bispinosa* (Num-Num), *Halleria lucida* (Tree fuchsia)

Remainder of Upper Catchment until Midmar Dam

Grassland

- Beautiful grasslands of *Aristida junciformis* (Ngongoni grass), *Cymbapogon, Sporobolus africanus* (Rats tail drop seed) and *Eragrostis*
- Wetlands with reed beds of *Phragmites* and sedges
- *Watsonia*
- Tall yellow *Helichrysum*
- *Widdringtonia*

Riparian zone

- *Leucocidea* (Ouhout trees)
- Willow tree (indigenous)
- *Rhus*
- *Clausena anisata* (Horse wood)
- *Gymnosporia buxifolia* (Common Spike Thorn) (previously *Maytenus heterophylla*)
- *Celtis africana* (White Stinkwood)
- *Dias cottonifolia* (Pom Pom Tree)
- *Xymalos monospora* (Lemon wood)
- *Hypericum* spp
- *Grewia occidentalis* (Cross Berry Raisin)
- *Buddleja* (Wild Sage)

- *Ziziphus mucronata* (Buffalo Thorn)
- *Erythrina caffra* (Coral Tree)
- *Halleria* (Tree Fuschia)
- *Cussonia* spp (Cabbage Tree)
- *Barlaria*
- *Rhus*
- *Widdringtonia*
- Ferns

Indigenous forest in sheltered valleys.

Section 3: Howick Area to top of Howick Falls

Floodplain alongside river dotted with *Wahlenbergia*, *Helichrysum* and sedges.
River bank with *Combretum* (River Bush Willow), *Acacia ataxacantha* (Flame Thorn), *Ziziphus mucronata* (Buffalo Thorn), *Greyia sutherlandii* (Natal Bottlebrush), *Barlaria, Tecomaria* (Cape Honeysuckle), *Phoenix reclinata* (Wild Date Palm), *Widdringtonia* (Dwarf Cyprus), *Leonotis* (Wild Dagga), *Polygala* (September Bush), *Watsonia*.
Scattered *Acacia siberiana* trees beyond floodplain.

Section 3: Howick Falls to Albert Falls Dam

Indigenous forest around Falls gorge on the cool slopes. Thereafter:

- *Acacia ataxacantha* (Flame Thorn)
- *Acacia siberiana* (Paperbark Acacia)
- *Ficus* spp
- Jobes tears
- *Rauvolfia caffra* (Quinine Tree)
- *Combretum erythrophyllum* (River Bush Willow)
- *Phoenix reclinata* (Wild Date Palm)
- *Ziziphus mucronata* (Buffalo Thorn)
- *Phragmites* reeds
- *Cussonia* (Cabbage Tree)
- *Aloe ferrox*

Section 5: Albert Falls Dam to Nagle Dam

- Grasses:
  - *Sporobolus*
  - Broad leaved *Setaria*
  - *Rhynceletrum* (Natal red top)
  - *Hyperhennia hirta* (Rats Tail drop seed)
  - *Digitaria*
  - *Aristida*
- *Phragmites*
- *Mundelia* (Cork Wood)
- *Acacia siberiana* (Paperbark Acacia)
- *Acacia* (Knobthorn)
- *Acacia karoo*
- *Acacia ataxacantha* (Flame Thorn)

- *Phoenix reclinata* (Wild Date Palm)
- *Combretum* (Bush Willow)
- *Hypoxis*
- *Crinum*
- *Grewia*
- *Erythrina caffra*
- *Ziziphus mucronata*
- *Phragmites*
- *Dalbergia* (Climbing flat bean)
- Hibuscus – yellow flower
- Plumbago
- *Senecio*
- *Euclia*
- *Ziziphus mucronata*
- *Gymnosporia buxifolia*
- *Rhus*
- *Aloe arborescence*
- *Euphorbia* (used for hedging)
- *Euphorbia ingens*
- *Euphorbia triangularis*
- *Brachylenia*
- *Ehretia rigida*
- *Combretum molle*
- *Dombeya rotundifolia*
- *Albizia*
- *Ficus sycamorus*
- *Vangueria infausta*
- *Dichrostachys cineria*
- *Schyzigium gerrardii*
- *Ficus* – rock splitting
- *Halleria lucida*
- *Aloe arborescens*
- *Cussonia*
- *Commiphora* (Paperbark *Commiphora*)
- *Aloe bainsii*
- *Hypericum*

Sections 6 & 7: Nagle Dam to Inanda Dam

- *Sclerocarrya birrea* (Marula)
- *Diospiros mespiliformes* (Tambuti)
- *Dichrostachys cineria*
- *Euphorbia* (hedge)
- *Euphorbia ingens*
- *Podocarpus Phoenix reclinata*
- *Schyzigium*
- *Euphorbia ingens*
- Pigeon wood
- *Acacia siberiana*
- *Phoenix reclinata*
- Bracken fern
- *Vangueria infausta*
- *Ziziphus mucronata*
- *Rhus*

- *Aloe* (*ferrox* or *marlothii*)
- *Aloe arborescens*

Sections 8 & 9: Inanda Dam to Durban

- *Acacia siberiana*
- Plumbago
- Hibiscus
- *Phragmites*
- *Cleome* (Spider flower)
- *Euphorbia ingens*
- *Euphorbia* (hedge)
- *Sclerocarrya* (Marula)
- *Dichrostachys cineria*
- *Schotia brachypetala*
- *Boscia albitrunca*
- *Combretum molle*
- *Rhus*
- *Chalanchoe*
- *Diospiros* (Tambuti)
- *Gymnosporia buxifolia*
- *Ziziphus mucronata*
- *Combretum apiculatum*
- *Albizia*
- *Ansellia gigantica*
- *Vangueria infausta*
- *Brachelinia*
- *Euclea*
- *Rhoicissus* (Wild Grape)
- *Grewia*
- *Dombeya rotundifolia*
- *Trichelia emitica*
- *Nkoka* (creeper with lucky bean red & white seeds)
- *Schyzigium*
- *Tabernaemontana ventricosa*

Section 9: Durban

- *Acacia siberiana*
- *Sclerocarya birrea*
- *Buddleja*
- *Dombeya*
- *Phoenix reclinata*
- *Acacia ataxacantha*
- *Albizia*
- *Erythrina caffra*
- *Schotia brachypetala*

Appendix 5

Invasive Vegetation

As a reference for species recorded on the walk, we compiled our list from three sources:

- SANBI's list of Declared Weeds
- *Invasive Aquatic Vegetation* by Lesley Henderson
- *Common invasives and weeds* by Clive Bromilow

Thus plant species on our list are either officially declared invasives or are recognised problem plants. In order to differentiate between the two, the list of CARA declared weeds follows the list of plant species recorded below.

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Invasive Plants and Weeds identified

Terrestrial Invasives / Weeds identified

Japanese Maple	*Acer negunda*	Pine	*Pinus spp*
Wattle	*Acacia dealbata / mearnsii*	Plane Tree	*Platanus acerifolia*
Sisal	*Agave sisalana*	Poplar	*Populus*
Crofton Weed	*Ageratina adenophora*	Peach	*Prunus persica*
Moth Catcher	*Araujia sericifera*	Guava	*Psidium guajava*
Bamboo	*Bamboosa balcooa*	Firethorn	*Pyracantha*
Orchid tree	*Bauhenia variegata*	Castor oil	*Rhicinus communis*
Black jack	*Bidens*	Bramble	*Rubus fruticosus*
Mauritius thorn	*Caesalpinia decapetala*	Weeping willow	*Salix babylonica*
Bottlebrush	*Callistemon*	Salvinia	*Salvinia molesta*
Indian shot / canna	*Canna indica*	Brazilian Pepper Tree	*Schinus terebinthifolius*
Balloon vine	*Cardiospermum grandiflorum*	Peanut butter cassia	*Senna didymobotrya*
Climbing Rose	*Catharanthus roseus*	Red Sesbania	*Sesbania punicea*
Cestrum	*Cestrum laevigatum*	Bitter apple	*Solanum*
Triffid	*Chromolaena odorata*	Bug weed	*Solanum mauritianum*
Camphor	*Cinnamomum camphora*	Kudu Berry	*Solanum pseudocapsicum*
Thistle	*Cirsium vulgare*	Potato Creeper	*Solanum seaforthianum*
Spider flower	*Cleome*	Khaki bos	*Tagetes minuta*
Pampas Grass	*Cortaderia selloana*	Yellow bells	*Tecoma stans*
Thorn Apple	*Datura stramonium*	Yellow oliander	*Thevetia peruvianna*
Dahlia	*Dactyoclenium*	Mexican sunflower	*Tithonia diversifolia*
Silver eucalypt	*Eucalyptus cinerea*	Wandering Jew	*Tradescantia spp*
Honey Locust	*Gleditsia triacanthos*	Stinging nettle	*Urtica urens*
Ivy	*Hedera helix*	Periwinkle	*Vinca major*
Wild Ginger	*Hedychium gardneranum*	Bur	*Xanthium strumarium*
Hypericum	*Hypericum perforatum*		
Moonflower	*Ipomoea alba*	**Terrestrial invasives possibly seen**	
Morning glory	*Ipomoea puppurea & indica*		*Ailanthus altissima*
Jacaranda	*Jacaranda mimosifolia*		*Amaranthus*
Jasmine	*Jasminum*		*Echium vulgare*
Lantana	*Lantana camara*		*Ipomoea alba*
Duck weed	*Lemna*		*Leucaena leucocephala*
Privet	*Ligustrum japonicum*		*Mirabilis jalapa*
St Joseph's Lily	*Lilium formosanum*		*Montanoa hibiscifolia*
Japanese honeysuckle	*Lonicera japonica*		*Senna hirsuta*
Cats claw	*Macfadyena unguis-cati*		
Syringa	*Melia azedarach*	Note: There is a possibility that our initial recordings of *Tecoma stans* were actually *Thevetia peruvianna.*	
Delicious Monster	*Monstera deliciosa*		
Mulberry	*Morus nigra*		
Parrots feather	*Myriophyllum aquaticum*		
Sword fern	*Nephrolepis*		
Prickly pear	*Opuntia ficus-indica*		
Granadilla	*Passiflora subpeltata*		
Fountain Grass	*Pennesetum setaceum*		
Barbados Gooseberry	*Pereskia aculeata*		
Pink knotweed	*Persicaria capitata*		
Wild gooseberry	*Physalis peruviana*		
Bellhambra	*Phytolacca dioica*		

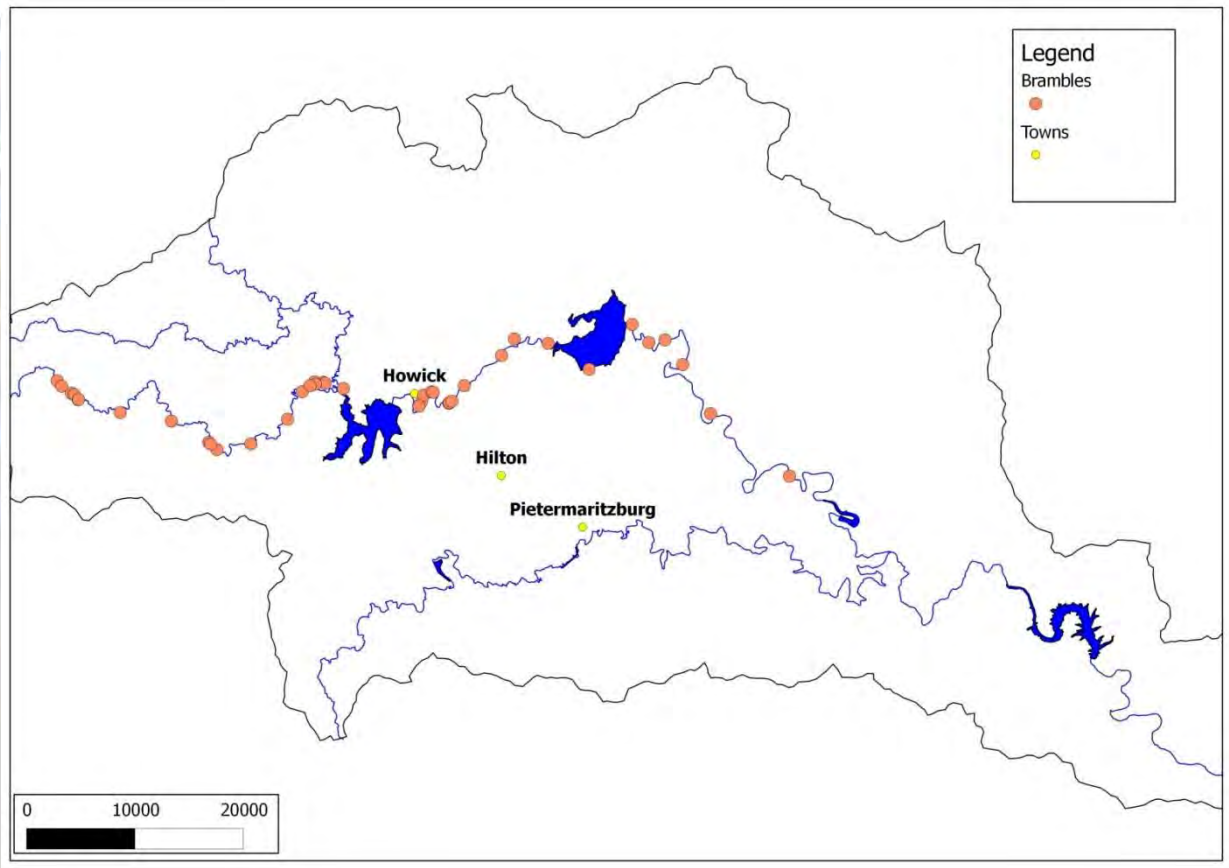
Aquatic Invasives identified

Giant Reed	*Arundo donax*
Red Water Fern	*Azolla filiculoides*
Madumbe / Elephant Ear	*Colocasia esculenta*
Garden Canna	*Canna generalis*
Indian Shot	*Canna indica*
Water Hyacinth	*Eichornia crassipes*
Willow Herb	*Ludwigia stolonifera*
Parrots Feather	*Myriophyllum aquaticum*
Watercress	*Nasturtium officinale*
Parrots Feather	*Myriophyllum aquaticum*
Watercress	*Nasturtium officinale*
Water Lettuce	*Pistia stratiotes*

Aquatic Invasives possibly seen

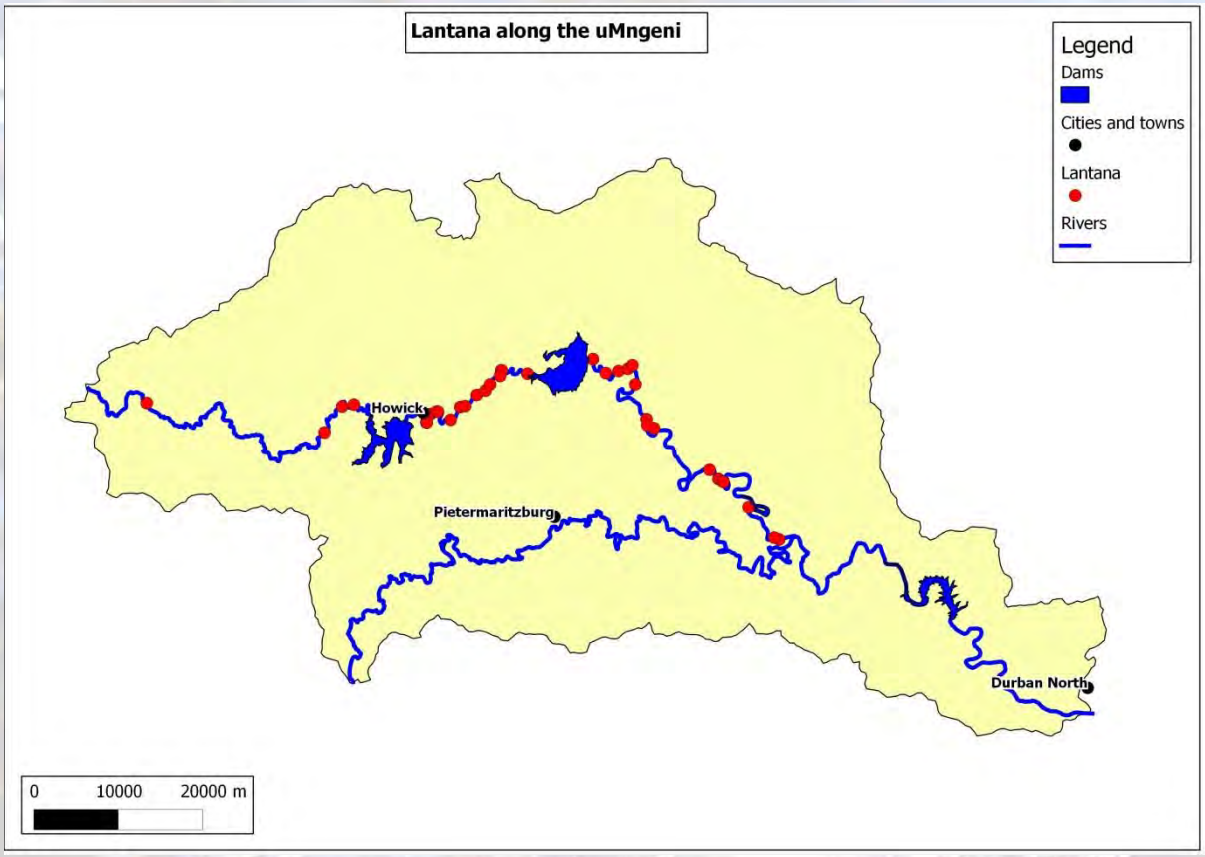
Canadian Water Weed	*Egeria canadensis*
Dense Water Weed	*Egeria densa*
Hydrilla	*Hydrilla verticillata*
Fine Oxygen Weed	*Lagarosiphon muscoided*

Map: Areas of Heavy Bramble Infestation



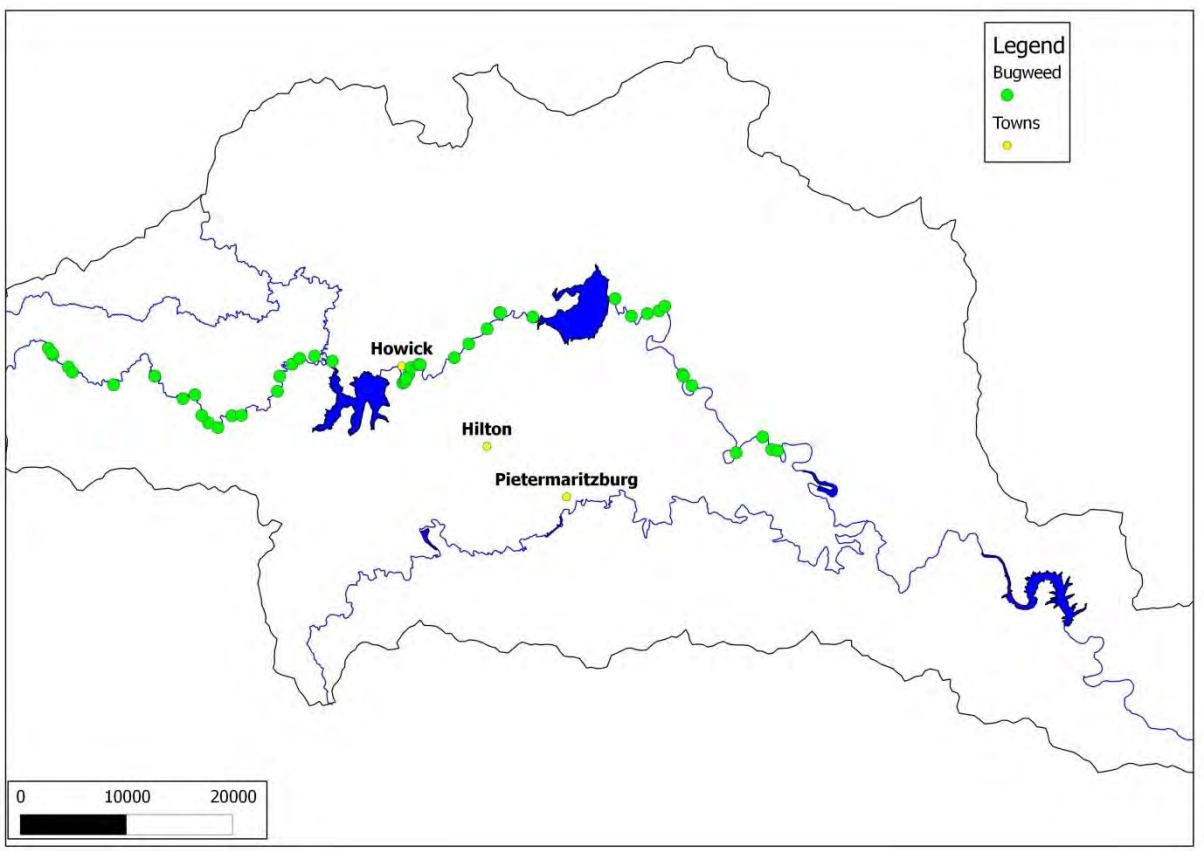
Note: this map shows only the heavy infestations of bramble seen along the river and does not account for the light and medium infestations

Map: Areas of Heavy Lantana Infestation



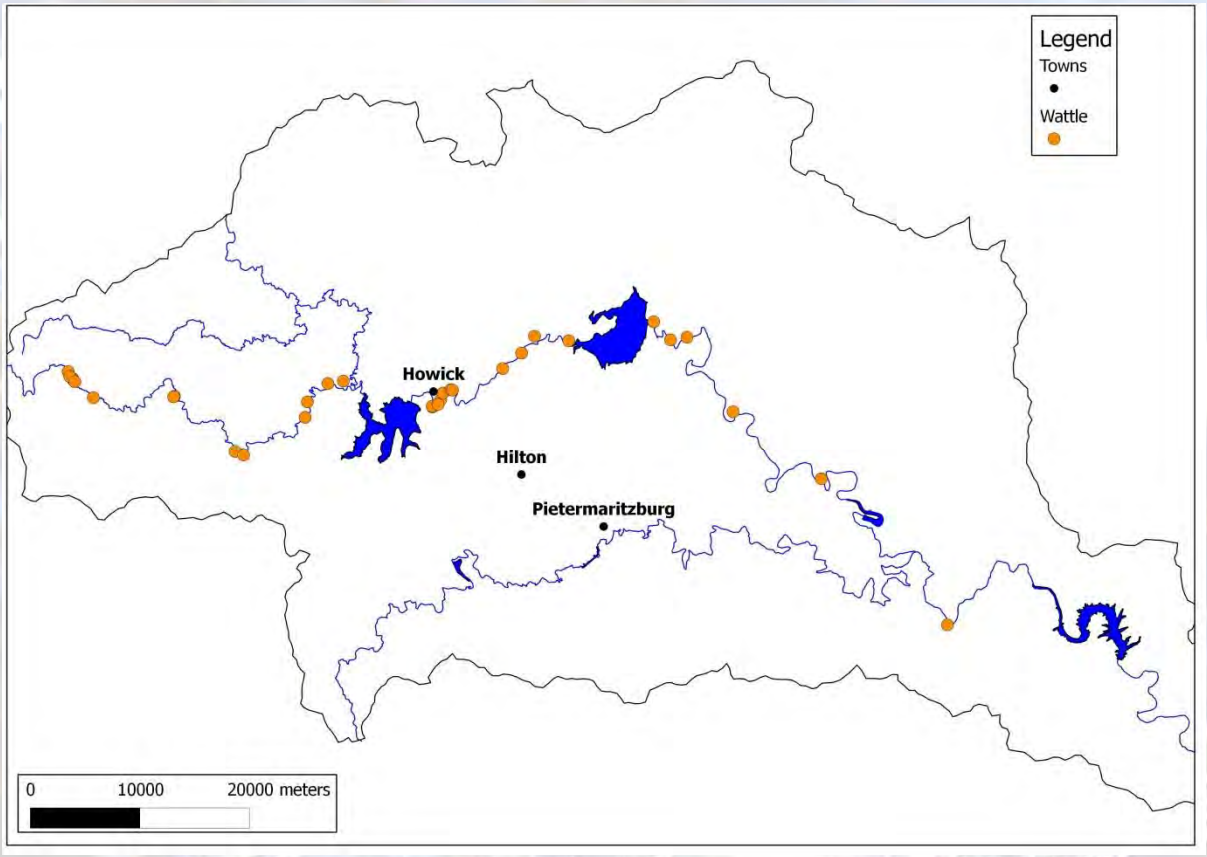
Note: this map shows only the heavy infestations of lantana seen along the river and does not account for the light and medium infestations.
The first red dot on the map is erroneous, as this was a mistaken identity.

Map: Areas of Heavy Bugweed Infestation



Note: this map shows only the heavy infestations of bugweed seen along the river and does not account for the light and medium infestations

Map: Areas of Heavy Wattle Infestation



Note: this map shows only the heavy infestations of bugweed seen along the river and does not account for the light and medium infestations

Invasive Plant List from Dictaphone recordings

This list is an attempt to give a picture of the overall extent of the invasive plant problem along the river, and is by no means a complete nor always chronological list of all invasive plants occurring. Many areas / invasives were recorded with GPS, however due to the overwhelming quantities of invasives observed, I often recorded by dictaphone a running commentary as I was walking. The list below comprises the unedited dictaphone transcripts.
Plant names in red text denote the first time the particular species was sighted.

We are quite certain that grass listed below during the walk in Section 1 (Source to Midmar Dam) as young Pampas Grass, is actually *Pennesetum* (Feather Grass). The first actual confirmed Pampas Grass was seen at the inlet of the uMngeni River into Midmar Dam.

Section 1: Source to Midmar

Start Point: 29°27'45.56"S 29°52'17.55"E End Point: 29°28'31.78"S 29°53'10.86"E

Only one small area with invasives on this section, mainly regrowth since previous invasive control measures.

- 1st Pinus spp (Pine trees), 1st Wattle (Acacia dealbata or mearnsii); 100 m downstream = 1st Solanum mauritianum (Bug weed). Some Pine & Wattle ring barked
- Small island: young Wattle trees, Pines, Bugweed going up embankment, on river bed as well as island
- Wattle
- Pine trees, right up to waters edge, also Wattle almost up to waters edge. Looks mostly like regrowth. Trees were ring barked - very big Pines lying across the river bed where they have fallen & now young pines coming through
- Big patch of Rubus (Bramble) & fairly big Wattle tree. Bugweed right at river, just below the 4x4 track
- 1st Bramble coming almost to waters edge +-5m from water
- Bugweed. Couple of Wattles & young Pine trees some Pines have been ring barked.

Start Point: 29.29.351 29.54.193 End point: 29°29'20.93"S 29°54'7.53"E

After an initial area almost clear of invasives, the line was crossed where previous invasive clearing had ceased, and thereafter, infestations were heavy

- 1st Prunus spp (Peach tree) on north side of bridge
- 2x Pyracantha.
- Small drained floodplain, lots of Bramble from disturbance
- Signs of invasive clearing - Gums cut down. Plane tree ahead, Bugweed been cut down. Brambles on top of bank
- Lots of Pyracantha (firethorn). Bramble, young and mature Wattle.
- Tiny Bramble covered flood plain. Thick with Pyracantha (Firethorn) on sharp bend of stream, lots of Bramble as well.
- Pyracantha very thick
- All the way down have Firethorn, Bramble, occasional Pine & Wattle tree
- Had good spell where not seen many invasive trees. Populus sp (Poplars) all of a sudden
- 1st tributary – lowest point of previous invasive clearing two years ago. River bank cloaked with Bramble, Bug weed, Acer (Chinese Maple), Plane trees, Canna indica (Indian Shot). Within less than 100m of the confluence, Wattle starting - large Wattles. Bramble everywhere.
- Downstream of tributary open grassland invaded by Bramble. Land owner attempting to clear the Bramble - much has been treated, is dying. Lots of Wattles, very young saplings, and also very large trees.
- Cut Wattles have been stacked and burnt, causing soil sterility so now nothing will grow.

- Crossed to north side of river: like a line & all invasives have stopped. Still ribbon of Wattle along river, but no invasives in grassland.
- Gully choked with Bugweed – looks like was Wattle that was burnt out and now Bugweed coming in on the burn.
- Are in 6 foot high Cymbapogon excavatus absolutely inundated with emerging Bramble, will be solid in a couple of years. To our right is solid Bugweed, then masses of Wattle along the river.
- Wattle trees on river bank, quite a lot of Pyracantha (firethorn), young Pine tree. Wattle.
- 1st Bidem (Blackjack)
- Bugweed up drainage line. Old Kikuyu pasture full of weeds & Blackjacks, Datura.
- Small stream – low water flow as stream is coming through Wattle & Eucalyptus (Gum) plantation, plenty of Bugweed at stream. Bugweed been cut but not treated so its coppicing and now flowering. Stream has indigenous plants, could be awesome if invasive were cleared.
- On the extremely steep slopes near the cliffs to the south of the river, is a plantation of extremely large old Pine trees, along with many “escapes”. Prior to 1972 there were no water course buffer zone limits for planting next to streams, and thus many are in the watercourses which have subsequently dried up. In addition, the timber has apparently never been properly tended nor harvested. A request was made by previous landowners for these trees to be felled, as they are a seed source and are the cause of erosion gullies, drying streams, etc, however due to the terrain, they are inaccessible and apparently cannot be removed.

Start Point: 29.29.332 29.54.220 **End Point: 29°29'20.62"S 29°57'29.51"E**

Less infested than previous day – more patchy, but with wattles lining the river for almost the entire section. Many Bramble “hedges” parallel to the river.

- Bugweed, Bramble, young Gums, Wattle trees along river edge
- Piles of bulldozed Wattle trees; Wattles have been stumped, everything cleared. Wattle hanging over river bank was felled and dropped into river so all sticks & branches are in the river
- Bramble, Bugweed next to very old track that has been kept mown
- Grassland choked down there with Brambles & Wattles
- Grasslands dotted with Wattle trees.
- Inhluzane down on our right, open grassland between us and mountain, lots of baby Wattle starting to appear in grassland
- Tributary completely encroached with young Wattles which are encroaching into indigenous forest. On crest of hill are Gum plantations, and below and to the side of the plantations are lots of Gum “escapes”
- Downstream of where farm road climbs up the hill after river crossing, lots of Bugweed starting to sprout and lots of young Wattle
- Since mini SASS there were not many Wattle & Bugweed, now is definitely worse
- Hill that was grassland now with lots of Gum & Wattle encroachment. Wattle growing everywhere
- Bit of a flood plain +-100m wide full of Bramble, Bugweed, Scotch Thistle
- Bramble, Wattle
- Far fewer Wattle than we have had up to now – invasive vegetation has cleared up a lot from earlier on
- Another tributary coming in on left – is choked with what looks like Wattle, Wattle coming down stream as well as on floodplain. Grassland of Senicio from overgrazing
- Some Wattle & Bugweed
- Been a fire through here, huge amount of Wattle burnt, masses of regrowth since fire - will be a problem
- Tributary stream, been fire thro, lot of Wattle dead, will be lots of young Wattles, river totally choked where Wattles have fallen down & haven’t been cleared.
- Sitting on confluence where tributary 3 comes in from the south. Been a lot of Wattle.
- Some Bugweed, Blackjacks
- Very thick Bramble

- Indian Shot. River banks are lined with Wattle trees
- Wattle right on the rivers edge
- Most solid Bramble we have seen must be 5 foot high, solid mass going all the way down the outside of fence which is parallel to river
- Datura
- Impenetrable Bramble along the river
- Bramble
- Heaviest infestation of Blackjacks so far, Wattle trees on banks
- Cirsium vulgare (Scotch Thistle), old Kikuyu pasture, Blackjacks. More Bramble, young Bugweed - 1st Bugweed for a while
- Bramble
- Veld grass interspersed with Kikuyu
- Bramble on edge of wetland
- Nice wetland up ahead. Cortaderia jubata (Pampas Grass) We are fairly certain that this is in fact Pennesetum (Fountain Grass). Thickets of Datura

Start Point: 29°28'56.12"S 29°57'53.37"E End Point: 29°31'31.70"S 30° 1'39.60"E

Approximately the first half of this section showed signs of invasive control with many treated trees, and areas that were clear of most invasives. One of the better stretches of river so far. This was followed by a heavily infested stretch with predominantly pine & wattle, bugweed and bramble

- Pine, Bramble & Wattle
- Pine, Bramble & Wattle cleared by slashing with brush cutter
- Wattle, Plain trees
- Wattle, thick Bramble alongside river, Pampas Grass
- Young Pampas Grass, Wattles
- Long stretch on right bank fairly clear of Wattles and Brambles due to landowner clearing
- Hillside of either Liquid Ambers or Japanese Maples in full autumn colours – heavy infestation of garden escapes now invading the indigenous bush
- Wattle
- Poplars along river bank – area otherwise clear of invasives
- Poplar plantation. River bank lined with large Wattles that have been killed by ring barking. Majority of the Wattles lean away from the river, so won't cause log jams
- Pine
- Grove of young Wattles – some ring barked , some cut and treated with herbicide
- Wattle, young Pampas Grass, wetland infested with Bramble and
- Bugweed clump
- Datura, Indian Shot, Plain trees
- Bugweed, Wattle, Pine continuously smothering banks – forcing us to rock hop & walk in water
- Young Pampas Grass, abandoned Kikuyu
- Bugweed, Wattle, young Pampas,
- Wattle, Bugweed invading indigenous forest
- Bramble on firebreak roads
- Bugweed
- Wattle, Bugweed

Start Point: 29.31.360 30.4.297 **End Point: 29.31.610 30.04.419**

- Singisi bridge, lot of Bramble, Plane trees & Wattle on the river bank. Possible Pecan Nut tree. Escaped pines outside of plantation line, Bugweed, Gums
- Bugweed in the plantation.
- Lots of Bugweed & Khakibos on island
- Tributary stream – Blackjack, Datura
- Edge of maize – Blackjacks, Bramble, Wattle, Bugweed, Datura

- Overgrazed veld – weeds & Khakibos
- Pretty island choked with Bugweed, Wattle, Bramble
- Left bank: Bugweed, Wattle on island, plantation on right, Bramble also on forestry track which has been mowed & burnt – tracer line
- Bramble, large old Wattles, Bugweed on floodplain,
- Grassy area absolutely clogged with Bramble, tributary stream coming down is a green carpet of Bugweed
- Blackjack, Senicio, Bugweed between plantation & track.
- Solid Bramble infestation between trees & firebreak road
- Small stream / gully, infested with Bugweed. Seep area below with Bramble
- Island – Bugweed – lots.
- Another section nearly clear of invasives due to efforts of landowners. Invasives on island, young Wattles 3-4 foot high on bank
- Attempts to clear Wattles but felled big Wattles into the river.
- Only light infestation young Bugweed & Wattle
- Plain / Poplar in garden +-3 m high & quite a lot of Bugweed on the banks below house
- Indian Shot
- Bugweed has been cut down, started re-growing
- Possibly young Pampas Grass. A few old enormous Blue Gum trees, lots of small Gums coming up under them.
- Lots of Bugweed & Wattle
- Indian Shot, Bugweed, Thistle, few Blackjacks, surrounded by Kikuyu pastures.
- Poplars, Bugweed, Wattle.
- On east side: have a whole row of Plain trees. Little bit of Bramble may be more between track we are on & the river. Aristida
- Plain trees dotted down river and avenue of young Plain trees approaching river
- Poplars & Bugweed on island
- Peculiar grass again - possibly young Pampas
- Blackjack
- Bugweed on forest margin
- Blackjack, Wattle, maize lands choked with Ipomea (Morning Glory) - looks like snow! Bramble, very big old Wattle, Bugweed
- Khakibos, Bramble, Bugweed, Thistle, very tall Bugweed, Wattle on the slope, bit of Bugweed starting underneath the Pine trees & Poison Apple.
- Tributary. Poplar plantation - lots & lots of Bugweed on left bank
- Aliens begin: Bramble, Khakibos, Ivy, Bramble, Wattle
- Tributary stream very choked. Wattle, Gums
- Seep line - Brambles, Bugweed, Wattle. River choked with Bugweed. Totally jammed up with possible young Pampas Grass & Bugweed. Left side river = Poplars, Wattles & veld grass infested with Bramble

Start Point: 29.31.360 30.4.297 **End Point: 29.28.740 30.07.448**

- Lots of Bramble on banks right going down & Bugweed
- Just passed big Wattle trees fallen over - causes a log jam
- Lots of Blackjacks, Bugweed starting
- Wattle & Bugweed down at the waters edge. Theres not that much Bugweed and Wattle that its uncontrollable. Many are big trees, if they flatten them then can pull any emerging young seedlings.
- Beautiful spot near the river, unfortunately lots of Bugweed coming in
- Infestation of Bramble on both left & right banks, Poison Apple, Bugweed, solid Bramble & Bugweed
- 1st Melia azedarach (Syringa)
- Section of probably 100m absolutely solidly choked with Bramble, lot of young Bugweed & Wattle trees

- Opuntia (Prickly Pear) on cliff will be hell to get rid of it. Bugweed down on edge of rock fall. Wattle
- Wattles along river, left bank lot of young Bugweed coming up 3 foot high Bugweed along the river again & lots of Wattle
- Taken 2 hours to go 1km walking in river all the way because of Bramble all the way on both sides.
- Bramble, solid, and Bugweed.
- Beautiful Aristida grassland becomes infested with Brambles, solid thicket of Datura, Khakibos, open ground, nothing is growing, hard packed.
- Hedges of Bramble on left and Wattle & Bramble on right
- Lots of Ligustrum (Privet).
- Not too many Wattles. Brambles on other side. Only 1 Bugweed
- Bramble on edge of river banks
- Khakibos then big drop off down to river below.
- Area choked with everything imaginable – looks as though the Bramble maybe been treated, also Khakibos, Bugweed, Ipomea (Morning Glory), more Blackjacks
- Over 6 foot high hedges of Bramble next to track separating us from river. A lot of the hedge next to the track is dead, has been sprayed. Still some green stuff on the river side but at least they have sprayed this.
- Plane trees, lots of Bugweed. Floodplain – lots of Gums planted & a lot of Wattle growth is coming up all over
- Hit inevitable Bramble & we had to come up to road – narrow strip of +-50 -80m between road & river is like no mans totally choked with Bramble, Khakibos, Wattle, Poplar plantation further down
- Pine trees, Poplars
- Poplar, 1st Morus nigra (Mulberries).
- Mulberries on the island, now there are Mulberries on the island theres Bugweed here too.
- The right bank choked with aliens, Bugweed, Wattle
- Wattle. Poplar plantation growing Wattles growing out of the bank.
- Wattle tree has fallen & blocked the river.
- Lot of Morning Glory on the vertical part of the bank, Mulberry trees and once again Wattles
- Peach trees
- Avenue of ancient Mulberry trees. Leave quite small, trees very gnarled
- Brambles again, down at the river gorgeous old Mulberry trees
- Salix babylonica (Weeping Willows) … big old gnarled trees
- Suddenly opposite river bank covered in Bramble again
- Giant old Blue Gum & Silver Gum trees
- Privet
- Wattle & Bugweed
- At bridge: Bramble, Inkberry, Mulberry, Wattle, Bramble, Indian Shot, Ipomea
- Blackjacks lining east of river, big patch on left, Blue Gums, grove of Acer negundo (False Celtis), lots of Wattle the other side of river floodplain
- Bramble on bank, Datura, Bramble, lots of Wattle & Datura
- Bramble – treated
- Wattle down on the river bank masses of Khakibos, Mulberries

Start Point: 29.28.740 30.07.448 **End Point: 29°29'15.93"S 30° 9'22.24"E**

- 1st Salix babylonica (Weeping Willow), also very young Poplar / Plain, Mulberries on island
- Pine trees up on the hill here big old Pine trees, row of Poplar trees planted
- Just passed Bugweed & on the other side massive Bramble. Lovely big pool where the Poplars are, Wattles on right side going down, Poplar, big Wattles mixture of different Wattles, Mulberries, lot of Plain trees on the hill = seed bank, Mulberries galore they are everywhere.. In the middle of Poplars, Plain trees, Bugweed and Mulberries
- Hit a patch that is packed with Bugweed, Mulberry on both sides, Poplar, Privet, Wattle, Mulberry. Plantation to waters edge,
- Mulberry, Wattle, Bugweed, very big Ghost Gums. Khakibos.

- More Bramble
- Brambles on river's edge
- Scotch Thistle, Weeping Willow, Bramble, Bugweed, Bamboo, Khakibos, Mulberry
- Wattles & Blue Gums again
- Many Blue Gums have been taken down, large trees felled by landowners. Couple of Bugweeds, lots has been cleared, nice pathway along river. Indigenous bush returning. Reached the point they have cleared up to. Mulberries & Bugweed very dense - much has been cleared, especially Bramble.
- Now impenetrable with Bramble. Syringa. Pyracantha – 1st in a long time. Young Wattles coming up after burn - all big Wattles gone, so these can be hand pulled, lot of Weeping Willow
- Other side of river is thick Bramble, Mulberry, Bugweed.
- Wattle forest. Solid Bramble, lots of young Wattles, bit of Bugweed, +-50 metres from river. Datura, Blackjack, Morning Glory, Bramble, Mulberries and Wattle line river banks. Blue Gum plantation on other bank, Wattle, lots of Mulberry
- Very old large Mulberry and Bugweed
- Datura, Wattle, Mulberry, Poplar on other side
- Mulberry, Scotch Thistle, Urtica urens (Stinging Nettle).
- Property cleared of Stinging Nettles - owner had to put on plastic waders & go in & spray. Also removed all Wattles
- Blackjacks, young Mulberries, Poplar, Bramble, Khakibos.
- Liquid Amber / Maples in autumn colours. Mulberry, Wattle
- Mulberry & Wattle
- Ground cover smothering everything – unidentified
- Mulberry, Poplar, Bugweed & Senicio forest
- Choked with Blackjack & Mulberry, Poplar trees, Burs, Scotch Thistle, Ipomoea, Mulberry, Poplar, Bugweed, Wattle, lots of Bramble, Bugweed, Morning Glory – smothering crops, Bugweed forest,
- Horrific here totally choked solid Bramble plus Bugweed & everything else. Araujia sericifera (Moth Catcher Creeper) all over like a groundcover
- This is the point where we have Moth Catcher Creeper, Lonicera japonica (Japanese Honeysuckle)
- Gleditsia triacanthos (Honey Locust), forests of Mulberries, Moth Catcher, Bramble.
- Burrs as well, Gleditsia triacanthos – forests of very small ones 2-3 foot high and then a lot of very big ones
- Solid Stinging Nettle, Poplar trees
- Poplar forest choked with weeds underneath.
- Mulberry tree – 4th that's been cut (or fallen) – dropped straight into the river
- Excessive Bramble, dried Senicio
- Invasives have disappeared to a large extent some Bramble on far bank. No Bugweed, Wattle, Bramble, no trees - makes sense because we are on a floodplain! Bramble & Khakibos along edges of river only
- Brambles on the far bank
- On the opposite bank looks like Mulberry, Bramble, 2 small Weeping Willows, Honey Locust x2. Flood plains shouldn't have trees – and there arn't invasives here! Bizarre!
- Three Weeping Willow trees. We were told by a local fisherman we met that prior to the 1987 floods "Willow trees used to be on river edge, floodplain was reeds & was marshy, river was a lot shallower, and spilled out into reed beds, was very wet, during '87 floods willows were washed away as well as all the reeds, and the river channel got carved out deep as it is today".
- Poplar plantation, next to Poplars reeds so aside from Poplars the vegetation not too bad.
- Bramble, young Bugweed, bramble, masses of Bramble on other side, huge patch of Bramble & Bugweed
- Reeds on far side being smothered by Bramble; small Wattle, lots of Bramble. Suddenly Bramble stopped
- Ditch with Bugweed and Bramble

- Cortaderia selloana (Pampas grass) (on the assumption that previous “Pampas Grass” is actually Pennesetum) d/s Petrusstrooom bridge, left island. Wattle, Bramble, accumulation of all the aliens we have seen this far plus indigenous stuff.

Section 2: Midmar Dam

On Midmar dam

- Just under power lines, couple of areas of Brambles on banks, lots of Wattles & Bugweed.
- Across bay from Dukuduku lots of wattle on side of dam in bay opposite Dukuduku. Approaching pylon bay a lot of Wattle on side, Wattle, Syringa, Bugweed, Pine, Syringa, Wattle. Point of pylon bay grove of regrowth Wattle. 1st Myriophyllum aquaticum (Parrots Feather) in bay below contaminated stream inlet.

Section 3: Howick to Albert Falls Dam

Start Point: 29.29.511 30.12.93 **End Point: 29°29'25.21"S 30°14'41.69"E**

From Highway bridge

- Brambles, enormous patch of Indian Shot pretty close to road
- Bugweed, Inkberry, Ipomea, Datura, Khaki bos, Bramble, Blackjacks
- Blackjacks, Fir & Plane trees, big Bramble patch to left, Bugweed just below 1st complexes. Very muddy river, can’t see where coming from - possibly from weir
- Couple of Wattles on islands
- Red flowered Canna
- Pampas Grass
- Lots of Canna & young Weeping Willow.
- Lots of Cardiospermum grandiflorum (Balloon Vine)
- Balloon Vine at the bottom of peoples gardens, a few Wattles on the islands. From path to river is clear, from path to gardens a mess. Senna didymobotrya (Peanut Butter Cassia) & Bugweed on island. Lots of Commelina benghalensis (Wandering Jew) between house fence & path
- Bramble then Japanese Honeysuckle on island, on bank – Bugweed, Ribbon Bush (invasive indigenous), Wandering Jew, Blackjack, Mulberry, Celtis hybrid, possible Elderberry, Blackjack, Morning Glory
- Cinnamomum camphora (Camphor Tree), Privet, Japanese Honeysuckle
- Jasminum (Jasmine creeper), more Balloon Vine. Podranea brycei (Zimbabwe creeper), all garden escapes,
- Monstera deliciosa (Delicious monster), Bramble, Bugweed, Khakibos, Camphor, Privet, Blue Gum. Type of Chestnut, grove of Camphor trees and grove of Bugweed. Sisal /Yucca type plant, Weeping Willow, Physalis peruvianna (Gooseberry).
- Ipomea, Peanut Butter Cassia, Privet, Blackjacks
- More Cannas, lots of Blackjacks
- Peanut Butter Cassia – lots on river bank and inside the garden
- Lots of Peanut Butter Cassia, also Mulberries
- More Peanut Butter Cassia, Privet
- Pampas Grass in garden
- 1st Bottlebrush (Callistemon) opposite Water Works
- Hedychium gardneranum (Wild Ginger), house opposite ginger has a hedge of Bottlebrush, this must be where the other Bottlebrushes downstream seed from
- Black Wattle, Ginger, Gum, Pine, Pampas grass in middle of river
- more of the Yucca type plant
- Colocasia esculenta (Elephants ears / Madumbi)
- Below Mills Falls the river is full of Elephant Ears
- Hedera helix (Ivy): will become a problem.

- Peanut Butter Cassia
- Jasmine, Bugweed, Cannas
- Bugweed, Mulberry, Wandering Jew, Delicious Monster popping over fence, Indian Shot.

Edge of KwaMevana

Massive seed bank of Bugweed, Peanut Butter Cassia, Blackjack, Khakibos.

- Up near the corner of old main road & Prospect road on top of right bank: Peanut Butter Cassia, Wattle, Syringa, Firethorn, Bugweed on sides, needs to be sorted out before the indigenous vegetation on the bank gets smothered.
- Soccer field – Bramble, plus all the other invasives Ive been calling in Howick
- 1st Arundo donax (Giant Reeds) on right bank
- Giant Reeds, Blackjack

Opposite Sarmcol

- Peanut Butter Cassia everywhere
- Vinca major (Periwinkle creeper)

- **Top of Howick Falls at weir** – Nasturtium officinale (Watercress)

- **Pool below Howick Falls**
- Balloon Vine smothering forest, Bugweed, Canna, Macfadyena unguis-cati (Cats Claw), Ageratina adenophora (Crofton Weed), Dactyoclenium (Dahlia)
- Privet, Indian shot, Peanut Butter Cassia, Wandering Jew, Crofton weed, Lilium formosanum (St Josefs Lillys). Persicaria capitata (Pink Knot Weed) smothering rocks at foot of falls

+-100m downstream of Howick Falls

- Poplars, Balloon Vine, Bottlebrush, Bugweed, Blue Gums, Plain trees, Peanut Butter Cassia, Crofton weed, Wattle, Pine, tree with long hanging flower racemes and seeds, Watercress, Prickly Pear on cliff right bank, Canna, Indian Shot, Japanese Honeysuckle, Pink Knotweed
- Whole row of young Bottle Brushes and still more Balloon Vine
- Wandering Jew, Bottle Brushes, Watercress, tree with long hanging flower racemes and seeds, Bugweed, young Wattle, Japanese Maple, Mulberry, Blackjack, Khakibos, Plain trees, Crofton Weed, Pink Knotweed

Hydroelectric station outlet, right bank

- Lots of young Wattle, Peanut Butter Cassia, Bugweed, Indian Shot, Poplar

Near 1st small waterfall

- Balloon Vine invasion, Canna
- Bramble, Blackjack, Prickly Pear, Plane tree
- Balloon Vine
- Nephrolepis (Sword Fern)
- Bottle Brushes, Wandering Jew & Cats Claw on side of young Celtis tree

Start Point: 29.29.744 30.14.892 **End Point: 29.28.58 30.16.317**

- Watercress
- Balloon Vine, Mauritius Thorn, Pin oak
- Wandering Jew
- Blue Gum tree needs ring barking, Bugweed.
- Bramble
- 1st Lantana camara (lantana). Bugweed more Bramble. Gooseberry
- Bramble & Bugweed, Gums on edge of river at drop off
- Bugweed
- Cestrum & Peanut Butter Cassia
- Bugweed
- Lantana & Gooseberry

- Passiflora, Gooseberries
- More Gooseberry
- Bramble, Morning Glory
- Morning Glory, Cestrum & Gooseberry
- Syringa & Passiflora Vine, possible young mulberry
- Gooseberry
- Island: smothered in something we cant identify and Peanut Butter Cassia
- Peanut Butter Cassia
- Watercress has been seen consistently since we started this morning, Peanut Butter Cassia
- Bugweed
- Watercress
- On island: Datura, Balloon Vine, Syringa, Peanut Butter Cassia, Watercress, Mauritius Thorn, Lantana, Bugweed

Start Point: 29.27.971 30.17.37-- **End Point: 29.26.863 30.21.496**

- Watercress, observed constantly the entire section until Mortons Drift
- Lantana – heaviest infestation so far, Bugweed, Khakibos, Syringa, lots of Lantana both sides of road, Mauritius thorn, Tithonia diversifolia (Mexican Sunflower), Ipomoea
- Bugweed, Peanut Butter Cassia
- Lantana on island. Lots of lantana, 1st Sesbania punicea (Red Sesbania), Cestrum. Lantana everywhere smothering Acacia trees
- Syringa, Bugweed here, lots of Lantana, Peanut Butter Cassia, Bugweed
- More Lantana, Peanut Butter Cassia, 1st Solanum seaforthianum (Potato Creeper)
- Balloon Vine
- Bramble, Mexican Sunflower, Crofton, Mauritius Thorn, lot of the water plants we saw in Midmar dam, Duck Weed - African Tulip Tree, more Lantana
- Crofton Weed, Indian Shot, Lantana, Peanut Butter Cassia, more Lantana, very thick small Mulberry, Peanut Butter Cassia, more Lantana
- Jacaranda mimosifolia (Jacaranda), Peanut Butter Cassia. Lantana underneath the Acacia siberiana trees. Heavy infestation of Bugweed, lots of Lantana all the way down to the river, Peanut Butter Cassia, Bramble on river bank, Lantana on left side, a couple of Wattles, Bugweed
- Heavy infestation of Sword Fern

Mortons Drift

- Duck weed, 1st Pistia stratiotes (Water Lettuce), Watercress
- Mulberries, Lantana, Syringa & Blue Gum plantation on our left. Lantana, Balloon Vine, Khakibos
- Lots of Balloon Vine, Water Lettuce in river, Bugweed, Khakibos, Balloon Vine, Peanut Butter Cassia, Syringa, Poplar tree
- Peanut Butter Cassia, Lantana, Khakibos, Elephant Ears. Lantana climbing all the way up the mulberry tree. Three large Syringas, Mulberry and Poplar
- Mexican Sunflower, Lantana more Bugweed & Lantana
- Very big Syringa, Bugweed, Peanut Butter Cassia, Mauritius Thorn Elephant Ears, Lantana everywhere, & Bugweed, seven huge clumps Elephant Ear, Bugweed, Pereskia aculeata (Barbados Gooseberry), Lantana, Wattle
- Potato Creeper. Cestrum next to Lantana next to Bugweed next to Elephant Ear in river next to Blackjacks, Wattle that's been cut & island covered in Wattle, Elephant Ear, Balloon Vine, Watercress,
- Syringa, Cestrum, Passiflora, Sesbania, young Syringa, Lantana,
- Big clump of Pampas Grass
- Syringa trees & Bugweed
- Looking over the Syringa trees: Mulberry, Lantana, Khakibos, Mulberry, Lantana, Cestrum, Syringa, Bugweed
- Syringa, Mulberry

- Left bank, very few invasives. Mulberry on island & Pin Oak and a big Bugweed, suddenly a spot where there is not massive alien infestation
- Small clump of Bugweed, Lantana in veld grass huge
- Whole stand of young Poplars 5-6 feet high, six Bugweeds, Mulberry. Also a lot of Bramble on the left side of the mown track
- Another clump of young Poplars on right of track - between us & river, on left swampy vlei area where we walking lots of young Bramble, Khakibos on right
- Bramble picking up again also Bugweed, beautiful grassland with scattered Acacia trees - under the Acacias is Lantana

Albert Falls inlet

- Floating mass of Water Lettuce in the inlet and lying on the banks where the water has receded. Apparently Umgeni Water do have some bio control in place here, although there was no sign of the yellow wilting evident when these beetles are a success. Elephants Ear amongst the Phragmites reeds

Section 4: Albert Falls Dam

From the uMngeni River inlet travelling down the left (north) bank to the farthest point east the following were observed:

- Liquid Amber
- Syringa, Bugweed, Wattle, Bramble, Gum
- Water Lettuce
- Bugweed, Wattle, Gum escapes
- Syringa, Wattle
- Gum – plantation and escapes
- Prickly Pear
- Gum escapes, Prickly pear, Wattle
- Large Gums, Pine, Wattle
- Syringa, Gums, Wattle, large Gums
- Balloon Vine, Bugweed
- Granadilla, Bugweed, Lantana, Wattle
- Escaped Wattle, large Gums
- Bugweed, Granadilla, Wattle, Gum
- Granadilla
- Wattle escapes
- Syringa “forest”
- Jacaranda, Granadilla
- Jacaranda, Wattle
- Bugweed, Wattle, Jacaranda, Gum
- Syringa
- Khakibos, Syringa, Gum
- Wattle escapes, Pine escapes

The above were interspersed with large clumps of beautiful indigenous bush, and many of the above mentioned invasives were invading the indigenous vegetation. On the south side of the dam, invasives were not apparent.

Section 5: Albert Falls Dam to Nagle Dam

Start Point: 29.25.810 30.25.711 **End Point: 29.26.847 30.28.726**

Albert Falls Public Area

- Privet
- Bramble, Bugweed,
- Large Privets, Lantana, Bramble, Bugweed, mainly Privet.
- Passiflora vine, lots of Bugweed, young Syringa, open area laced with Bugweed
- Public picnic ground : huge clumps of Bugweed, Mulberries on island, more Syringa, Mulberries, Syringa, young Wattle, Bugweed, young Privet, Mulberries, Bugweed, clump of young Privet with Bugweed underneath, Mulberry, Madumbi, Lantana, lots Mulberry, Khakibos, Privet, Ivy starting to climb up Mulberry tree. Lantana & Elephant Ear, Syringa, Mulberry, Bugweed.

Albert Falls Village

- Wattle, Mulberry, Elephant Ear
- Lots of Mulberry's, Bugweed, Wattle, Syringa, Bramble, Balloon Vine smothering stuff, Elephant Ear

Pietermaritzburg / Greytown Road bridge

- Ipomoea, Mulberry, Balloon Vine, Khakibos.
- Bugweed, Poplars on right bank, Elephants Ear, its not so choked with aliens as higher up
- Poplar, Syringa, Bugweed, Mulberries, Bramble, looks like may have been treated – someone's making an effort on left bank. Poplars on right.
- Lantana, Mulberry, not as bad as other places, Syringa, Bugweed, Bramble
- Yucca
- Row of Mulberries on the river bank, Elephant Ear, Bugweed, Syringa, Bugweed, Mulberries, Syringas coming up
- Khakibos, Lantana, Bugweed, Bramble, Khakibos, Mulberry's, thick Bramble, old Kikuyu pasture under Khakibos
- Mulberry, Syringa the main one, Bugweed, Morning Glory, Lantana, Mulberry.
- Mulberry, Datura, Khakibos
- Datura
- Honey Locust, Elephant Ears, Mulberry
- Bramble, Mulberry, Balloon Vine, Bugweed. Khakibos, young Syringa, Mulberry, Syringa
- Giant Mulberry, beautiful old tree, another Blackjack patch, Bugweed, Syringa, Mulberry, very old Syringa tree
- Lantana, Sesbania
- Bramble, Bugweed, on river bank few Syringas & Mulberries
- Nice little wetland seep, Elephant Ears starting in it, some Mulberry's next to it, couple of Bugweed, won't be long before this is choked. Bush track that go's up ahead of us and there are Brambles on the other side of the track. Something needs to be done before this gets choked
- Mulberries next to river
- No alien vegetation this side, other side Mulberries, few Elephants Ears, Bugweed, some Mulberries
- Looks like it's been burnt – definitely keeping Lantana & Bramble back
- Lots of Lantana, Bramble, Mulberry, Bugweed all of a sudden, right bank – Mulberries on edge, inland seems okay
- Honey Locust, Bugweed getting worse, and Mulberries after a long stretch of nothing, getting thicker
- Mulberry, Syringa, solid Bramble & Lantana after a lovely stretch that was clear, Bugweed, Morning Glory, Mulberry

Approaching Mpolweni

- Picking up more Bugweed, not as heavy infestation as before, lots of small stuff, bigger along the river, Brambles have been burnt
- Suddenly invasives take off like a line has been drawn, Bugweed big and small, Lantana. Old terracing lines - Lantana & Bramble, very sandy soil, Lantanas all died back – possibly from fire
- Mauritius Thorn, Bugweed, Lantana, Mulberry, Honey Locust, as long as we had natural bush on the other side there was no aliens, now sugar cane opposite and aliens galore here
- Honey Locust - enormous clump of them on the bend on the river
- Choked with Lantana, occasional Bugweed. Still close to river, thicker & thicker lantana, bigger & bigger Bugweed, Syringa tree, in a couple of years time this will be choked out
- Bramble, Mulberry, Lantana

Bottom end of Mpolweni

- Solid with Bugweed, Lantana
- Lantana has died - so seems that burning keeps lantana back

Mshwathi confluence

- Lot of Lantana, they've been clearing all sorts of stuff - small power line, +-10m from river, been clearing everything, invasive and indigenous – may be due to power line. Lantana.

Start Point: 29.26.818 30.28.966 **End Point: 29.32.482 30.31.406**

- Lots of Lantana, Bugweed, Mundelia / sesbania, Bramble, Mauritius Thorn, Datura on right in cane. Honey Locust, Blue Gums, Poplars on river bank, young Syringas, also lots of Khakibos
- Elephant Ears. Lots of young Syringa, Poplars, Lantana when big will be lots. Thick Lantana under acacias, two metre tall Datura between river & cane
- Poplars, Datura
- Syringas, Bugweed. Left looks pretty good. Small Blue Gums, Syringas, fairly clear of invasives this side, Lantana, lots of Bugweed, definite correlation with the more disturbed / farmed the land, the more the aliens come in. Honey Locust, Mulberry tree
- We cant even get to river because of the Castor Oil. Thick stand of Honey Locust, big old Mulberries, big Syringa
- Lots of Elephant Ears. Lots of dried Datura about to drop its seeds
- Senicio, Mulberry, but not as thick as in other places, Elephant Ears, some Bramble patches, couple of Mulberry's, Syringa, fairly big Mulberries, Bugweed, Lantana, Mulberry, Honey Locust, Bramble, big gnarled old Mulberry +-10 m from river bank. Phytolacca dioica (Belhambra)
- Looking at river island in middle choked with everything Honey Locust, Syringa, Mulberry
- Very big old Ghost Gums left bank
- Pass under power pylons with masses of weeds where they keep servitude open. Big clump of Bamboo
- Rivers widened up again. Castor Oil, lots of Blue Gums, possible Mauritius Thorn, Balloon Vine on other side. Very large Castor Oil tree, very big old Gums, Bugweed, Syringas, Mulberry
- Balloon Vine, Syringa, Bugweed
- Granadilla, wandering Jew, Balloon Vine, Syringa, Blue Gums, Prickly Pear
- Mulberries
- Very big Gum

Wartburg Rd bridge

- Lots of Wandering Jew
- Syringas & very big Gums, Wattles, Mulberry, bit of Bramble, Gooseberries, Passiflora
- Couple of Syringas
- Syringa, Mulberry, big Blue Gums all along the river. If we had a view out through all the gums lining the river we would see what was on the other side

- Bugweed, Lantana, Elephant Ears
- Syringa, Gum, Datura, Bugweed, Lantana - moderate infestation
- Pine trees next to river
- Blue Gum, Syringa
- Bugweed
- Gum & Lantana
- Wattle, lot of big Gums on left, on right they have been cleared, Elephant Ear, Wattle, a few Syringas
- From cliff tops can see where the river is because of all the Blue Gum trees, majority on left bank, right bank has been cleared by landowners. Occasional Lantana around base of thorn trees. Wattle, Syringa, Lantana, Balloon Vine down in the valley below us.
- Big Gums continue on left bank, Elephant Ears. A lot of the gums have been ring barked. Possible Mauritius Thorn. 1st Chromolaena odorata (Triffid Weed) since just below Howick
- Prickly pear – 2-3yrs ago they put cochineal on the prickly pear & it seems to be working

Start Point: 29.34.152 30.32.237 **End Point: 29.33.246 30.34.714**

- 1st time in miles no gums on this side. bit of Lantana starting, 1 Blue Gum tree
- Blue Gum again, couple of Syringa, young Syringa, Peanut Butter cassia - all the invasives are still young so if someone got stuck in now they would get on top of the problem. Big Syringa, Prickly Pear. This infestation could be stopped now
- Cestrum covered by Passiflora. This are is very steep & thick on right, the narrow band along the old road to river seems to have aliens.
- Some clumps of Lantana, Bugweed getting worse & worse
- No Blue Gums or Syringas, nothing, it looks pretty good - only 1 Gum on left bank
- A few Blue Gums starting again
- Peanut Butter Cassia, Castor Oil. Working on Water were here +- a year ago - they need to come in & do follow up work
- Chromolaena
- Lot of Castor Oil
- 1st Jacaranda seen for a long time fairly high above the river
- Syringa, Blue Gum on right, young Syringas, so wow definitely need to come back & do follow ups. Chromolaena
- Still on district road, bit away from river, on left clump of Lantana, Bugweed, very big Blue Gum probably 100m away from us
- Chromolaena, Bugweed, quite a lot of Lantana
- Peanut Butter Cassia, big Syringa, lots of Gums, obviously been sand mined, Castor Oil, Wattle, Mulberries, it's a bad corner, Sesbania, we've had such an awesome stretch for such a long way where it was clear of aliens.
- Tributary: Peanut Butter Cassia, Syringa, Gums. After having the whole day so far with no aliens we are suddenly seeing aliens, Wattle, Syringa, young Gums, right : Peanut Butter Cassia, Gums, Lantana. Sand mine – not been rehabilitated. Lots of Syringas seem to be more syringas than anything else, then Blue Gums
- Walking through mining area – Sesbania, Peanut Butter Cassia, lot of Sesbania, banks 2m deep & choked with Lantana: worst alien infestation today. Lantana is choking everything right side.
- Lantana, Bugweed, walked +-50m & start next mined area - Cestrum, Chromolaena middle of sand mining area, Lantana, big clump of Chromolaena
- Bugweed, back on river, Syringa, Bugweed are +-10m from river, still in sand mining area
- Sand mining area (last mined 7 years ago) - tunnel through the Lantana, Gum, Wattle big & small, Cestrum, Bugweed, Lantana all right on river bank. Lantana thickets over 2 metres high.

Start Point: 29.33.246 30.34.714 **End Point: 29°34'39.11"S 30°36'34.21"E**

- Medium infestation young & big Gums, Syringa tree, Chromolaena starting all over, young Wattles
- Chromolaena still small wont be long before it covers entirely
- Young Cestrum
- Big patch of Bramble then masses of Chromolaena starting to get thick
- Mulberries again
- There's quite thick forests of Chromolaena, also Passiflora
- Clump of young Sesbania
- Chromolaena problem its bad here, it is everywhere
- One Bugweed
- Bugweed, bush is too thick so veering away from river, big Lantana patches 20-30m from river. 20-30m from river more Lantana under all the trees, small amount of Chromolaena most is at the river
- Grove of Inkberry obviously been here a while, Lantana, Bugweed, pretty choked with Lantana, lot of very small Bugweed could be pulled, forest of young Inkberries will cause major problems'
- Passing young Mauritius Thorn
- Mix of indigenous and lot of Wandering Jew & Lantana, Inkberries, lot of Lantana
- Choked with Lantana & young Inkberry now we back on the river
- Wattle, Lantana, Gums, Bugweed, Lantana

Msinsi Game Reserve

- Worst alien infestation we have seen on the whole walk - spent last half hour fighting our way through solid, two to three metre high Lantana. Gums, Peanut Butter Cassia, Syringas, Wandering Jew amongst the Lantana, absolutely choked. apart from the big indigenous trees, its just Lantana & Chromolaena
- Syringa, Chromolaena on left with river just beyond. Right - Lantana & Chromolaena
- Left bank - Syringa, Chromolaena, Sesbania, couple of Gums, other side Syringa, Sesbania, Chromolaena, Gum, Lantana, Peanut Butter Cassia, Bugweed
- Lantana, Chromolaena
- Bugweed,
- Overgrazed area choked with Lantana
- Prickly Pear & tons of Lantana & smaller Lantana, so its encroaching right up the ridge.
- Just upstream f Mkhambathini & Nkabela stream lot of Castor Oil on the side of river (right)

Gauging Weir

- Peanut Butter Cassia, Bugweed, Mauritius Thorn, Peanut Butter Cassia, Mauritius Thorn, Passiflora, Bramble, going up the road Lantana, Lantana, Bugweed, Peanut Butter Cassia, Bugweed, Lantana, Poplars, Castor Oil, Chromolaena all the way
- Mauritius Thorn, Passiflora, Peanut Butter Cassia, Lantana, more Lantana, moving away from river, Chromolaena, road on edge of dam – lots of the Passiflora, lots of Chromolaena between road & river

Section 6: Nagle Dam

Heavy infestations of Chromolaena, bugweed & lantana observed on all level, deep soil areas, with medium to light infestations of jacaranda and peanut butter cassia. No invasives seen on steep, shallow soil areas.

Section 7: Nagle Dam to Inanda Dam

Start Point: 29.35.494 30.37.576 **End Point: 29°38'24.78"S 30°41'28.55"E**

- Right underneath Nagle wall, Peanut Butter Cassia, Bauhenia variegata (Orchid tree)
- Artificial flood plain: lot of Khakibos, Blackjacks, Passiflora, lot of Lantana, 1st Psidium guajava (Guava), Mexican Sunflower, Blackjack, Lantana
- Left bank :still going d/s of dam wall, Mexican Sunflower, Lantana, Guava,
- Peanut Butter Cassia, Lantana, Syringa
- Cestrum 3 metre high Lantana
- Now on what was the river bank but with no water heavy infestations of Chromolaena, Mulberry, Bugweed, Lantana
- Mulberry
- Lots Lantana & 2 large Mulberry either side
- Downstream of sluice outlet: lot of Lantana, Chromolaena
- Young Wattle, Mauritius Thorn
- Left bank: lot of Chromolaena, big clumps of Sword Fern, Mauritius Thorn
- Peanut Butter Cassia increasing on the flat areas, Syringa, Peanut Butter Cassia, Chromolaena, Cestrum, Sesbania
- Tributary stream choked with Peanut Butter Cassia,
- Elephant Ear
- Peanut Butter Cassia, Sword Fern, Sesbania, Wattle
- Peanut Butter Cassia, 1st Sisal – Blue Gum plantation
- Peanut Butter Cassia, lantana, Chromolaena
-

Uppermost point where DUCT River Care Teams clear (at bridge).
Difference is amazing between here & upstream of bridge

- After 2 weeks of reporting invasives there is just 1 small pine tree
- Prickly Pear
- Mexican Sunflower (one), Elephant Ear
- 4x Peanut Butter Cassia, left bank
- Small patch Lantana, Peanut Butter Cassia
- Cestrum, Bugweed, Lantana, Peanut Butter Cassia
- Lantana, Peanut Butter Cassia, possible Sesbania
- Small tributary stream – Peanut Butter Cassia, Mauritius Thorn? Big old Gum, Peanut Butter Cassia, Lantana, Sesbania - all where the stream comes in
- Few Peanut Butter Cassias, Prickly Pear

Confluence of uMsunduzi

- Huge contrast looking up & downstream on uMngeni. From Duzi confluence heavy infestations of bright green aquatic plants along the river edge
- Elephant Ears / Madumbi
- Water Hyacinth, Peanut Butter Cassia, Elephant Ears, very green aquatic plants in water

- Old sand mine: Verdant green plants in river – Wandering Jew on island, lots of small Peanut Butter Cassias +-7cm high, Elephant Ears, even the grass on the island is extra green, Prickly PPear, Ipomoea, passiflora
- Tributary - upper reaches down to where it meets river edges are lined with Blue Gum trees, lot of Castor Oil, Bugweed, Elephant Ear, Lantana, Peanut Butter Cassia, Chromolaena
- Tributary stream choked with Lantana
- Sand mine abandoned 2 years ago. Big Syringas have been ring barked.
- Right bank: many Syringas have been ring barked & lots of dead Balloon Vine

Start Point: 29.38.461 30.41.467 **End Point: 29°38'52.18"S 30°44'35.04"E**

- Peanut Butter Cassia, Wandering Jew, Watercress, Elephant Ear, Mexican Sunflower
- Balloon Vine, ring barked Syringa trees
- Tributary stream on right bank – lot of Peanut Butter Cassia in it, otherwise RCT has done a really good job. Now it's the aquatic stuff: all the way down Elephant Ear, Duck Weed, Water Hyacinth, Water Lettuce : non stop green ribbon from where the Duzi came in
- Most of the aliens been cleared. Some Peanut Butter Cassia coming back , the normal green ribbon
- Prickly Pear
- Lots of water lettuce up till now but this is a really big clump looks as tho across the whole river, can't see properly because of the reeds. Also some Water Hyacinth stuck in it

Mamba gorge

- Riparian bush choked with a plant that looks very similar growth form to ivy but has white flowers. Masses of Elephant Ears. Ipomoea.
- Section of river where the whole channel is closed up with Watercress
- Left bank Opuntia. River Care Team has done well - have cleared all the invasives around here
- Balloon Vine all over, left bank
- Light infestation Chromolaena
- Old sand mining: Chromolaena & Lantana

Start Point: 29.38.848 30.44.571 **End Point: 29.39.1-6 30.48.006**

- Lots of ring barked Syringas, Elephant Ear in river – no other alien veg
- Left bank: lots of Castor Oil & Peanut Butter Cassia
- Couple of very old Syringas on left bank
- Inkberries on edge of river bank, Syringas. Across the river has been disturbed (sand mine) – Peanut Butter Cassia, & Syringas
- Lot of Watercress in river, Water Lettuce, some Bugweed, Elephant Ear, Peanut Butter Cassia
- Syringa, quite a big one. 2x Sisal plants, suddenly quite a bit of Peanut Butter Cassia on left bank, another Sisal, Peanut Butter Cassia. Large Sisal.
- Left: Lantana amongst Peanut Butter Cassia, also Prickly Pear. More infestation on left bank of Peanut Butter Cassia
- Lantana getting thicker & thicker lot of small ones. Bugweed, Balloon Vine
- Big clump Water Hyacinth, Lantana, Chromolaena. Right: the occasional Peanut Butter Cassia. Chromolaena, Lantana, Syringa, Peanut Butter Cassia
- Local guides really need help clearing aliens on the picnic tributary
- Old sand mine: Sesbania, Peanut Butter Cassia, Lantana, invasives coming up in whole area full of Peanut Butter Cassia, Wattle, Chromolaena, Peanut Butter Cassia, big Syringa, Peanut Butter Cassia, Chromolaena.
- Bamboo

- Chromolaena, Lantana, Bramble, Mexican Sunflower, Guava, Balloon Vine, heavy Bugweed infestation, Sesbania, lot of Inkberries, Mexican Sunflower, Syringa, Indian Shot
  Dry river bed - tributary stream in summer: couple of young Wattles, Sesbania, Wattles getting bigger
- Another tributary Indian Shot
- Bush laced with Lantana, young Wattle, Chromolaena, Syringa, Prickly Pear, Chromolaena go's all the way up the hill. Peanut Butter Cassias
- Chromolaena everywhere – whole hillside covered with it, also Lantana, Peanut Butter Cassia
- Choked with Lantana, Mexican Sunflower, Peanut Butter Cassia
- Mulberry. Balloon Vine, Peanut Butter Cassia

Down the road from Mbetje Store

- Balloon Vine, Peanut Butter Cassia, masses of Water Lettuce
- Old sand mine: Mexican Sunflower on left, Peanut Butter Cassia, Chromolaena, Bugweed, Balloon Vine, Peanut Butter Cassia
- Below soccer field: Peanut Butter Cassia, Chromolaena, Water Hyacinth & Water Lettuce a solid green mass
- Pool in river: Azolla filiculoides (Red Water Fern), Ludwigia stolonifera (Willow Herb), Myriophyllum aquaticum (Parrots feather), Eichornia crassipes (Water Hyacinth), Pistia stratiotes (Water Lettuce)
- Mauritius Thorn Chromolaena, Passiflora, Bugweed
- Peanut Butter Cassia & some Chromolaena

Section 8: Inanda Dam

Only the left bank (North shore) was walked, firstly downstream from the bridge at the dam inlet, and secondly from a point farther east to the Durban Green Corridor camp site. In addition, we checked some of left and right shore line in the vicinity of the dam wall by boat.

Start Point: 29.39.1-6 30.48.006 **End Point: 29.30.23 30.49.430**

- Walking along left bank from bridge, masses of Lantana, Bugweed, Peanut Butter Cassia
- Bug weed, Chromolaena, Lantana, Castor Oil
- Dead Water Hyacinth, yellow Water Lettuce from bio control. Most areas choked with Chromolaena
- Another bay with more Water Hyacinth & lettuce been bio controlled. Chromolaena, Peanut Butter Cassia, Lantana, Prickly Pear, Lantana
- Peanut Butter Cassia, Mexican Sunflower
- Someone has been clearing Peanut Butter Cassia now young Bug weed coming up +-half meter high
- Tributary stream – Peanut Butter Cassia,
- Lot of flowering Chromolaena
- Sisal, Chromolaena
- Tributary - choked with predominantly Chromolaena, also Peanut Butter Cassia, Lantana
- Sisal planted as a kraal fence, some has escaped
- Variegated Wandering Jew on grave
- Giant old Syringa

Start Point: 29.39.767 30.31.318 **End Point: 29.41.510 30.53.337**

- Small tributary coming into dam choked with Peanut Butter Cassia
- Lots of Lantana, Bugweed, Peanut Butter Cassia,
- Chromolaena at tiny little bay
- Chromolaena, young Peanut Butter Cassia seeding
- Tributary stream, lots of Mexican Sunflower, Water Hyacinth, Water Lettuce looks like its been chomped bio control bugs. Side of the little stream totally choked with Mexican Sunflower, Castor Oil. Mexican Sunflower stretches away into the hillsides
- Bugweed, Lantana, Peanut Butter Cassia, Syringa trees, Sisal
- Bugweed, Peanut Butter Cassia, Castor Oil
- Lot of Lantana, Chromolaena, Mexican Sunflower inland

During the boat trip, those bays that we inspected had a repetition of the following species: Passiflora, African Tulip tree, Sisal (whole bay), Chromolaena, Peanut Butter Cassia, Mango, Bugweed, Syringa, Prickly Pear

Section 9: Inanda Dam to Estuary

Initial recordings of sightings of Tecoma stans (Yellow Bells) are likely to have been a mis-identification of Thevetia peruvianna (Yellow oliander).

Start Point: 29.42.286 30.51.864 **End Point: 29.45.468 30.54.193**

- Between dam wall and bridge, seen from road on right of river: Bugweed, Peanut Butter Cassia, Syringa, Lantana, Chromolaena, Mexican Sunflower.
- Passiflora plant with fruit on it
- Balloon Vine, Castor Oil
- Balloon Vine, Bugweed
- Tecoma stans (Yellow bells)
- Balloon Vine & Mexican Sunflowers on right of river bank on road
- Chromolaena
- Sand mine: Chromolaena, Lantana
- Chromolaena, Tecoma
- Elephant Ears, Mexican Sunflowers
- Big Lantana, Peanut Butter Cassia,
- Pereskia with bio control
- Elephant ear & Peanut Butter Cassia
- Syringa, may have been ring barked
- Tecoma on right of road. Lot of dead Balloon Vine - River Care Team work. Piles & piles & piles of dead invasives that they have been clearing – it is almost bare underneath – good example of how everything is smothered out underneath
- Passiflora Vine
- Khakibos
- Tributary – Peanut Butter Cassia, Mexican Sunflower
- Mexican Sunflower, Peanut Butter Cassia
- Cemetery: Peanut Butter Cassia, Bugweed, by & large not too bad
- Cliffs right of river – Peanut Butter Cassia where cliffs end, left of river - Balloon Vine, Lantana, Bugweed, Chromolaena
- Mexican Sunflower
- Schinus terebinthifolius (Brazilian Pepper Tree)
- Peanut Butter Cassia
- Mexican Sunflower
- River Care Team has cleared here

Start Point: 29.45.364 30.54.590 **End Point: 29.48.325 30.59.693**

Outside of 32 metre buffer

- Mexican Sunflowers, Peanut Butter Cassia
- Sesbania
- Balloon Vine smothering everything, Peanut Butter Cassia, Syringa, Pereskia - the hill slope covered in mix of Pereskia and Balloon Vine
- Bugweed, Syringa, Balloon Vine, Pereskia, Chromolaena, Lantana
- More Mexican Sunflowers, Balloon Vine just cascading off the trees – you cant even see what the indigenous vegetation is here, and Mexican Sunflowers & Bugweed & more Balloon Vine & more Mexican Sunflower, Bugweed, Peanut Butter Cassia, Mexican Sunflower. Tecoma stans on both sides of the road
- Mexican Sunflower, Tecoma, Mauritius Thorn, Sword Fern, Peanut Butter Cassia, indigenous forest on left choked, Sesbania, Peanut Butter Cassia. Left is more Tecoma
- Mexican Sunflower, Elephant Ear

- Mexican Sunflowers, Syringa, Tecoma
- Lots of Chromolaena
- Big Syringa tree on the bank

River at new KwaDabeka bridge site

- Syringa, Tecoma, Balloon Vine, Pereskia, climbing up & smothering all the trees in the forest
- River choked with Water Lettuce. Mexican Sunflower
- Choked with Water Lettuce, a few Elephant Ears. Mexican Sunflower, Chromolaena, Syringa on left bank
- Are between the 2 weirs, lots of Tecoma & Triffid Weed & weeds. Thick grass cover but there has been a disturbance – possibly from bridge building. Left bank pretty steep & difficult to access: Castor Oil, Mexican Sunflower, Balloon Vine going all the way up the slope, Syringa trees, Water Lettuce
- Elephant Ears, lots of Gums, Balloon Vine, Peanut Butter Cassia, Bugweed
- Almost solid Castor Oil on hill slope

Newlands East slope above river

- Lots of Syringas in the old mango orchard, Chromolaena
- Thick Triffid, Bugweed, Syringa, Castor Oil, pretty thick with Syringa, Sesbania, Bugweed
- lot of Chromolaena, Balloon Vine, Pereskia
- Jacaranda & Orchid tree, Balloon Vine, the odd mango tree, Syringa. Looking down at river we see Bugweed, Blue Gums & Peanut Butter Cassia down at the river
- Pipeline road: Balloon Vine, Syringa - absolutely choked, Lantana, Balloon Vine
- Pipe line road literally choked with Balloon Vine, you cant see any other vegetation aside from Balloon Vine, Chromolaena, Syringa & Castor Oil
- Mexican Sunflower, Balloon Vine, Castor Oil on far bank of floodplain
- Pipeline bridge: , mass of Blackjacks, also Syringa

Slightly inland

- Arundo donax thicket, Mexican Sunflower, Lantana, Chromolaena, - so thick I cant see beyond to river. Seem to be following UW pipeline path - Syringa, Balloon Vine covering everything, Mexican Sunflowers, Pereskia
- Syringa, Chromolaena, Balloon Vine, Bamboo, Bugweed, Syringa, dead Wattle, road lined with Mangoes
- Tecoma stans
- Have dropped back to river onto floodplain, edge of floodplain is +-10m to our left and is lined with Bugweed & Syringas, few young Peanut Butter Cassias
- Left bank: big trees mostly Syringas smothered in Balloon Vine
- Lot of Khaki bos
- Peanut Butter Cassia, Ipomea
- Left bank: Section with lots of Sisal growing on the rocks, River Care Team must have been through here its basically clear.
- We have passed underneath the N2 bridge on the embankment above the flood plain – wading through Castor Oil “forest” which was cleared only six months ago. Balloon Vine.
- Waist high Kikuyu, Balloon Vine, Castor Oil, Mexican Sunflowers, like an alien jungle here at back of factories – this was all cleared by River Care Team six months ago!

Start Point: 29.48.325 30.59.693 **End Point: Estuary**

- Right bank – Syringa (lots), Bugweed, Balloon Vine, more Syringa
- Left bank – cleared by River Care Teams, big Syringas have been ring barked
- Sugar cane used to be planted here on the floodplain. Pereskia. Right bank – Mexican Sunflowers
- Mexican Sunflowers
- Left bank: Just below bird park - Balloon Vine, Elephant Ears

SANBI : Declared Weeds / Invaders listed by Common Name

(Source: http://www.plantzafrica.com/miscell/aliens6.htm)

'Abyssinian' coleus *Plectranthus comosus* Sims Category 3
Aleppo grass *Sorghum halepense* (L.) Pers. Category 2
Aleppo pine *Pinus halepensis* Mill. Category 2
Ant Tree *Triplaris americana* L. Category 1
American bramble *Rubus cuneifolius* Pursh and hybrid Category 1
Australian Albizia *Paraserianthes lophantha* (Willi.) Category 1
Australian blackwood *Acacia melanoxylon* R.Br. Category 2
Australian cheesewood *Pittosporum undulatum* Vent. Category 1
Australian myrtle *Leptospermum laevigatum* (Gaertn.) Category 1
Australian silky oak *Grevillea robusta* A.Cunn. ex R.Br. Category 3
Azolla *Azolla filiculoides* Lam. Category 1
Bailey's wattle *Acacia baileyana* F.Muell. Category 3
Balloon vine *Cardiospermum grandiflorum* Sw. Category 1
Banana poka *Passiflora mollissima* (Kunth) Category 1
Bananadilla *Passiflora mollissima* (Kunth) Category 1
Barbados gooseberry *Pereskia aculeata* Mill. Category 1
Beefwood *Casuarina cunninghamiana* Miq. Category 2 (Not for use in dune stabilisation)
Belhambra *Phytolacca dioica* L. Category 3
Black ironbark *Eucalyptus sideroxylon* A.Cunn. Category 2
Black locust *Robinia pseudoacacia* L. Category 2 (Only for use as rootstock if authorised by Executive Officer in terms of regulation 15B(10))
Black wattle *Acacia meamsii* De Wild. Category 2
Bloodberry *Rivina humilis* L. Category 1
Blue echium *Echium vulgare* L. Category 1
Blue passion flower *Passiflora caerulea* L. Category 1
Brazilian pepper tree *Schinus terebinthifolius* Raddi Mult categories
Brazilian guava *Psidium guineense* Sw. Category 3
Bridal wreath *Anredera cordifolia* (Ten.) Steenis Category 1
Brittle willow *Salix fragilis* L. Category 2 (Not to be confused with indigenous species)
Bugweed *Solanum mauritianum* Scop. Category 1
Burweed *Achyranthes aspera* L. Category 1
Butterfly orchid tree *Bauhinia purpurea* L. Category 3
Californian privet *Ligustrum ovalifolium* Hassk. Category 3
Camel thorn bush *Alhagi maurorum* Medik. Category 1
Camphor tree *Cinnamomum camphora* (L.) J.Presl Mult categories
Canadian water weed *Elodea canadensis* Michx. Category 1
Canary pine *Pinus canariensis* C.Sm. Category 2
Castor - oil plant *Ricinus communis* L Category 2
Cat's claw creeper *Macfadyena unguis-cati* (L.) Category 1
Chandelier plant *Bryophyllum delagoense* (Eckl.) Category 1
Cherry pie *Lantana* - all seedbearing forms Category 1
Chilean cestrum *Cestrum parqui* L'Hér. Category 1
Chinese privet *Ligustrum sinense* Lour. Category 3
Chinese tamarisk *Tamarix chinensis* Lour. Mult categories
Chinese wax - leaved privet *Ligustrum lucidum* Aiton Category 3 (Only for use as root-stock if authorised by the Executive official in terms of regulation 15C(5))
Chir pine *Pinus roxburghii* Sarg. Category 2
Chromolaena *Chromolaena odorata* (L.) R.M.King Category 1
Clover broomrape *Orobanche minor* Sm. Category 1
Cluster pine *Pinus pinaster* Aiton Category 2
Cochineal prickly pear *Opuntia monacantha* Haw. Category 1
Common dodder *Cuscuta campestris* Yunck. Category 1
Common mulberry *Morus alba* L. Category 3 (Excluding cultivar "Pendula", and only for use as root-stock if authorised by the Executive official in terms of regulation 15C(5))
Common privet *Ligustrum vulgare* L. Category 3
Common thorn apple *Datura stramonium* L. Category 1
Coral Bush *Ardisia crenata* Sims Mult categories

Coralberry tree *Ardisia crenata* Sims Mult categories
Cotoneaster *Cotoneaster franchetii* Boiss. Category 3
Crack willow *Salix fragilis* L. Category 2 (Not to be confused with indigenous species)
Crimson cestrum *Cestrum elegans* (Brongn.) Schtdl. Category 1
Crofton weed *Ageratina adenophora* (Spreng.) Category 1
Dense-thorned bitter apple *Solanum sisymbriifolium* Lam. Category 1
Dense water weed *Egeria densa* Planch. Category 1
Devil's pumpkin *Passiflora suberosa* L. Category 1
Downy thorn apple *Datura innoxia* Mill. Category 1
Drooping prickly pear *Opuntia monacantha* Haw. Category 1
Durban guava *Psidium x durbanensis* Baijnath ined. Category 1
Eglantine *Rosa rubiginosa* L. Category 1
European blackberry *Rubus fruticosus* L. agg. Category 2
European gorse *Ulex europaeus* L. Category 1
False lebbeck *Albizia procera* (Roxb.) Benth. Category 1
Feathertop *Pennisetum villosum* R.Br. ex Fresen. Category 1
Field bindweed *Convolvulus arvensis* L. Category 1
Formosa lily *Lilium formosanum* A. Wallace Category 3
Fountain grass *Pennisetum setaceum* (Forssk.) Category 1 (Excluding sterile cultivar "Rubrum")
Giant reed *Arundo donax* L. Category 1
Giant sensitive plant *Mimosa pigra* L . Category 3
Golden wattle *Acacia pycnantha* Benth. Category 1
Granadina *Passiflora subpeltata* Ortega Category 1
Green wattle *Acacia decurrens* (Wendi.) Willd. Category 2
Grey ironbark *Eucalyptus paniculata* Sm. Category 2
Grey poplar *Populus x canescens* (Aiton) Sm. Category 2
Guava *Psidium guajava* L. Category 2
Harrisia cactus *Harrisia martinii* (Labour.) Britton Category 1
Himalayan firethorn *Pyracantha crenulata* (D.Don) Category 3
Hoary candaria *Lepidium draba* L. Category 1
Honey mesquite *Prosopis glandulosa* Torr. Var. Category 2
Honey locust *Gleditsia triacanthos* L. Category 2 (Excluding sterile cultivars)
Horsetail tree *Casuarina equisetifolia* L. Category 2 (Not for use in dune stabilisation)
Imbricate cactus *Opuntia imbricata* (Haw.) DC. Category 1
Imbricate prickly pear *Opuntia imbricata* (Haw.) DC. Category 1
Indian laurel *Litsea glutinosa* (Lour.) C.B.Rob. Category 1
Indian shot *Canna indica* L. Category 1 (Excluding hybrid cultivars)
Indigo berry *Passiflora suberosa* L. Category 1
Inkberry *Cestrum laevigatum* Schtdl. Category 1
Invading ageratum *Ageratum conyzoides* L. Category 1
Jacaranda *Jacaranda mimosifolia* D.Don Category 3 (Excluding sterile cultivar "Alba")
Jambolan *Syzygium cumini* (L.) Skeels Category 3
Japanese wax - leaved privet *Ligustrum japonicum* Thunb. Category 3
Johnson grass *Sorghum halepense* (L.) Pers. Category 2
Jointed cactus *Opuntia aurantiaca* Lindl. Category 1
Kahili ginger lily *Hedychium gardnerianum* Category 1
Kangaroo wattle *Acacia paradoxa* DC. Category 1
Kariba weed *Salvinia molesta* D.S.Mitch. Category 1(And other species of the family Salviniaceae)
Karri *Eucalyptus diversicolor* F.Muell. Category 2
Kudzu vine *Pueraria lobata* (Willd.) Ohwi Category 1
Lantana *Lantana* - all seedbearing forms Category 1
Large cocklebur *Xanthium strumarium* L . Category 1
Large flowered prickly pear *Opuntia humifusa* (Raf.) Raf. Category 1
Large round-leaved prickly pear *Opuntia spinulifera* Salm-Dyck Category 1
Large thorn apple *Datura ferox* L. Category 1
Lebbeck tree *Albizia lebbeck* (L.) Benth. Category 1
Lesser broomrape *Orobanche minor* Sm. Category 1
Leucaena *Leucaena leucocephala* (Lam.) de Wit Mult categories
Loblolly pine *Pinus taeda* L. Category 2
Long - leaved wattle *Acacia longifolia* (Andr.) Willd. Category 1

Long spine cactus *Opuntia exaltata* A.Berger Category 1
Longifolia pine *Pinus roxburghii* Sarg. Category 2
Loquat *Eriobotrya japonica* (Thunb.) Lindl. Category 3
Lucerne dodder *Cuscuta suaveolens* Ser. Category 1
Madeira vine *Anredera cordifolia* (Ten.) Steenis Category 1
Manatoka *Myoporum tenuifolium* G.Forst. Category 3
Matchwood poplar *Populus x canescens* (Aiton) Sm. Category 2
Mauritius thorn *Caesalpinia decapetala* (Roth) Alston Category 1
Mexican ageratum *Ageratum houstonianum* Mill Category 1 (Excluding cultivars)
Mexican sunflower *Tithonia diversifolia* (Hemsl.) A.Gray Category 1
Mission prickly pear *Opuntia ficus-indica* (L.) Mill. Category 1 (Excluding spineless cactus pear cultivars and selections)
Mistflower *Ageratina riparia* (Regel) R.M.King Category 1
Monterey pine *Pinus radiata* D.Don Category 2
Montpellier broom *Cytisus monspessulanus* L. Category 1
Moon cactus *Harrisia martinii* (Labour.) Britton Category 1
Moonflower *Ipomoea alba* L. Mult categories
Morning glory *Ipomoea indica* (Burm.f.) Merr. Mult categories
Morning glory *Ipomoea purpurea* (L.) Roth Category 3
Moth catcher *Araujia sericifera* Brot. Category 1
Nassella tussock *Nassella trichotoma* (Nees) Arech. Category 1
New Zealand christmas tree *Metrosideros excelsa* Sol. ex Gaertn. Category 3
Old man saltbush *Atriplex nummularia* Lindl. Category 2
Oleander *Nerium oleander* L. Category 1 (Excluding sterile, double-flowered cultivars)
Orange cestrum *Cestrum aurantiacum* Lindl. Category 1
Orchid tree *Bauhinia variegata* L. Category 3
Pampas grass *Cortaderia jubata* (Lem.) Stapf Category 1
Pampas grass *Cortaderia selloana* (Schult.) Asch. Category 1 (Excluding sterile cultivars)
Parrot's feather *Myriophyllum aquaticum* (Vell.) Verdc. Category 1
Parthenium *Parthenium hysterophorus* L. Category 1
Patterson's curse *Echium plantagineum* L. Category 1
Patula pine *Pinus patula* Schltdl. & Cham. Category 2
Peanut butter cassia *Senna didymobotrya* (Fresen.) Irwin Category 3
Pearl acacia *Acacia podalyriifolia* A.Cunn. Category 3
Pepper - cress *Lepidium draba* L. Category 1
Pepper tree wattle *Acacia elata* A.Cunn. ex Benth. Category 3
Persian lilac *Melia azedarach* L. Category 3
Pest pear of Australia *Opuntia stricta* (Haw.) Haw. Category 1
Pickerel weed *Pontederia cordata* L. Category 3
Pink tamarisk *Tamarix ramosissima* Ledeb. Mult categories
Pitanga *Eugenia uniflora* L. Mult categories
Pom pom weed *Campuloclinium macrocephalum* Category 1
Port Jackson *Acacia saligna* (Labill.) H.L.Wendl. Category 2
Potato creeper *Solanum seaforthianum* Andr. Category 1
Purple loosestrife *Lythrum salicaria* L. Category 1
Queen of the Night *Cereus jamacaru* DC. Category 1
Radiata pine *Pinus radiata* D.Don Category 2
Rambling cassia *Senna bicapsularis* (L.) Roxb. Category 3
Red eye *Acacia cyclops* A.Cunn. ex G.Don Category 2
Red ginger lily *Hedychium coccineum* Sm. Category 1
Red ironbark *Eucalyptus sideroxylon* A.Cunn. Category 2
Red river gum *Eucalyptus camaldulensis* Dehnh. Category 2
Red sesbania *Sesbania punicea* (Cav.) Benth. Category 1
Red sunflower *Tithonia rotundifolia* (Mill.) S.F.Blake Category 1
Red water fern *Azolla filiculoides* Lam. Category 1
Rivina *Rivina humilis* L. Category 1
Rock hakea *Hakea gibbosa* (Sm.) Cav. Category 1
Rose apple *Syzygium jambos* (L.) Alston Category 3
Rose gum *Eucalyptus grandis* W.Hill ex Maiden Category 2
Rosea cactus *Opuntia fulgida* Engelm. Category 1

Saligna gum *Eucalyptus grandis* W.Hill ex Maiden Category 2
Saucepan cactus *Opuntia spinulifera* Salm-Dyck Category 1
Scotch broom *Cytisus scoparius* (L.) Link Category 1
Scotch thistle *Cirsium vulgare* (Savi) Ten. Category 1
Screw - pod wattle *Acacia implexa* Benth. Category 1
Silky hakea *Hakea sericea* Schrad. & J.C.Wendl Category 1
Silver - leaf cotoneaster *Cotoneaster pannosus* Franch. Category 3
Silver wattle *Acacia dealbata* Link Mult categories
Silver-leaf bitter apple *Solanum elaeagnifolium* Cav. Category 1
Singapore daisy *Thelechitonia trilobata* (L.) H.Rob. Mult categories
Sisal *Agave sisalana* Perrine Category 2
Slash pine *Pinus elliotti* Engelm. Category 2
Small round - leaved prickly pear *Opuntia lindheimeri* Engelm. Category 1
Spanish broom *Spartium junceum* L. Category 1
Spanish reed *Arundo donax* L. Category 1
Spear thistle *Cirsium vulgare* (Savi) Ten. Category 1
Spider gum *Eucalyptus lehmannii* (Schauer) Mult categories
Spiked water-milfoil *Myriophyllum spicatum* L. Category 1
Spiny cocklebur *Xanthium spinasum* L. Category 1
Sponge - fruit saltbush *Atriplex lindleyi* Moq. Subsp. inflata Category 3
St Joseph's lily *Lilium formosanum* A. Wallace Category 3
St. John's wort *Hypericum perforatum* L. Category 2
Stink bean *Paraserianthes lophantha* (Willi.) Category 1
Strawberry guava *Psidium cattleianum* Sabine Category 3
Sugar gum *Eucalyptus cladocalyx* F.Muell. Category 2
Surinam cherry *Eugenia uniflora* L. Mult categories
Sveetbriar *Rosa rubiginosa* L. Category 1
Sweet hakea *Hakea drupacea* (C.F.Gaertn.) Roem. Category 1
Sweet locust *Gleditsia triacanthos* L. Category 2 (Excluding sterile cultivars)
Sweet pittosporum *Pittosporum undulatum* Vent. Category 1
Sweet prickly pear *Opuntia ficus-indica* (L.) Mill. Category 1 (Excluding spineless cactus pear cultivars and selections)
Sword fern *Nephrolepis exaltata* (L.) Schott Category 3 (Excluding cultivars)
Syringa *Melia azedarach* L. Category 3
Tickberry *Lantana* - all seedbearing forms Category 1
Tipton weed *Hypericum perforatum* L. Category 2
Tipu tree *Tipuana tipu* (Benth.) Kuntze Category 3
Toon tree *Toona ciliata* M.Roem. Category 3
Torch cactus *Echinopsis spachiana* (Lem.) Fiedrich Category 1
Tree - of - heaven *Ailanthus altissima* (Mill.) Swingle Category 3
Tree daisy *Montanoa hibiscifolia* Benth. Category 1
Triffid weed *Chromolaena odorata* (L.) R.M.King Category 1
Triplaris *Triplaris americana* L. Category 1
Trumpet lily *Lilium formosanum* A. Wallace Category 3
Velvet mesquite *Prosopis velutina* Wooton Category 2
Water hyacinth *Eichhornia crassipes* (C.Mart.) Solms Category 1
Water lettuce *Pistia stratiotes* L. Category 1
Watercress *Rorippa nasturtium* - aquaticum (L.) Category 2
Wax tree *Rhus succedanea* L. Category 1
Weeping willow *Salix babylonica* L. Category 2 (Not to be confused with indigenous species)
White ginger lily *Hedychium coronarium* J. König Category 1
White mulberry *Morus alba* L. Category 3 (Excluding cultivar "Pendula", and only for use as root-stock if authorised by the Executive official in terms of regulation 15C(5))
White poplar *Populus alba* L. Category 2
White tussock *Nassella tenuissima* (Trin.) Barkworth Category 1
White-flowered Mexican poppy *Argemone ochroleuca* Sweet Category 1
White top *Lepidium draba* L. Category 1
Wild tomato *Solanum sisymbriifolium* Lam. Category 1
Wild morning glory *Convolvulus arvensis* L. Category 1
Wild tobacco *Nicotiana glauca* Graham Category 1

Woolly plectranthus *Plectranthus comosus* Sims Category 3
Yellow bells *Tecoma stans* (L.) Kunth Category 1
Yellow cestrum *Cestrum aurantiacum* Lindl. Category 1
Yellow firethorn *Pyracantha angustifolia* (Franch.) Category 3 (Excluding cultivars)
Yellow ginger lily *Hedychium flavescens* Roscoe Category 1
Yellow oleander *Thevetia peruviana* (Pers.) K.Schum. Category 1
Yellow-flowered Mexican poppy *Argemone mexicana* L. Category 1

Appendix 6

Negative Impacts

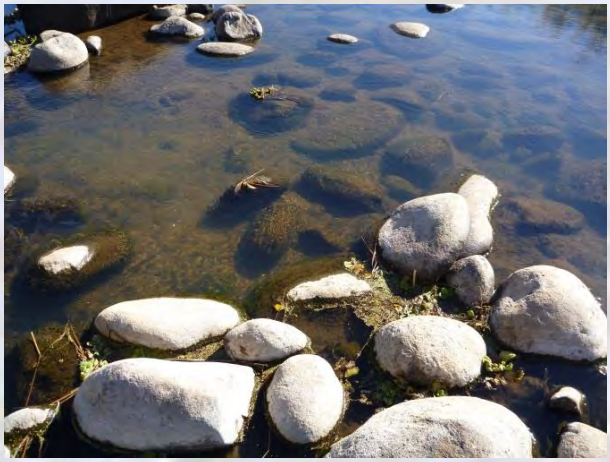
Erosion

Top left: Source plateau: Old Road
Middle left: Upper catchment: Bulldozing of river bank
Bottom left: Upper catchment: Bulldozing of floodplain

Top right: Source plateau: Old Cattle Path
Middle right: Upper catchment: Bulldozing of river crossing
Bottom right: Dargle: Wetland trampled by cattle

Top left: Dargle: Overgrazing
Middle left: Dargle: River banks trampled by cattle
Bottom left: Dargle: Overgrazing

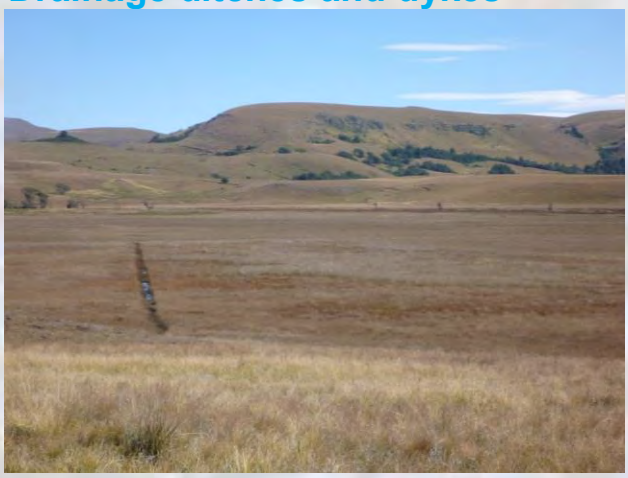
Top right: Dargle: Cleared steep river bank
Middle right: Dargle: Fertilizer stains on rocks
Bottom right: Dargle: Cattle access to water



Top right: Upstream of Albert Falls Dam: Gully erosion
Middle right: Downstream of Albert Falls: Soil erosion at pump house
Bottom right: Nagle Dam: Silt release channel

Top left: Albert Falls inlet: Fertilizer stains on rocks
Middle upper left: Nagle Dam: Sand bearing stream entering dam
Middle lower left: Durban: Near new KwaDabeka road bridge
Bottom left: Durban: Upstream of Molweni Cemetery

Drainage ditches and dykes



Top right: Source Plateau: Ditches to drain wetlands (historical)
Bottom right: Upstream of Midmar: Dyke (to left of photo)

Top left: Source plateau: Ditch to drain wetlands (historical)
Middle left: Dargle: Drainage ditch
Bottom left: Upstream of Midmar: Drainage Ditch (historical)

Buffer vegetation removal

Top left: Dargle: Rye grasslands
Middle left: Dargle: Poplar grove and kikuyu pasture
Bottom left: Albert Falls Village: gardens to water edge

Top right: Dargle: Maize lands
Middle right: Upstream of Albert Falls Dam: Road
Downstream of Albert Falls: District road

Top left: Downstream of Albert Falls: Kikuyu
Middle left: Downstream of Albert Falls: New garden
Bottom left: Durban: Sand mining

Top right: Downstream of Albert Falls: Eskom servitude
Middle right: Durban: Un-rehabilitated sand mine
Bottom right: Durban: Industrial area

Litter / Illegal dumping

Top left: Dargle: Rubbish pit
Middle left: Howick: Garden rubbish
Bottom left: Cumberland: Abandoned canoe

Top right: Howick outskirts: Dumping
Middle right: Howick commercial area: Litter
Bottom right: Upstream of Nagel Dam: Dumping

Top right: Durban: Dumping
Bottom right: Industrial area: Wind blown litter

Top left: Durban: Burnt rubbish at sand mine
Middle left: Durban: Dumping
Bottom left: Springfield Park: Litter collected by DUCT River Care Team

Sewer surcharges

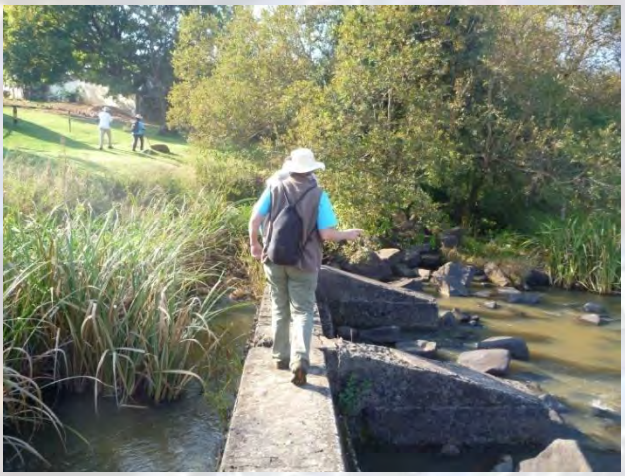
Top right: Howick: Surcharging sewer pump station
Middle right: Durban: Sewage stream en route to river

Top left: Howick: Surcharging manhole
Middle left: Durban: Sewage stream en route to river
Bottom left: Durban: Surcharging manhole

Storm water drains

Top left: Durban industrial area: Litter and engine oil
Bottom left: Durban: Litter and oil
Top right: Durban: Litter and engine oil
Middle right: Durban
Bottom right: Durban: Blue Lagoon (strong sewage smell)

Construction / Buildings



Top left: Dargle: Fenced off river
Middle left: Howick: Broken weir
Bottom left: Durban: Illegal backfilling into river bed

Top right: Dargle: Water extraction pump station
Middle right: Above Albert Falls: Fenced off river
Bottom right: Durban: Illegal backfilling into river bed

Sand Mining

References to left or right bank are on that side of the river going downstream.

Site #1: Right bank: Near Wartburg Rd bridge
Active mine

Site #2: Right bank: Tributary stream below Cumberland Nature Reserve

Previously mined area has not been rehabilitated, although grass is growing back in some places. No levelling has taken place nor topsoil put back. Disturbed areas choked with *Lantana, Syringa, Sesbania, Cestrum*.

Note mining on far side of stream

Recent activity on stream bank

Site #3: Right bank
Un-rehabilitated – last mined approximately 2005
Mined from river's edge to outside edge of floodplain – no rehabilitation
Rhynceletrum (Natal Red Top Grass), *Hyperhennia*, Rats tail grass, *Sesbania*, Bugweed, *Cestrum*, *Chromolaena*. River banks choked with *Lantana*. This is the worst alien infestation today, definitely as a result of the mining.

Site #4: Right bank
Un-rehabilitated
About 150m d/s of confluence. Old sand mining – all overgrown with grass. From river about 75m all the way up into the banks of the flood plain. Not rehabilitated.

Un-rehabilitated area

Site #5: Right bank
Un-rehabilitated – signs of recent excavations
Mined from the river bank to the flood plain edge and d/s until the floodplain narrows near the river bend. Mine was abandoned 2 years ago. Mining narrows right down where flood plain narrows near bend in river.

Un-rehabilitated mine

Close proximity to river's edge

Site #6: Left bank
Active

Digging in the river

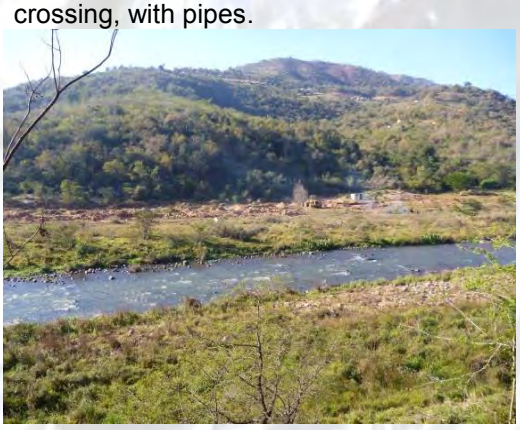
Rock dumping rock the river: possible causeway?

Site #7: Left bank: Upstream of Imfula Store
More sand mining: some very old, covered in grass, some not so old – looks new u/s of Mamba Gorge?
On left is *Chromolaena* and Lantana!
More sand mining on river left between river and road that leads to Imfula
More of the same sand mining operation still heading for Imfula

Activity close to river bank

Mining activity

Site #8: Right Bank: Downstream of Imfula Store
Active
Mining up to the rivers edge within 32m limit on most d/s point
Mine stretches from where hill slope meets river banks. Stock piles being dumped in river, includes causeway crossing, with pipes.



Portion of the mine

Site # 9: Left & Right bank: Downstream of Imfula Store
Abandoned
Causeway across river. Was mined in 2011, since then has just been abandoned. All equipment was sold.

Left bank – access and mining

Right bank – stockpiles

Broken causeway

Site # 10: Left bank: Downstream of large tributary stream entering uMngeni on left side
Un-rehabilitated. Mining stopped about two years ago
Left bank mined over 100 metres wide, u/s to the tributary confluence. Below tributary. The tributary splits into 2. The island has been mined. Almost all the trees have been bulldozed, just aliens coming up – area full of Peanut Butter Cassia, Wattle, *Chromolaena*, Syringa. Chromolaena emerging everywhere. About 100 m width of floodplain mined. A few scattered small indigenous trees.
Mined area infested with Peanut Butter Cassia, Wattle, *Chromolaena*, Syringa, *Sesbania*, *Cestrum*, Mexican Sunflower, very large patch of bamboo.

Un-rehabilitated area

Alien plants in un-rehabilitated area

Site # 11: Left bank
Abandoned causeway U/S of Inanda Dam
Causeway slowing water flow. Only three large pipes in causeway. From the causeway all the way down on right bank is sand mining.
Access road to causeway constructed on left river bank, road raised like a dyke, recently used. Rock and earth bulldozed into the river to give a platform for equipment digging in river. Earth moving machine in middle of river.

Durban: Upstream of Molweni Cemetery

Site #12: Right bank: Close to Mbetje Store
Active
D/s extent of sand mining that started opposite Mbeje. On left bank old sand mining. As one mine finishes on one bank it starts on the other bank. No rehabilitation.

Mining on right bank

Causeway to mining area

Site #13: Right bank
Un-rehabilitated Mine

Site #14: Right bank
Active
Mining taking place in the river – causeway halfway into the river, bulldozed to the river's edge. Within the 32 metre river edge limit.
Right bank – bush has been cleared right into the river. Bulldozing into the river. *Chromolaena*, Lantana, Sickle Bush in previously mined areas

Recent activity

Sand "causeway"

River bank destruction

Site #15: Left bank: Just past road bridge on approach to Durban
Active
Mining on left of road, mining whole hillside
Entrance to sand mining operation on left of road (river left bank)

Site # 16: Left bank
Sand mining. Seems to stretch quite far inland. Erosion going down to the river

Site # 17: Right bank
Recent - could possibly be from bridge construction
A river pool has been cut off and is choked with *Pistia* (Water Lettuce). Mexican Sunflower on banks

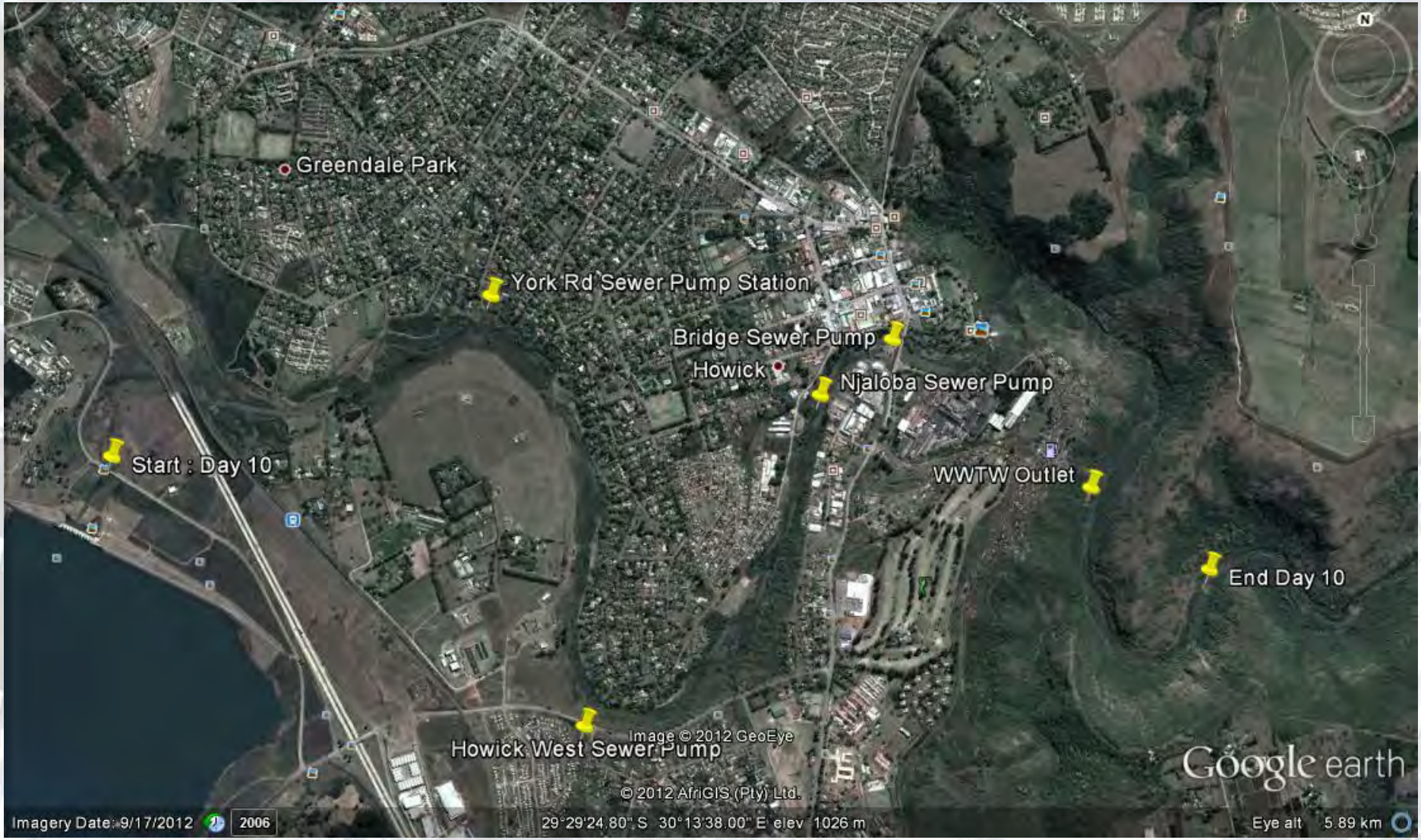
Section of mined area

Soil erosion from mined area

Site # 18: Right bank, Left bank d/s of N2 highway bridge
Active – Legal
From upstream of N2 highway bridge to downstream of bridge

Legal mining at N2 bridge

Sewer Pump Stations, Howick



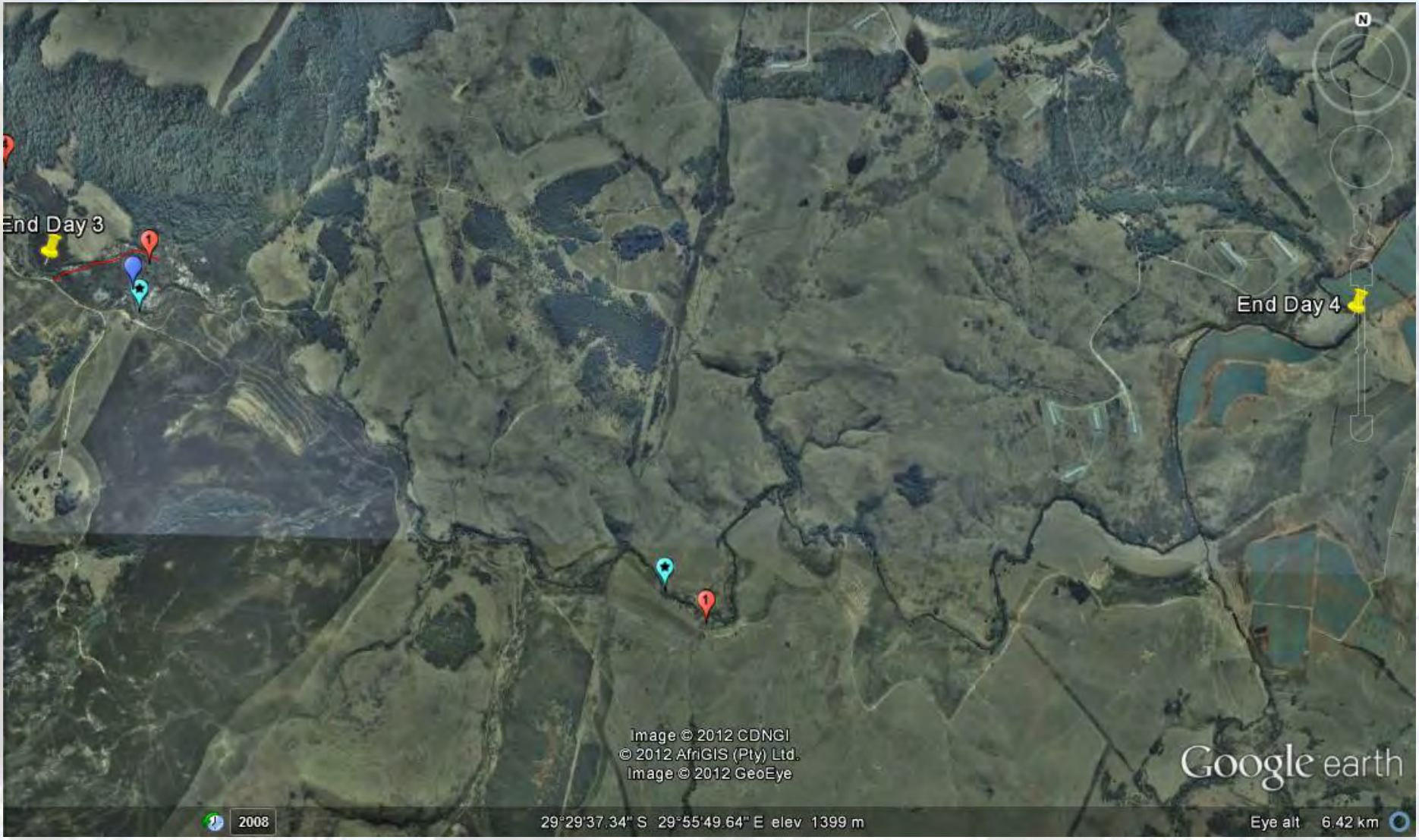
Impacts Section 1: Source to Midmar

Erosion Drainage ditches & dykes Both Mini SASS & lab sample

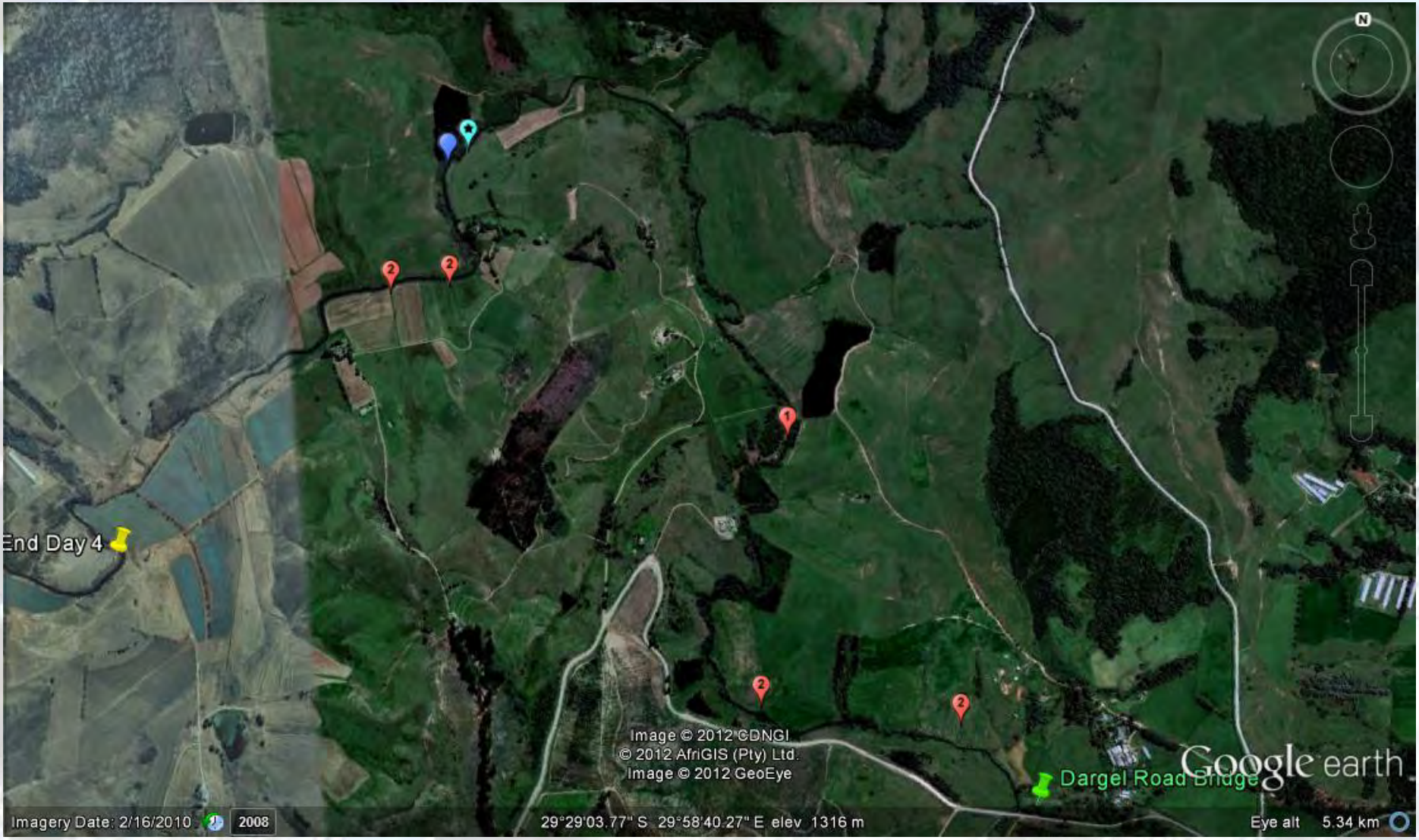
Erosion

Mini SASS & lab sample

Erosion Drainage ditch / dyke Canal Construction Negative water quality – visual Mini SASS Lab test



Erosion Negative water quality – visual Mini SASS



Erosion

Drainage ditch / dyke

Negative water quality – visual

Mini SASS

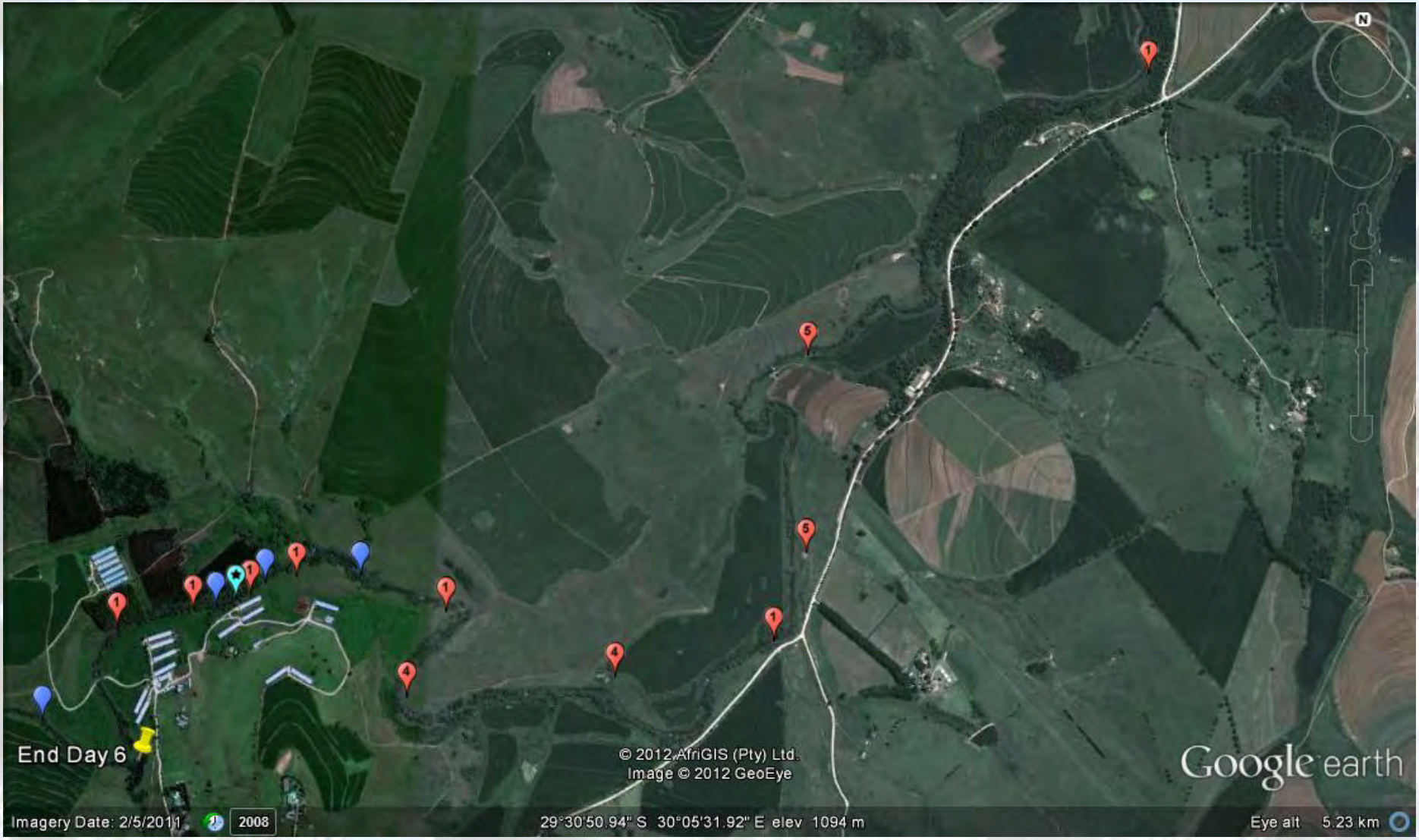
Erosion Mini SASS

Erosion

Riparian vegetation removed

Negative water quality – visual

Mini SASS & lab sample



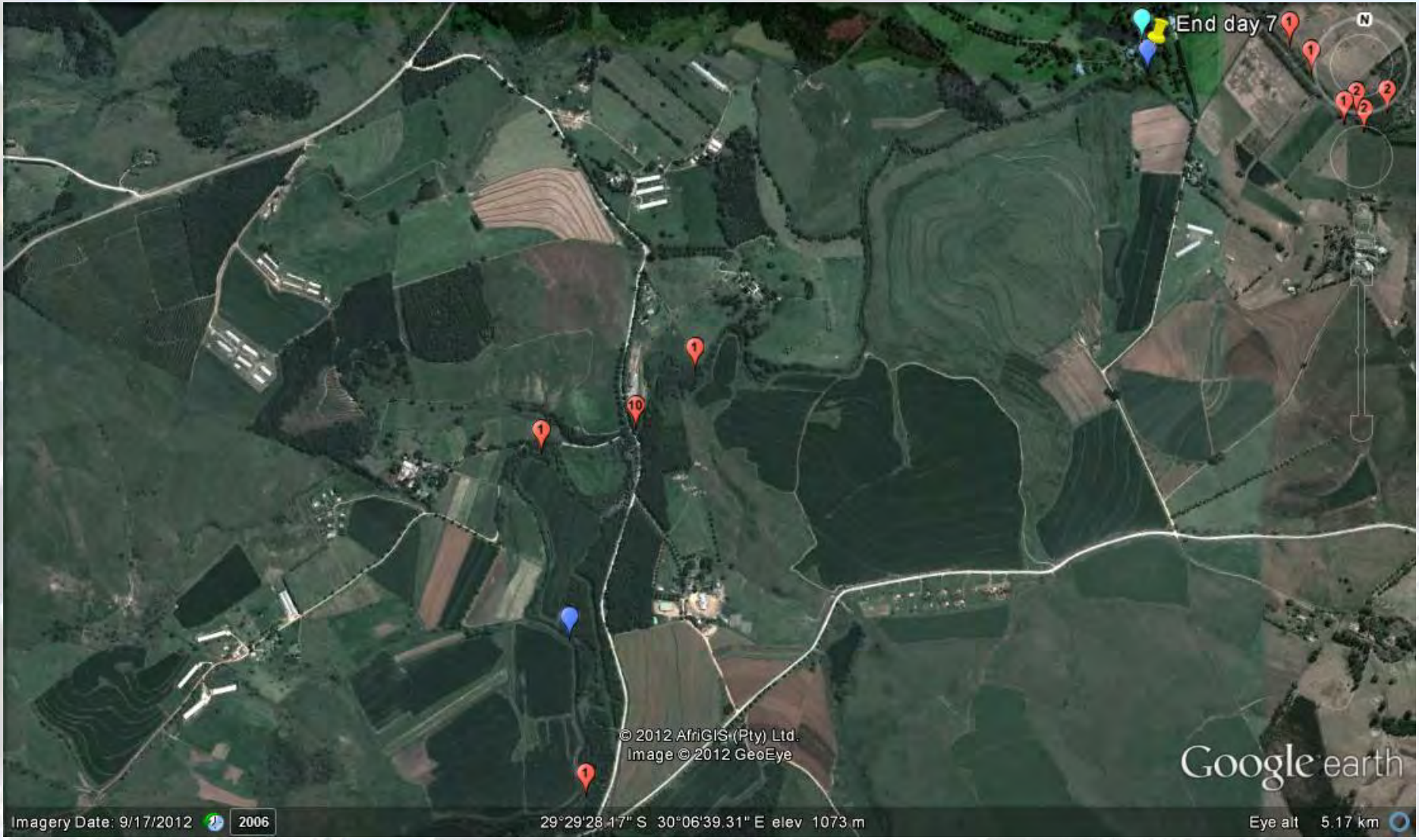
Erosion

Riparian vegetation removed

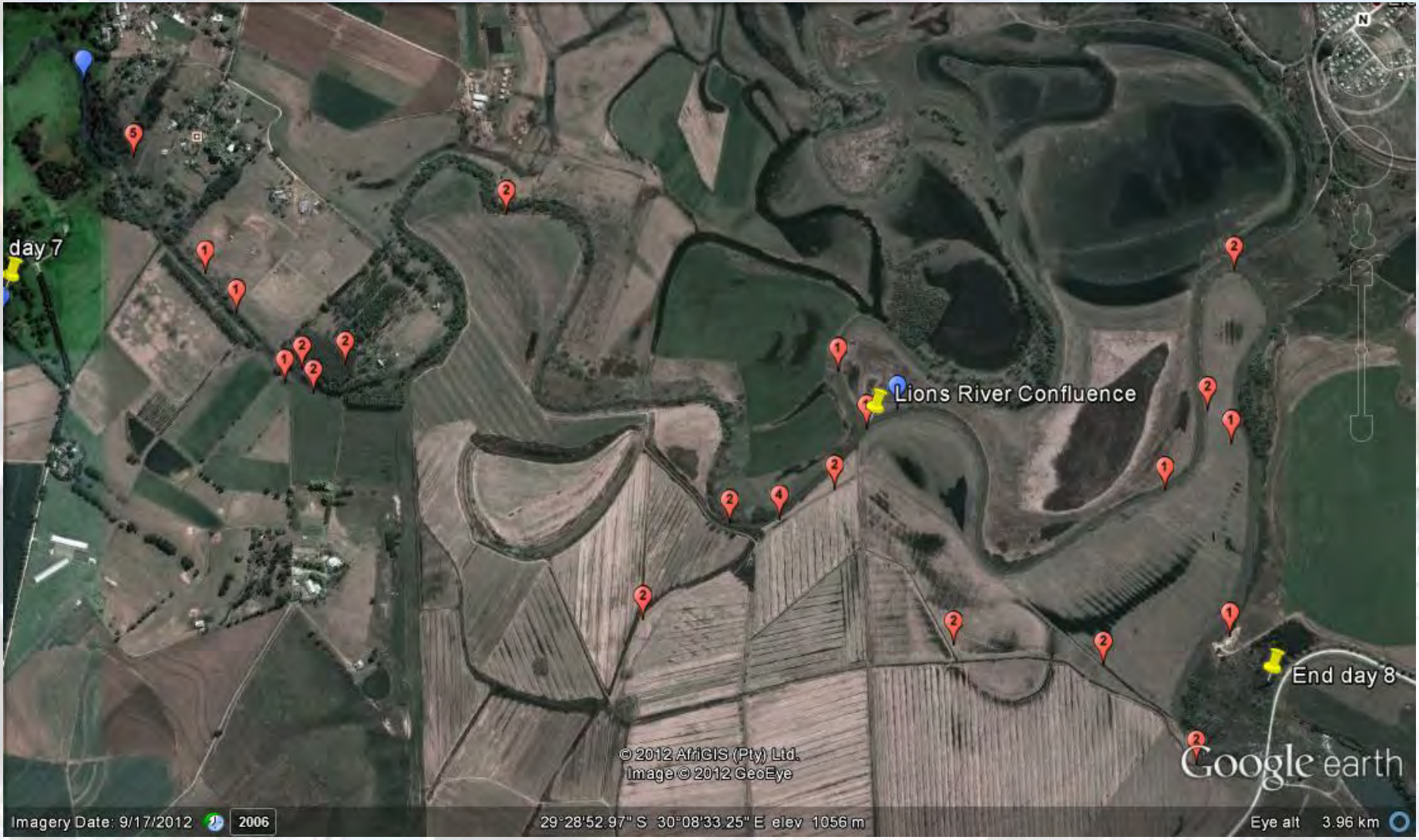
Litter / dumping

Negative water quality – visual

Mini SASS

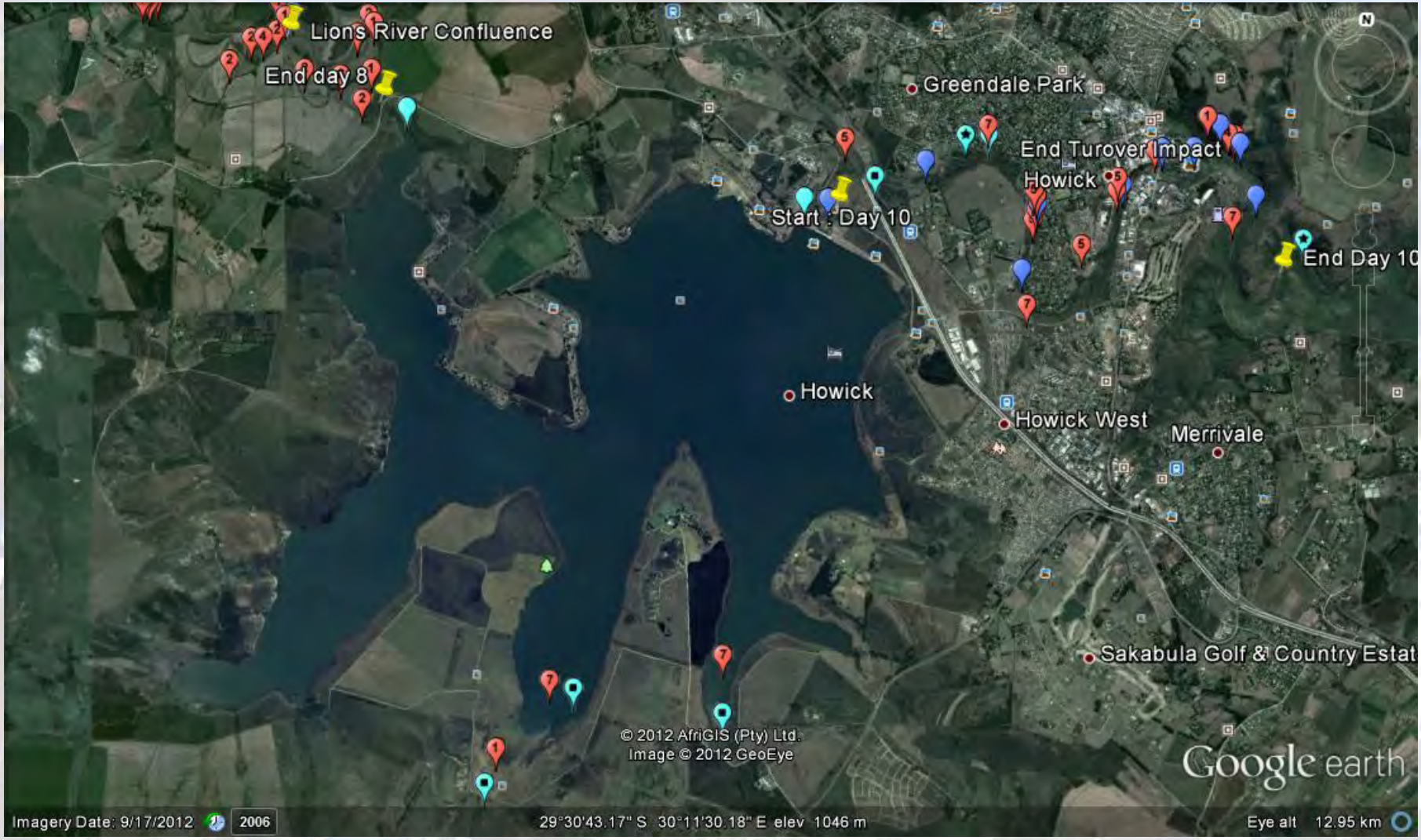


Erosion Drainage ditch / dyke Construction Negative water quality – visual Mini SASS & lab sample



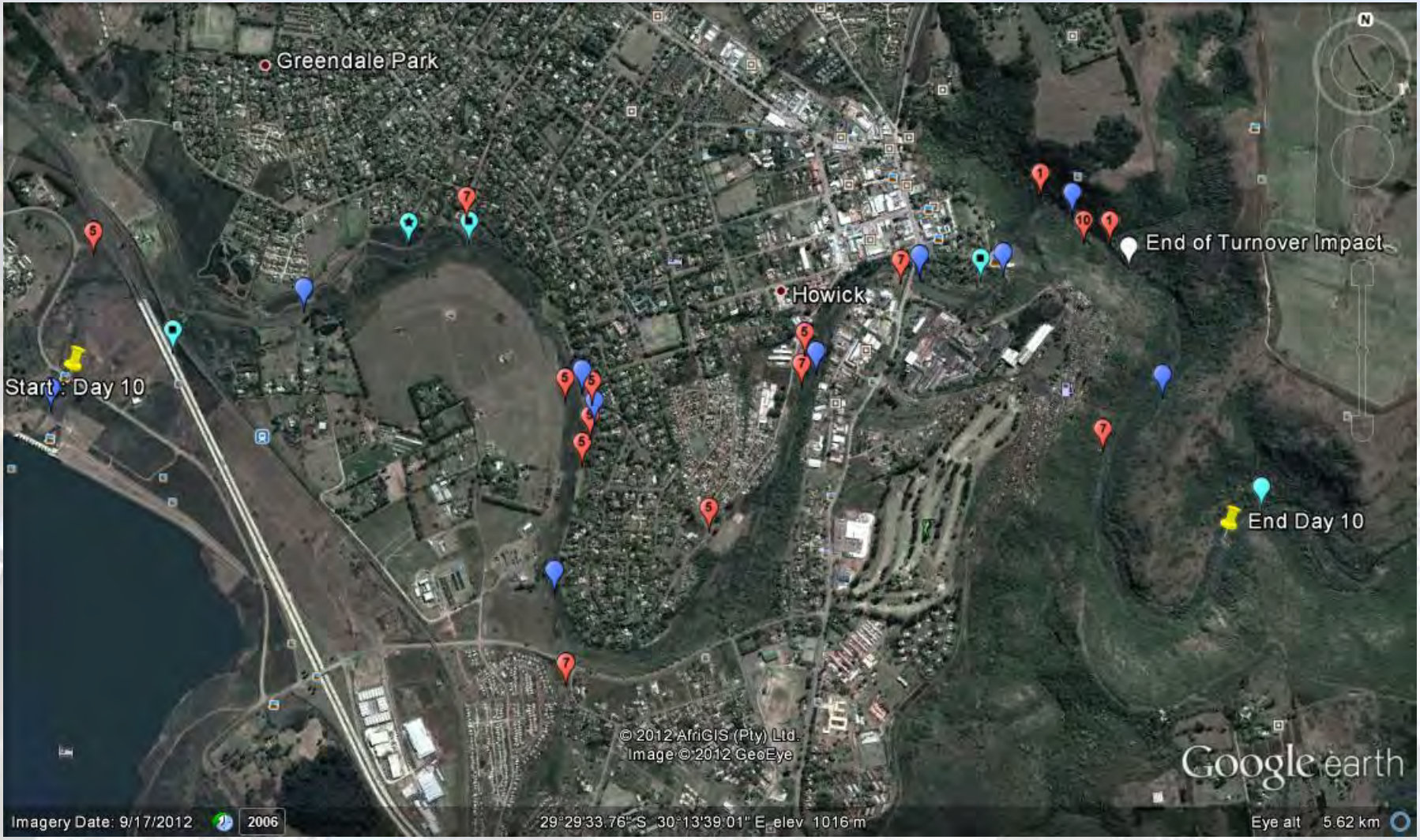
1 Erosion 2 Drainage ditch / dyke 4 Riparian vegetation removed 5 Litter / dumping Negative water quality – visual

Impacts Section 2: Midmar Dam / Howick



Erosion | Drainage ditch / dyke | Riparian vegetation removed | Litter / dumping | Sewer - surcharge | Negative water quality – visual | Mini SASS | Lab sample | Mini SASS & lab sample

Impacts Section 3: Howick to Albert Falls Dam



Erosion

Litter / dumping

Sewer – pump station / surcharge

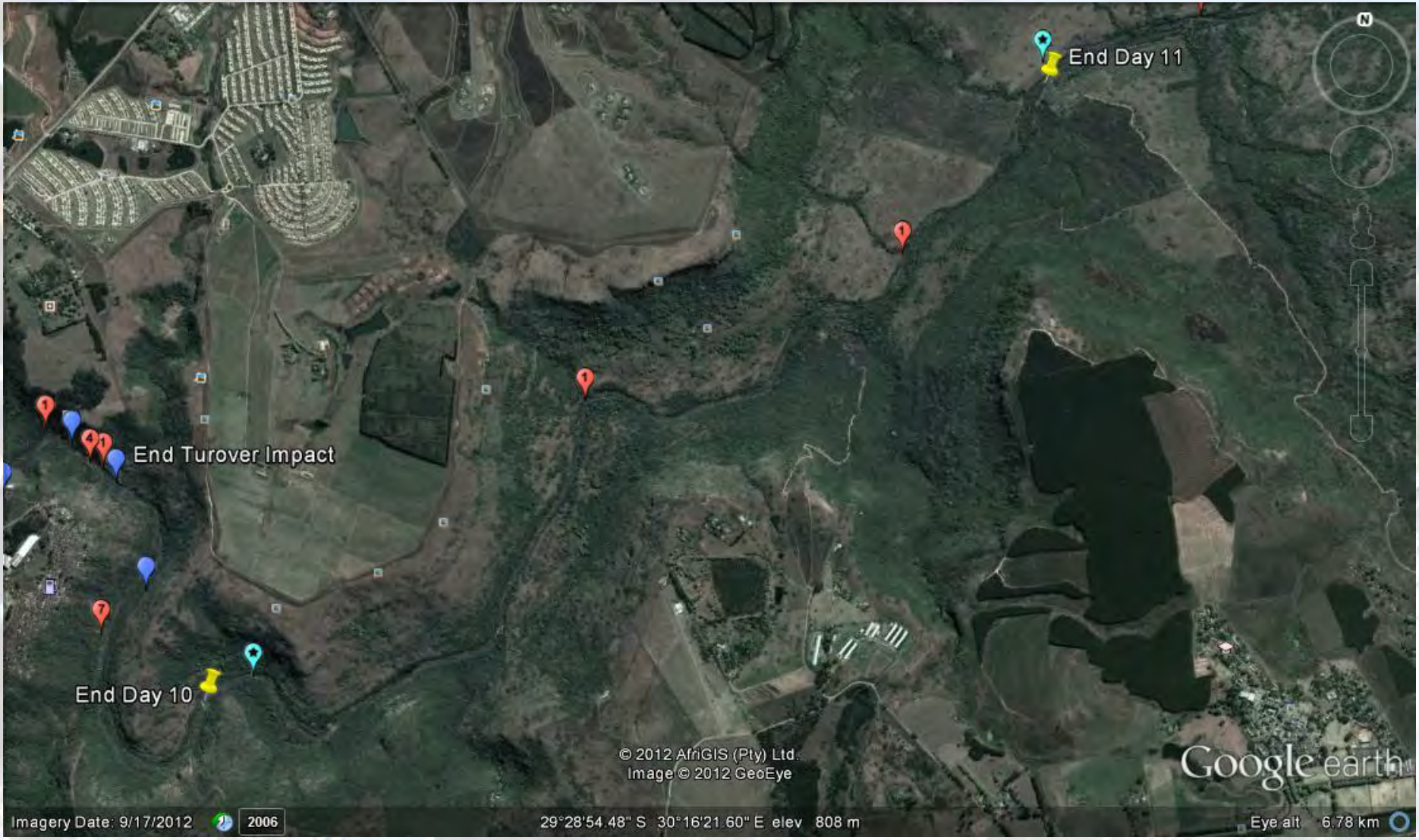
Construction

Negative water quality – visual

Mini SASS

Lab test

Mini SASS & lab sample



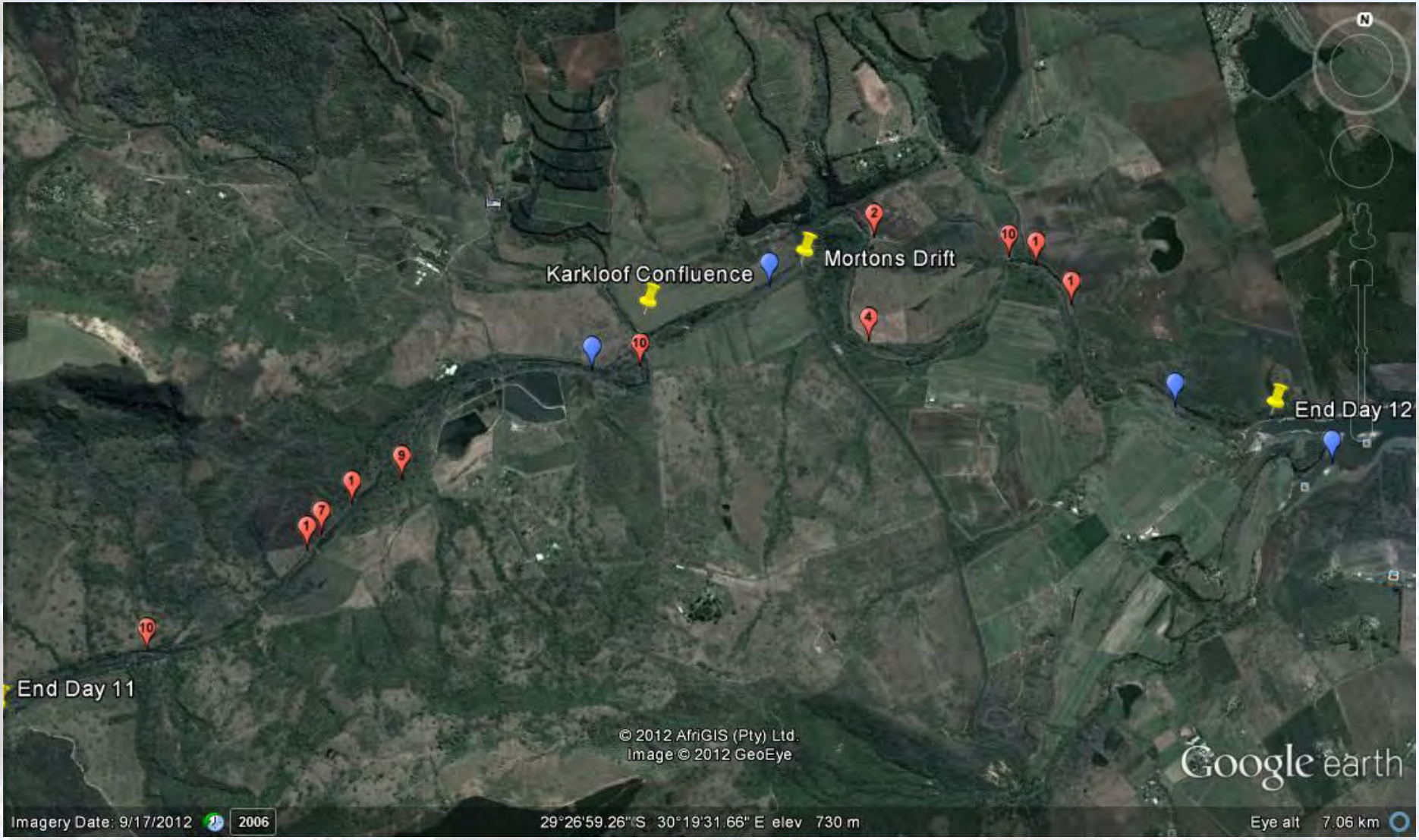
Erosion

Riparian vegetation removed

Sewer – pump station / surcharge

Negative water quality – visual

Mini SASS



1 Erosion

2 Drainage ditch / dyke

4 Riparian vegetation removed

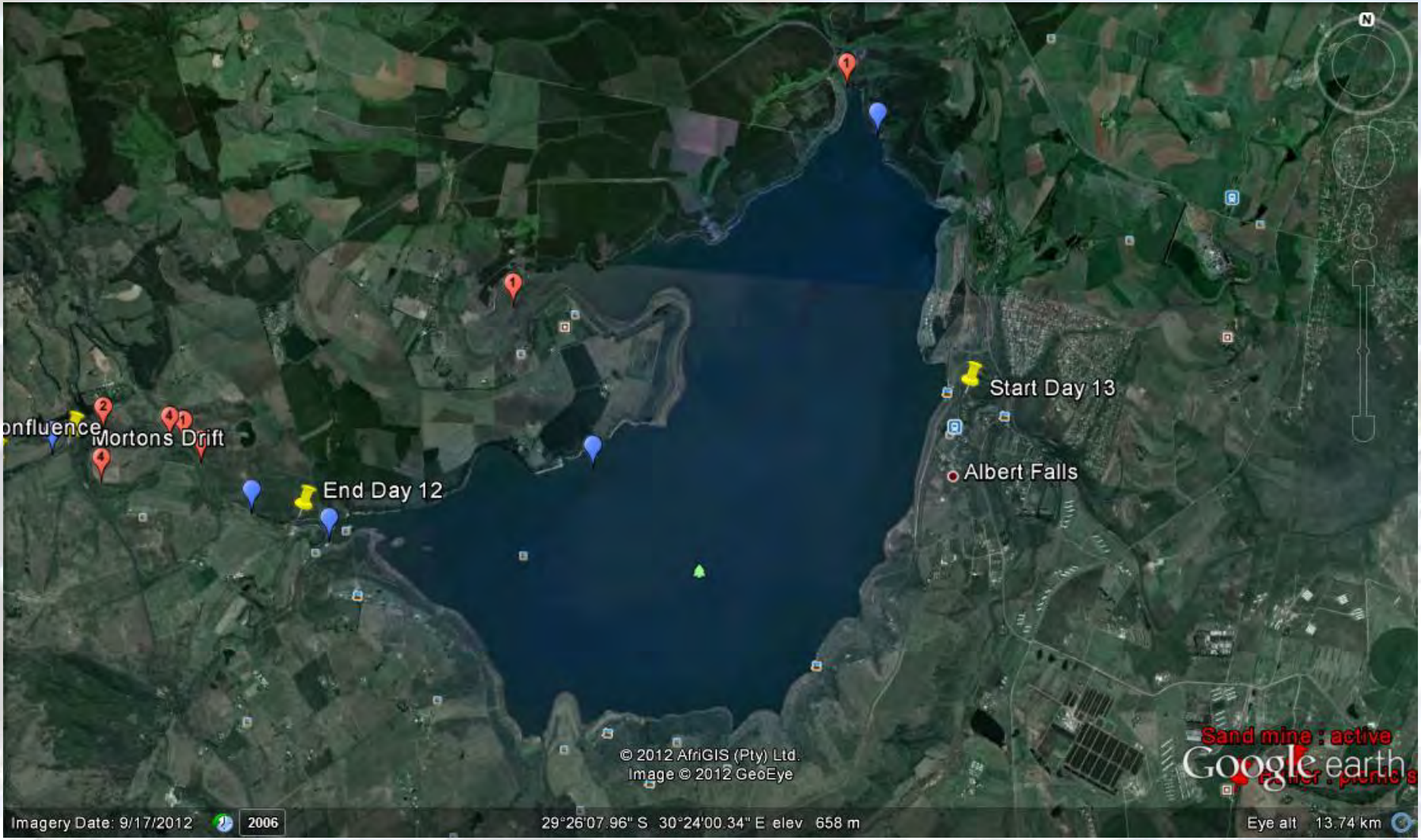
7 Sewer – pump station / surcharge

9 Canal

10 Construction

Negative water quality – visual

Impacts Section 4: Albert Falls Dam



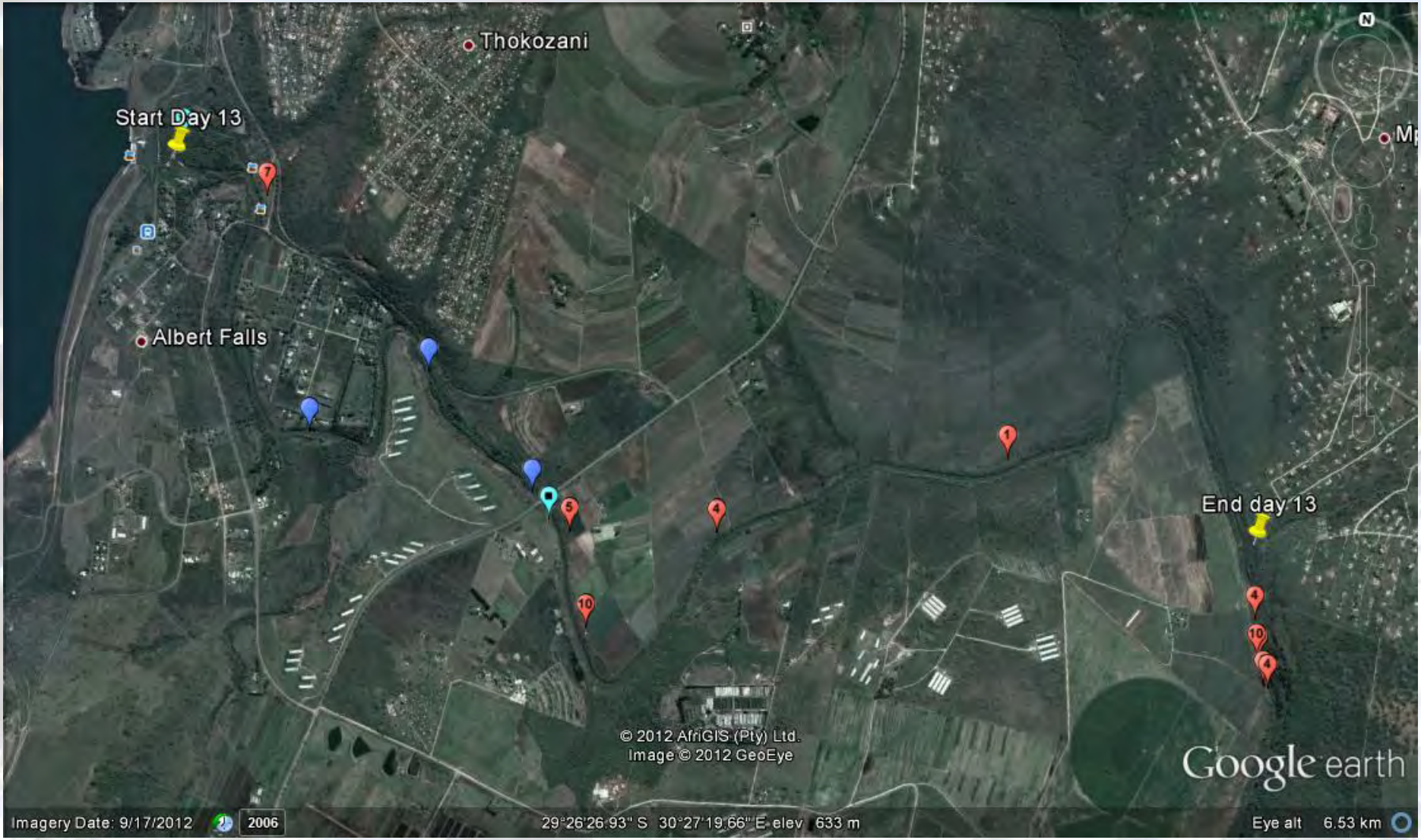
1 Erosion

2 Drainage ditch / dyke

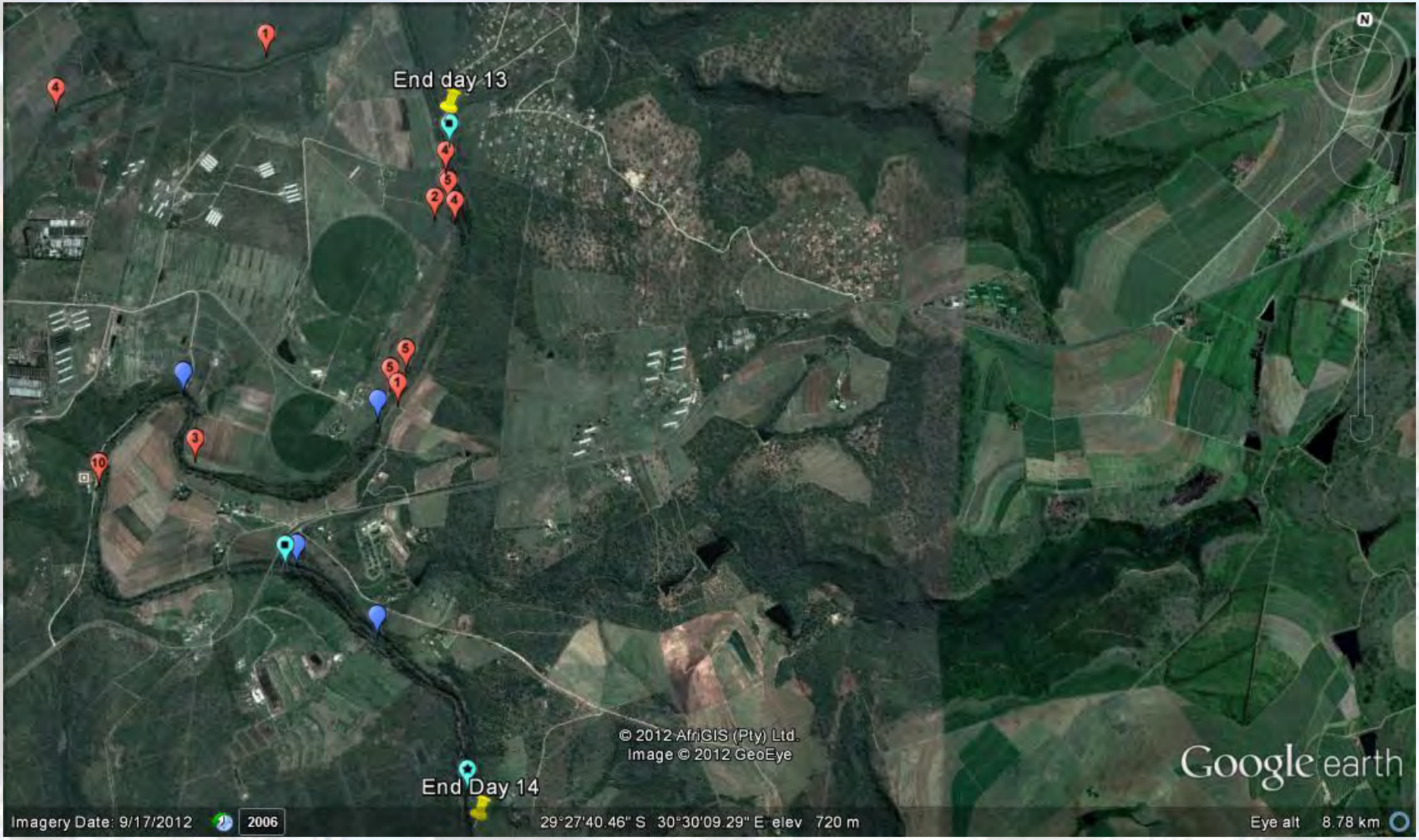
4 Riparian vegetation

Negative water quality – visual

Impacts Section 5: Albert Falls Dam to Nagle Dam



1 Erosion 4 Riparian vegetation 5 Litter / dumping 7 Sewer – pump station / surcharge 10 Construction Negative water quality – visual

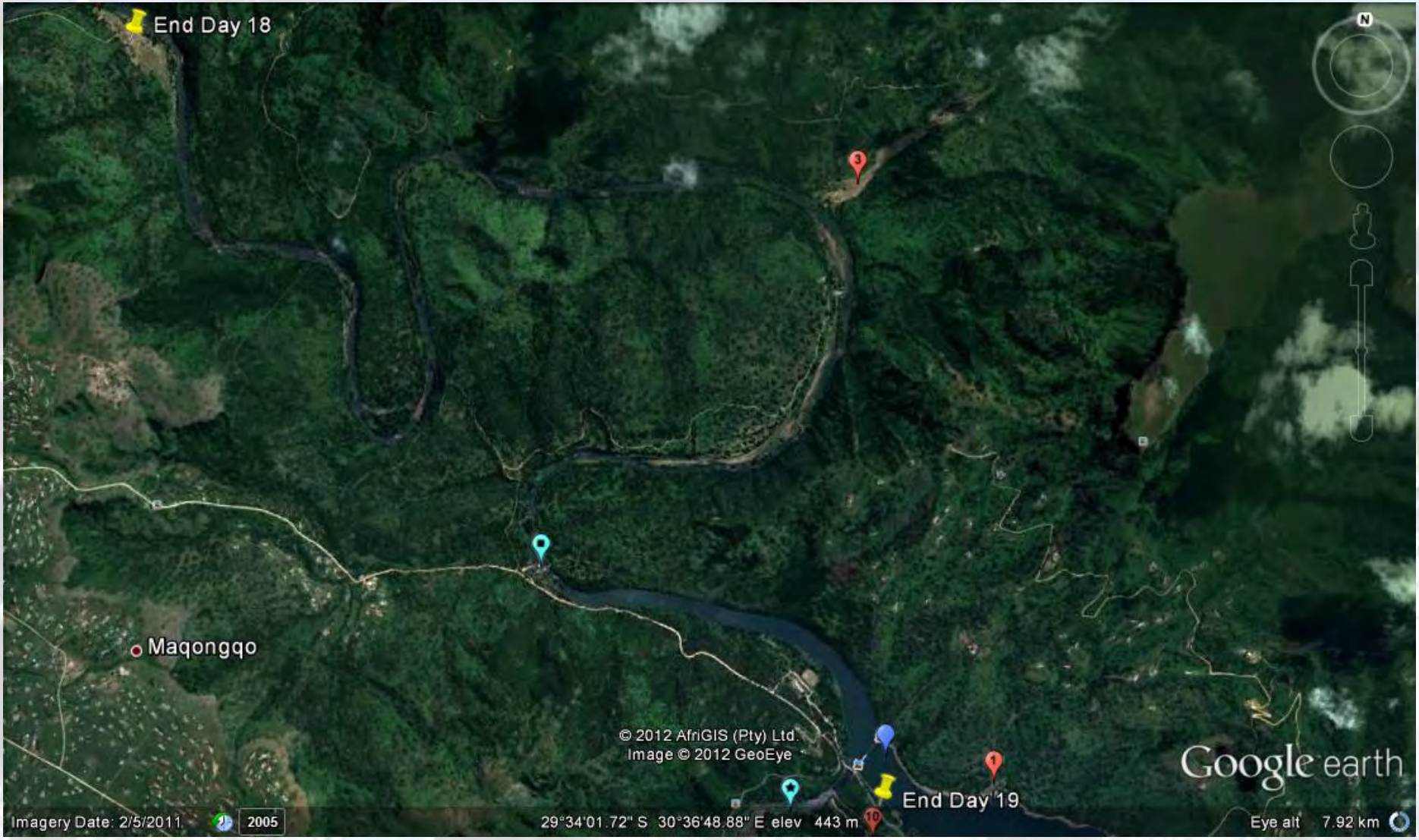


1 Erosion
2 Drainage ditch / dyke
3 Sand Mining
4 Riparian vegetation removed
5 Litter / dumping
6 Dam / weir
10 Construction
Invasive vegetation
Negative water quality – visual
Mini SASS
Lab test

Mini SASS Lab test

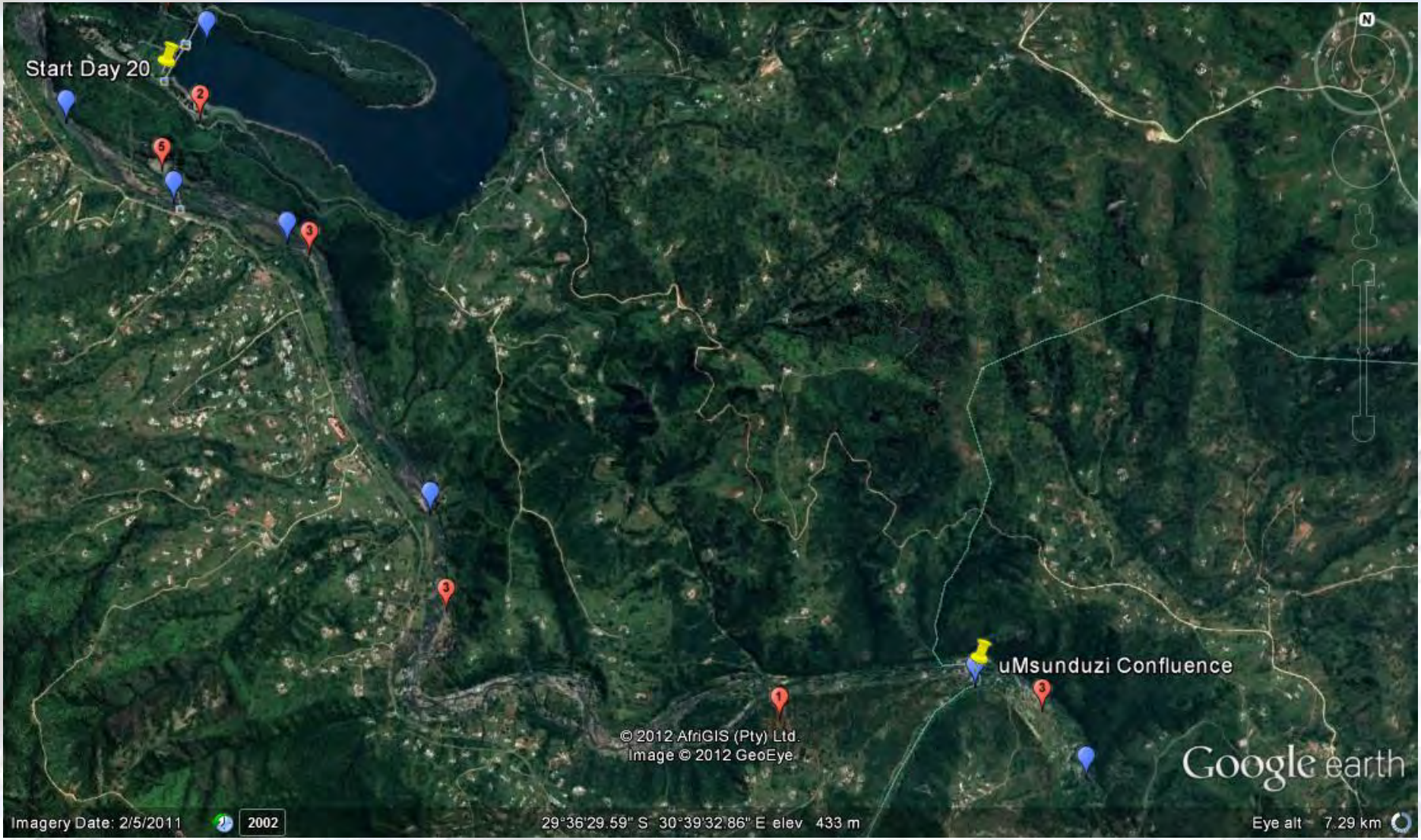
Negative water quality – visual Mini SASS

Erosion Sand Mining Construction Mini SASS



Erosion Sand Mining Construction Negative water quality – visual Mini SASS Lab test

Impacts Sections 6 & 7: Nagle to Inanda Dam



1 Erosion

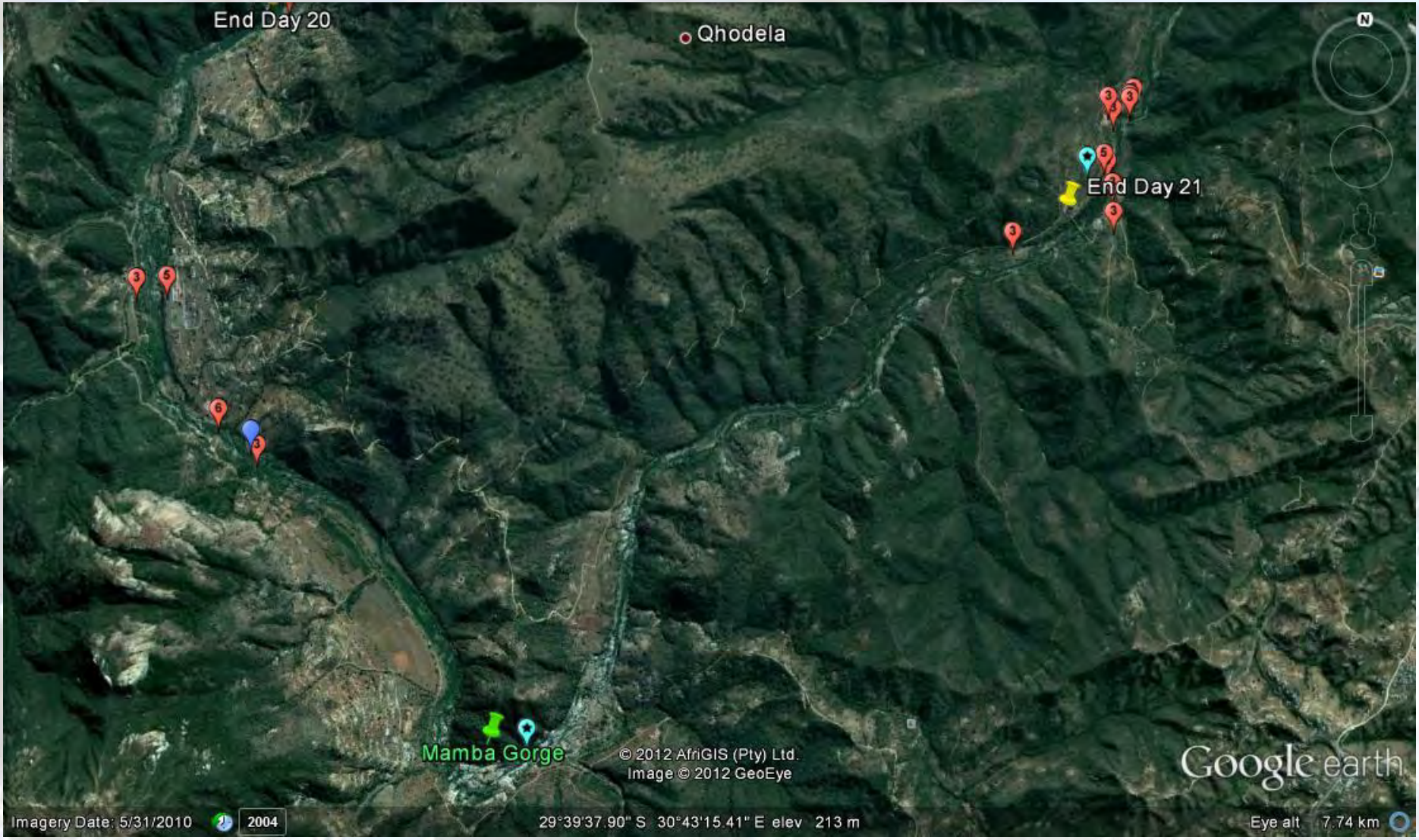
2 Drainage ditch / dyke

3 Sand mining

5 Litter / dumping

Negative water quality – visual

Erosion Sand mining Negative water quality – visual



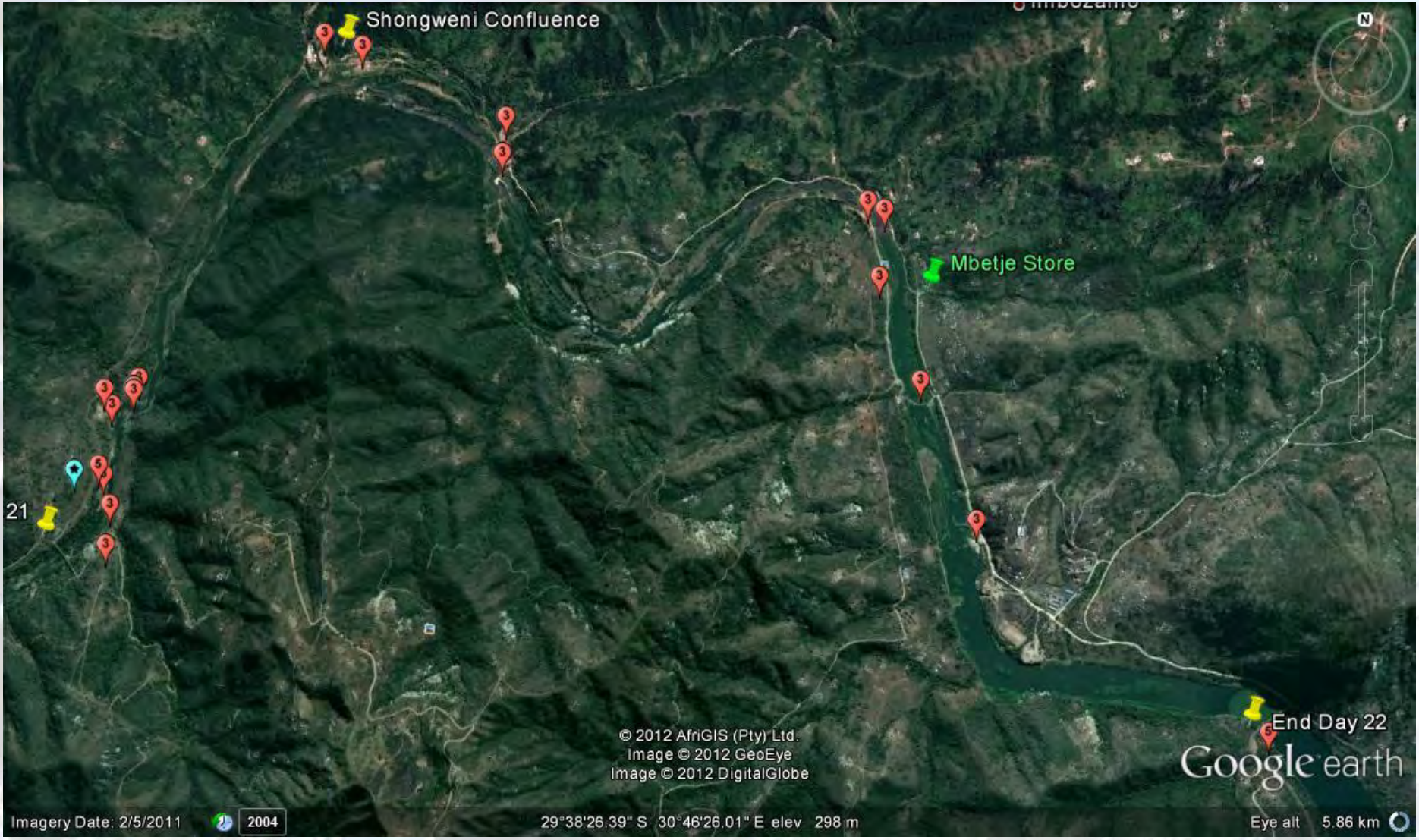
3 Sand mining

5 Litter / dumping

6 Dam

Negative water quality – visual

Mini SASS



Sand mining

Litter / dumping

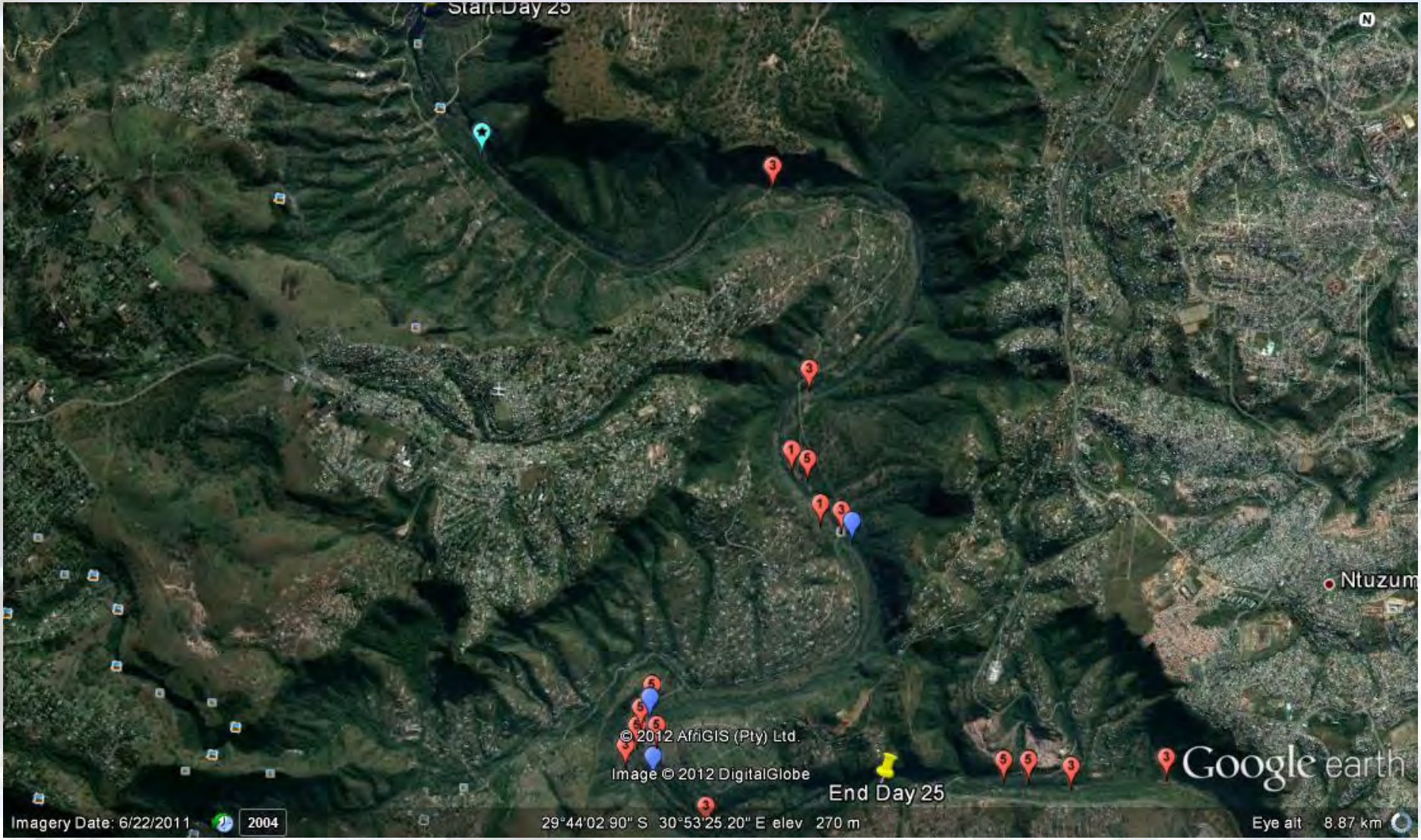
Mini SASS

Impacts Section 8: Inanda Dam

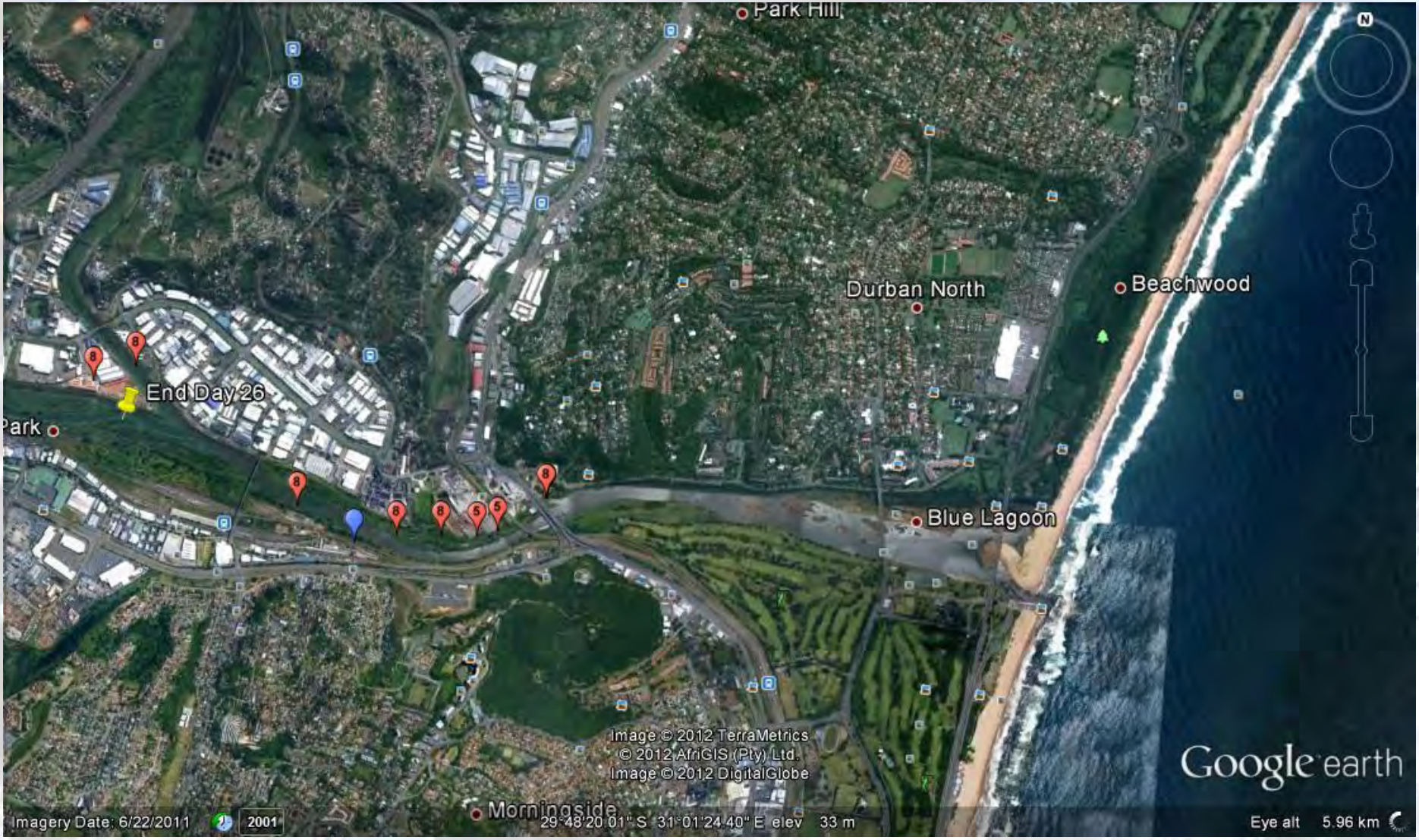
3 Sand mining

5 Litter / dumping

Impacts Section 9: Inanda Dam to Estuary



Erosion Sand mining Litter / dumping Negative water quality – visual Mini SASS



Litter / dumping Storm water drain Negative water quality

Appendix 7

Water Quality

Mini SASS and Laboratory Tests

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*" (SA Water Quality Guidelines). According to Norris and Thoms "*Water quality measurements are not very useful for large scale management of catchments or for assessing whether river ecosystems are being protected.*"

River health refers more to the overall assessment and state of river ecosystems and comprises a far broader scope that includes the entire ecological system of the river as well as the interconnected land. It includes 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.

As water quality samples taken in a laboratory cannot indicate what state of health the river is in and as the Mini SASS tests cannot show problematic levels of chemicals, metals, nutrients etc, we carried out 29 Mini SASS tests as well as took 16 samples for analysis at the Umgeni Water laboratory in Pietermaritzburg.

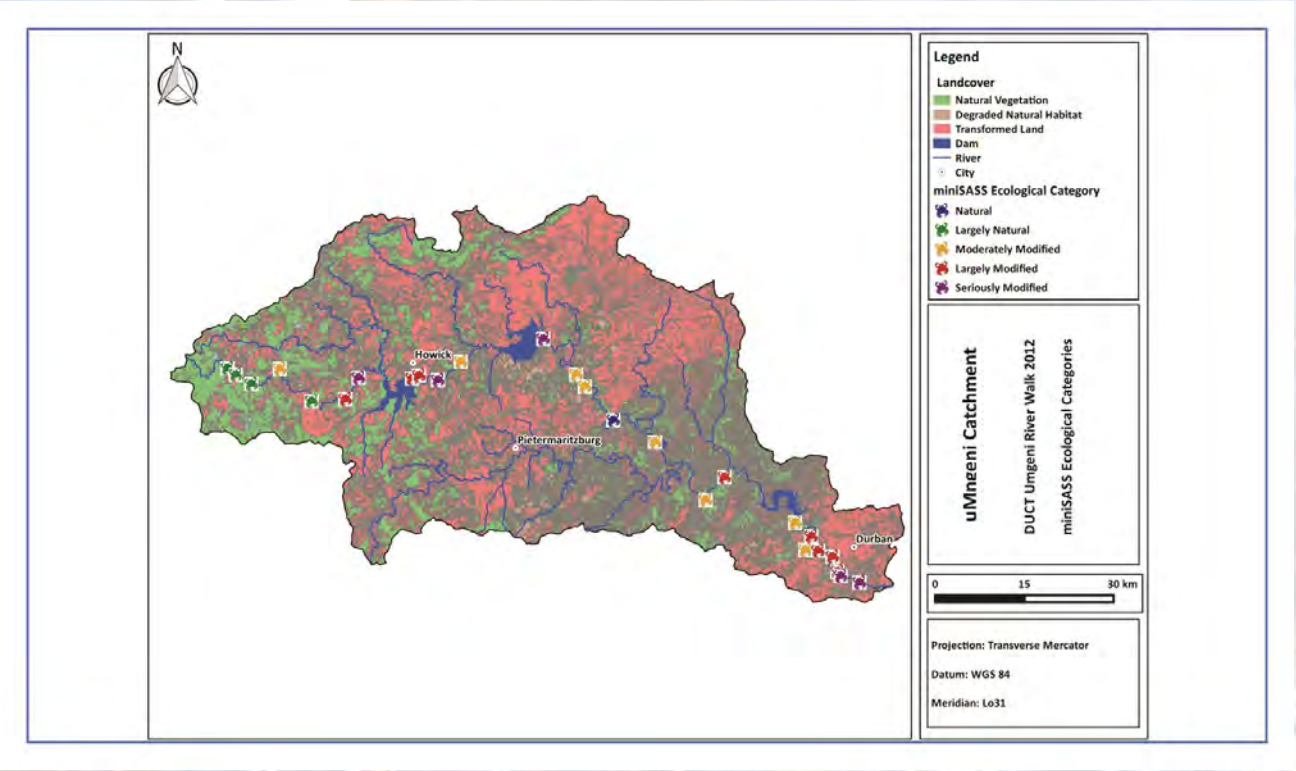
The Mini SASS is a simplified "idiot proof" version of the SASS5 test, the latter giving such an accurate picture of river health that it stands up in a court of law. Mini SASS can be done by any civilian, is easy and fun and comprises catching and identifying aquatic insects and classing them according to tolerance levels of pollution. A simple scoring method results in an accurate picture of river health. (For more information see www.minisass.org)

This appendix is thus in two parts – firstly the findings of the daily Mini SASS tests done on the walk, followed by the assessment of the laboratory tests done on samples taken from the river during the walk.

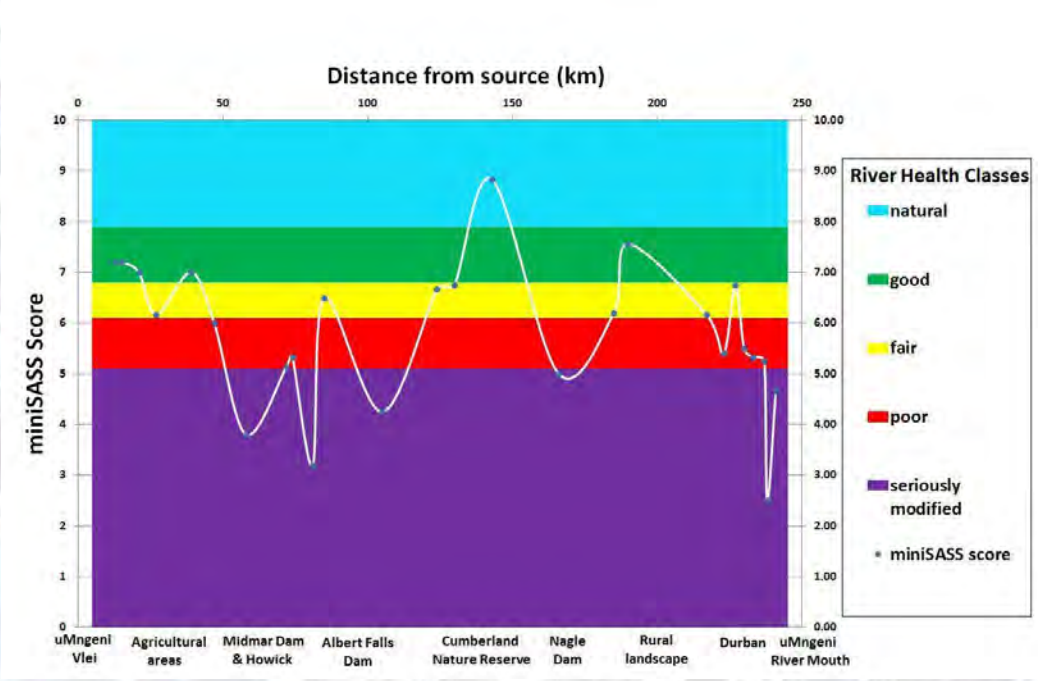
The uMngeni River teaches two profound lessons:

- The somewhat contradictory situation: water quality improves in large dams but the health of the river immediately downstream of the dam is negatively impacted by the dam due to various factors such as scouring, turnover, low flows etc (discussed in the introduction of the main report).
- Rivers can and do heal – given a long enough length without impacts water quality and river health can improve.

Map: Mini SASS Test Sites



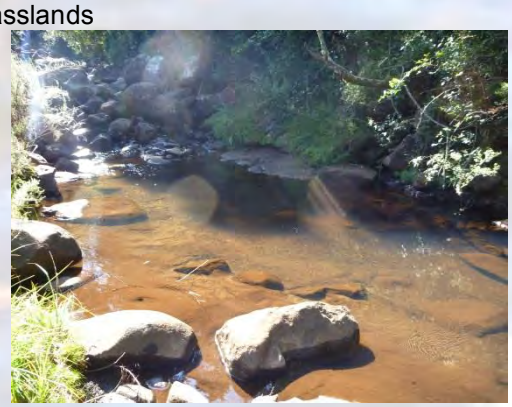
Graph: Mini SASS Profile indicating river health



Mini SASS Test Sites and Results

01-May **Mini Sass #1: Just u/s of uMngeni Poort Bridge**

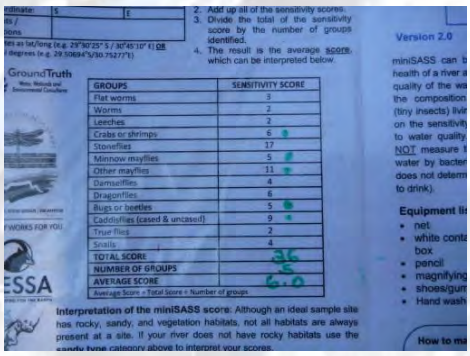
Sediment (excess diatoms) on rocks u/s of Mini SASS site
Surrounding vegetation: Indigenous forest & grasslands



Score: 7.1.Largely Natural / few modifications. GOOD condition

02-May **Mini Sass #2 : D/s of weir & bulldozed road**

First green algae
Bright green patch of algae on horseshoe bend. Horseshoe bend inundated with Wattle and Bugweed.
Road cleared with a bulldozer, less than 5 metres from stream edge. Medium infestation of Bugweed Bramble, river lined with Wattle trees
Surrounding vegetation; grasslands infested with Lantana, Bugweed, Wattle along river.
Surrounding land use: Cattle. Veld grazing. Some timber on higher ground
Score: 6.0 Largely modified. POOR condition.



GROUPS	SENSITIVITY SCORE
Flat worms	3
Worms	2
Leeches	2
Crabs or shrimps	6
Stoneflies	17
Minnow mayflies	5
Other mayflies	11
Damselflies	4
Dragonflies	6
Bugs or beetles	5
Caddisflies (cased & uncased)	9
True flies	2
Snails	4
TOTAL SCORE	36
NUMBER OF GROUPS	6
AVERAGE SCORE	6.0

03-May **Mini Sass #3: Upper Dargle farm #1**

Algae above rapids, sediment on the rocks. Water mongoose at river.
Surrounding land use: Cattle, small arable lands. Poultry sheds in close proximity to river on opposite bank, but situated atop a high hill.
Surrounding vegetation : Veld grass infested with Brambles near river; Wattles along river.
Score: 7.0 Largely natural / few modifications. GOOD condition




06-May **Mini Sass #4: Upper Dargle farm #2**

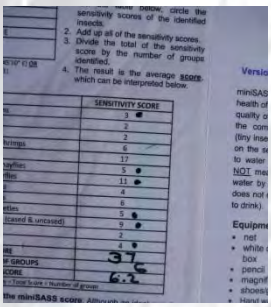
2-300m from Sass site on right of river Buddleja, Erythrina, Elephantorhiza

Surrounding land use: +-2km up stream, left bank - poultry and veld grazing. +-1km upstream, right bank - house & veld, +-1/2km upstream, right bank - holiday home & veld.

Surrounding vegetation : U/s natural river banks; on site - Bramble on one side bank, Pine & Wattle scrub other bank

Score: 6.2 Moderately modified. FAIR condition

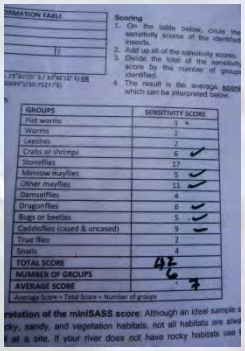


07-May

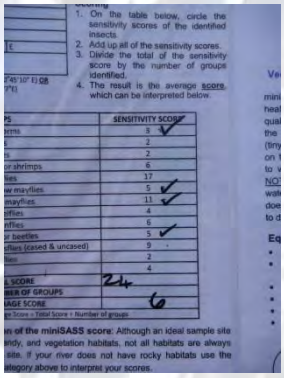
Mini Sass #5: Singisi Bridge

Surrounding land use: Timber plantations
Surrounding vegetation: Timber. Inside 30m buffer heavy Bramble infestations, Wattle lining banks. Some natural areas
Score: 7 Largely natural / few modifications. GOOD condition



Mini Sass #6: Petrus Stroom Farm #1

Surrounding land use : Intense Poultry (19 sheds), intense cattle
Surrounding vegetation: Grasslands & kikuyu pastures. Various aliens. Wattles on river banks. Occasional indigenous river vegetation
Score: 6 Largely modified. POOR condition



Mini Sass # 7: Petrus Stroom Farm #2

Surrounding land use: U/S Cattle, dairy. Pastures, irrigated crops. Test site situated between two houses in close proximity to river
Surrounding vegetation: U/s Kikuyu pastures, veld grass, indigenous alongside river. On site kikuyu lawn and mown veld grass, large scattered Blue Gum trees
Score: 3.9 Seriously / critically modified VERY POOR condition)

Mini Sass #8: Howick : Midmar Dam: gauging weir d/s of dam wall near road bridge

Score: 5.1 Score on the edge between Seriously / critically modified (VERY POOR condition) and largely modified (POOR condition)

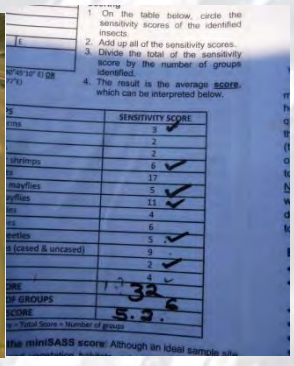
River upstream from Midmar

Release from Midmar

09-May

Mini Sass #9: Howick : Upstream of York Road Pump Station

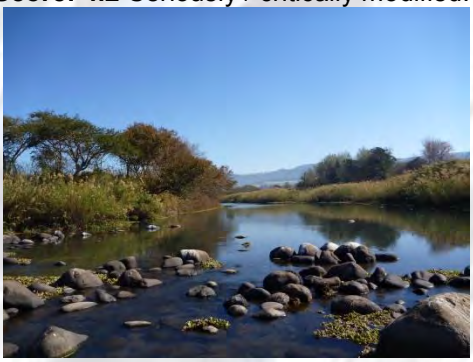
Lots of algae and sediment on rocks. Turbidity bad.
Surrounding vegetation: Natural floodplain and houses beyond
Score: 5.2 Largely modified. POOR condition



10-May **Mini Sass # 10: Fish Jump Falls: Umgeni Valley Nature Reserve**
Surrounding land use : Nature reserve immediately downstream of Howick
Surrounding vegetation: Valley Bushveld with some Balloon Vine, Mauritius Thorn. Heavy infestation of Nasturtium officinale in river.
Score: 3.2 Seriously / critically modified. VERY POOR condition

10-May **Sass # 11 : Hilton College**
Surrounding land use: Game Reserve
Surrounding vegetation: Valley Bushveld
Score: **Unrecorded** but noted as Moderately modified, Fair condition: improved since previous test site (done with school group)

13-May **Sass # 12: Albert Falls Below Dam Wall**
Surrounding land use: U/s dam
Surrounding vegetation: Indigenous
Score: 4.2 Seriously / critically modified. VERY POOR condition



River upstream of Albert Falls Dam

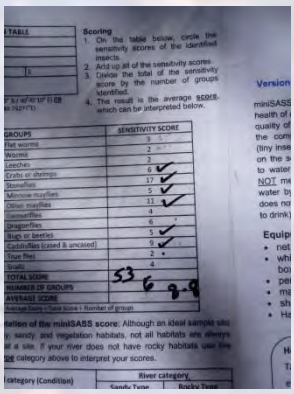
Release from Albert Falls Dam



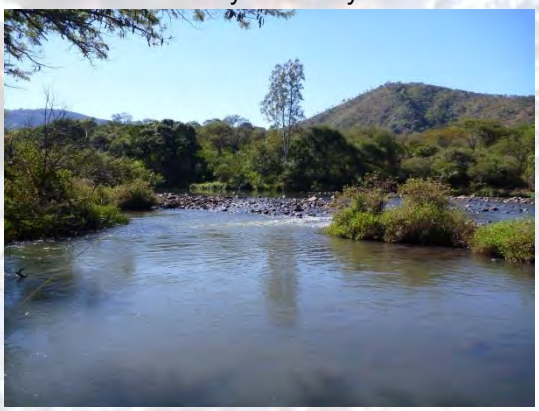
14-May **Mini Sass # 13: D/s of Wartburg Road Bridge, about 1km u/s of Valley of 1000 Hills**
Water Samples about 50-100m d/s of bridge. Gum and Syringas, Wattles, Mulberry, bit of Bramble, Gooseberries, *Passiflora*
Surrounding land use: U/s: feed lot, cane. On site: cattle
Surrounding vegetation: Giant gums lining river, occasional Elephants Ears
Score: 6.4 Moderately modified. FAIR condition

15-May **Mini Sass # 14: Cumberland Nature Reserve**
Surrounding land use: Game reserve
Surrounding vegetation: Valley Bushveld. All aliens removed and on opposite side large gums along river
Score: 6.75. On the top end of Moderately modified. FAIR condition. Highest score since upstream of Howick


17-May **Mini Sass #15: Upstream of Nagle Dam**
Surrounding land use: Nothing
Surrounding vegetation: Valley Bushveld. Working for Water cleared two years ago – occasional *Chromolaena*
Score: 8.8 Unmodified NATURAL condition. Found a stone fly


19-May **Mini Sass #16: D/s Nagle wall, opposite sluice gate outlet**
Surrounding land use: U/s: Dam & Hydroelectric station outflow – very warm air from outlet, water tepid. Site: No land use, no habitation
Surrounding vegetation: U/s Young Yellowwood forest opposite hydro outlet giving way to Valley Bushveld at site with young *Schyzigiums* on river banks. Heavy Lantana and *Chromolaena* infestations. Also Wattle and Mauritius Thorn
Score: 5.0 Seriously / critically modified. VERY POOR condition


River upstream of Nagle Dam


Release from Nagle Dam - hydro station outlet


Silt sluice gate outlet

20-May **Confluence of uMsunduzi & uMngeni**. Huge contrast between the two rivers – start of verdant green vegetation rooted in water's edge
uMsunduzi: Algae and sludge on the rocks, Elephant Ears
At crossing of Duzi: on right bank – Water Hyacinth, Peanut Butter Cassia, Elephant Ears, very green aquatic plants in water, algae and slime on rocks

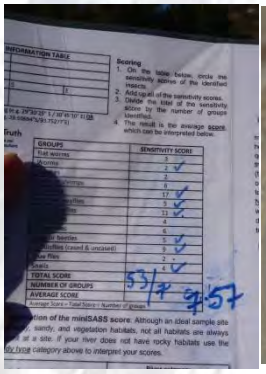
Mini Sass # 17: Bottom of Mamba Gorge

Surrounding land use: minimal cattle grazing
Surrounding vegetation: Valley Bushveld. Clumps of Elephants Ears, some Water Lettuce, invasive *Convolvulus* spp in one area
Lots of snails, limpets, lot of algae on rocks. No bugs and beetles.
Score: 6.2 Moderately modified. FAIR condition

22-May

Mini Sass # 18: Imfula Store

Surrounding land use: Nil
Surrounding vegetation: Valley Bushveld. Occasional Water Lettuce, Elephants ears along rivers edge
Score: 7.57 Unmodified. NATURAL condition



25-May **Mini Sass # 19: 3.7km as crow flies d/s of Inanda Dam wall**

Surrounding land use: U/s = Inanda dam. Site: Nil – road close to river
Surrounding vegetation: Valley Bushveld
Flat worms lots of *Planaria* and snails. Only water striders, brown / green caddis fly (seen below Albert Falls and once since then), lots of cased caddis flies. Minnow and other mayflies.
Score: 6.2 Moderately modified. FAIR condition

River upstream of Inanda Dam

Release from Inanda Dam

25-Jun **Mini Sass # 20: Molweni, outer Durban**

Surrounding land use: Scattered homesteads
Surrounding vegetation: Indigenous
Score: 6.0 Largely modified. POOR condition

25-Jun **Mini Sass # 21: Molweni Causeway d/s of cemetery**

Surrounding land use: Low cost houses. Illegal dumping

Surrounding vegetation: U/s = natural vegetation. Riverine forest choked with aliens. Light infestation of water lettuce

Score: 6.75 Moderately modified. POOR condition

25-Jun **Mini Sass #22: Five Fingers Causeway**

Score: 5.5 Largely modified. POOR condition

25-Jun **Mini SASS # 23: New Road Bridge, KwaDabeka, below gauging weir**

Surrounding land use: housing, disturbance from new road bridge construction

Surrounding vegetation: Mexican Sunflowers, Peanut Butter Cassia, Water Lettuce with signs of Bio control

Score: 5.33 Largely modified. POOR condition

25-Jun **Mini Sass # 24: Mango Rapids**

D/s of Durban WWTW

Surrounding land use: housing beyond floodplain. Floodplain ploughed – marigold farm

Surrounding vegetation: Water Lettuce, riverine forest choked with Bugweed

Score: 5.25 Largely modified. POOR condition

25-Jun **Mini Sass # 25: Silver Pipe: Reservoir Hills**

Surrounding land use: houses
Surrounding vegetation: Water Lettuce, heavy infestations of Balloon Vine and other aliens
No rapids at site, water murky. Sandy. Possibly skewed results lack of flow?
Score: 2.5 Seriously / critically modified. VERY POOR condition

25-Jun **Mini Sass # 26: U/s N2 Bridge**

Surrounding land use: U/s = natural area left bank, golf course right bank
Surrounding vegetation: Left bank natural, cleared of aliens. Algae present
Score: 4.67 Seriously / critically modified. VERY POOR condition

Umgeni Water Laboratory Test Results

In order to gain a greater insight into the results of the laboratory tests, Umgeni Water provided results from their routine test sites on the river taken during the same time period as the uMngeni River source to sea walk.

With this consistent set of data down the river, the result in change over distance is very revealing and informative – trends are established over length and time and results not consistent with trends raise alarm bells.
Tests indicated in the table below include the following:

CA – Calcium

Coliforms – A broad class of bacteria found in our environment, including the faeces of man and other warm-blooded animals. The presence of coliform bacteria in drinking water may indicate a possible presence of harmful, disease-causing organisms. (http://www.bfhd.wa.gov/info/coliform.php)

Conductivity – Electrical Conductivity: Indicator of total salinity. The measure of the capacity of water to conduct electricity directly relates to the concentration of salts dissolved in water. Salts dissolve into ions which conduct electricity. (Department of Water Affairs and Forestry).

DO – Dissolved oxygen

E. coli – Bacteria occurring in the human and animal gut. Elevated levels can be caused by livestock, however extremely elevated levels are indicators of sewage contamination from human faeces. Acceptable levels in water for drinking: 0 ppm (part per million). Acceptable levels in water for recreation: 127 ppm

NH_3 – Ammonia: a reduced form of nitrogen present in sewage discharge and small amounts of air, soil and water and in large amounts of decomposing organic matter. Relative proportions controlled by water temperature and pH (Department of Water Affairs and Forestry)

NO_2 – Nitrite: the inorganic intermediate of the oxidation of organic nitrogen and ammonia; usually measured and considered with NO_3. From discharge of effluent stream containing human faeces, agricultural fertilisers, organic industrial wastes

NO_3 – Nitrate: the end product of the oxidation of organic nitrogen and ammonia; usually measured and considered with NO_2. From discharge of effluent stream containing human faeces, agricultural fertilisers, organic industrial wastes

pH – Acidity: determined by geological and atmospheric influences and affected by temperature, concentrations of inorganic and organic ions and biological activity (Department of Water Affairs and Forestry)

SRP – Soluble Reactive Phosphate: see below under TP – Orthopohosphate

SS – Suspended solids: the amount of suspended solids in water. In South Africa most rivers except some in the Drakensberg foothills become highly turbid during the rainy season from natural erosion. This is exacerbated by bad land use practices. Suspended solids can also result from discharge of domestic sewage. (Department of Water Affairs and Forestry)

TOC – Total Organic Carbon: Organic contaminants (natural organic substances, insecticides, herbicides, and other agricultural chemicals) enter waterways in rainfall runoff; domestic and industrial wastewaters and accidental spills or leaks may also enter streams. (http://kywater.org/ww/ramp/rmtoc.htm)

TKN – Total Nitrogen: includes NH_3 (ammonia), NO_3 (nitrates) and NO_2 (nitrites)

TP – Total phosphate: the sum of the following:
Orthophosphates (also called SRP) (used heavily in fertilisers, enters rivers via surface runoff).
Organically bound phosphates (found in human and animal wastes or in decaying organic matter.)
Condensed phosphates (sometimes added to water supplies and industrial processes) (http://www2.vernier.com/sample_labs/WQV-07-COMP-ortho_total_phosphates.pdf)

Staff from the laboratory at Umgeni Water assisted with the interpretation of the results as there are not always benchmarks indicating standard acceptable concentrations or levels and even when there are such benchmarks, analyses are not straightforward and often need to examine trends, or either the context or the bigger picture relating to the samples, as results may or may not be acceptable depending on local conditions as well as factors such as climate, season and rainfall for example:

- COD will be higher in areas of shale, dolerite and sandstone
- COD increases in winter (increased concentrations caused by lower water levels)
- pH can vary naturally for example:
    - when CO_2 (Carbon dioxide) dissolves in water, the pH will drop (become more acidic)
    - when algae is present and using CO_2, the pH of the water increases (i.e. becomes more alkaline)
    - pH may vary both diurnally and seasonally (*Water Quality Guidelines vol 7)*
- In rivers, NO_3 (Nitrates) from lightening break down N_2 (Nitrogen) into gas

Furthermore, sometimes results from different tests need to be examined together to obtain a clear indication of water quality:
The toxicity of NH_3 (Ammonia) is influenced by pH and temperature
SS (Suspended solids) and NTU (Turbidity) should be looked at together

Interestingly, the quality of water can and often does improve in large dams

- Nitrogen compounds in dams [NO_3 (Nitrates) and NO_2 (Nitrites)] are converted into NH_3 (Ammonia) via anaerobic processes

- Bacteria “steals” O_2 (Oxygen) from the water and converts it to NH_3 (Ammonia) as a bio gas which is released to the atmosphere

Thus, as we cannot take each test type and read its results in isolation to gain a clear indication of the water quality of the uMngeni River, this discussion will investigate the trends with particular attention to areas where test scores have increased drastically and indicate water quality problems

In the table below, figures highlighted in yellow are of concern / indicate problems in water quality:

Umgenipoort Bridge **Mini SASS: 7.1 Largely natural**

Raised levels of NH_3, SRP, TP

Most likely a combination of decaying vegetation from forest, clay soils and agricultural runoff:

The site is at the downstream end of indigenous forest. A dirt road of predominantly clay soil leading down from agricultural pastures crosses the river. There was some evidence of soil erosion from this road.

NH_3 is associated with clay minerals and enters aquatic environments through soil erosion. Sample was taken at around 10h00 (Department of Water Affairs and Forestry)

SRP – likely from fertilisers entering river: agricultural pastures beside on the dirt road

TP – combination of fertiliser (SRP) run off and decaying vegetative matter from the forest

Petrusstroom Farm #2 **Mini SASS: 3.1 – Very Poor condition**

Raised levels of TOC

Most likely from cattle faeces

The sample site is downstream of a small dairy farm close to the milking parlour and a point where cattle have access to the river

TOC - natural organic substances, insecticides, herbicides, and other agricultural chemicals

Inlet to Midmar Dam

Raised levels of TOC

Most likely from the arable lands

The site is downstream of intense agriculture

TOC - insecticides, herbicides, and other agricultural chemicals enter waterways in rainfall runoff`

Ngkulu Stream

Elevated levels of Conductivity, E. coli, SRP, SS, TOC, TP

Most likely from sewage contamination

The sample site is situated downstream of the constantly surcharging sewer system in Mpophomeni which enters this stream that runs into a bay of Midmar Dam. The stream also runs through an agricultural area and cattle have access to the stream. There is no wetland to polish the water.

Conductivity - increased salinity from sewage

E. coli – increased level from sewage
SRP – this is supported by the elevated TP
SS - from discharge of domestic sewage
TOC – from sewage
TP – from fertilisers, human and animal waste

Mthinzima Stream confluence with Midmar

Elevated levels of E. coli, NH_3, NO_3, SRP, TOC, TP
From sewage contamination
The sample site is situated on the confluence of the stream and Midmar Dam. The stream runs through Mpophomeni and is constantly contaminated with sewage from the malfunctioning and surcharging Mpophomeni sewage system.
The raised levels are all indicative of sewage contamination

Midmar Outlet Weir **Mini SASS: 5.1 Poor / Very Poor condition**

Raised levels of NH_3, decreased pH
Most likely from turnover in Midmar Dam
Site is approximately 500 metres downstream of Midmar Dam wall
NH_3 – large amounts of decomposing organic matter stirred up with changing water temperatures and being released from Midmar.
pH – this may be a combination of two factors: at night, the major processes of respiration and decomposition release CO_2, resulting in a decrease of pH. In addition the sample was taken at around 07h00 and pH decreases as temperatures increase, iow as the day begins to warm up.

Fish Jump Falls **Mini SASS: 3.2 Very Poor Condition**

Raised levels of Coliforms, Conductivity, E. coli, NO_2, NO_3, SRP, TP, pH
Most likely from sewage from surcharging sewers in Howick as well as the Howick Waste Water Treatment Works
Site situated downstream of Howick town and WWTW effluent outflow. River heavily infested with Nasturtium officinale (Watercress) and algae – signs of nutrification.
Coliforms – indicator of possible presence of harmful, disease-causing organisms
Conductivity - increased salinity from sewage
E. coli – from sewage
NO_2 – From discharge of effluent stream containing sewage
NO_3 – From discharge of effluent stream containing sewage
SRP – from fertilisers: possibly emanating via homes in Howick
TP – from fertilisers and human waste
pH – when algae is present and using CO_2, the pH of the water increases

Above Valley of a Thousand Hills

Raised levels of Conductivity, SRP, TP
Most likely from agriculture upstream
Site situated downstream of intense agriculture including arable lands, feed lot, crocodile and dairy farm.
Conductivity - increased salinity from sewage
SRP - likely from fertilisers entering river
TP – total phosphates from fertilisers and animal waste

Nagel Dam inflow

Raised level of TOC

Only known possible source from dense natural vegetation of Nagel Dam Game Reserve

Site situated on Nagle Dam Game Reserve, and downstream of a long length of Game Reserve where the natural bush is extremely thick

TOC – a natural organic substance

Molweni Causeway **Mini SASS: 6.75 Poor condition**

Raised levels of EC, NH_3, SRP, TP

Most likely from sewage contamination

Site situated in outer area of Durban – below various low cost housing and informal settlements

NH_3 – present in sewage discharge

SRP – from fertilisers / decomposing bodies?

TP – combination of human and animal waste and fertilisers

Reservoir Hills **Mini SASS: 2.5 Very Poor condition**

Raised levels of Conductivity, Coliforms, EC, E. coli, NH_3, NO_2, NO_3, SRP, SS, TKN,TP

Most likely from sewage contamination

Site situated in Durban downstream of various surcharging sewers and a Waste Water Treatment Works

Conductivity - increased salinity from sewage

Coliforms - indicator of possible presence of harmful, disease-causing organisms

E. coli – from sewage

NH_3 – present is sewage discharge

NO_2 – from discharge of effluent stream containing human faeces

NO_3 – from discharge of effluent stream containing human faeces

SRP – from sewage

SS – can result from discharge of domestic sewage

TKN – the combination of NH_3, NO_2 and NO_3 all from sewage

TP – human and animal waste and fertilisers

N2 Bridge **Mini SASS: 4.67 Very Poor condition**

High levels of Conductivity, NH_3, SRP, TP

Most likely a combination of sewage and fertiliser contamination.

Site situated downstream of most of Durban City. However, just upstream of this site was a length of river with restored riparian habitat on one bank, and a sports complex of soccer, rugby and cricket fields and a golf course on the other bank. Thus there few were places of point source contamination. This is possibly why the results, although elevated, are lower than the previous site.

Conductivity – increased salinity from sewage

NH_3 – present is sewage discharge

SRP – From fertilisers – possibly Durban homes or industry

TP – human and animal waste and fertilisers

Colour Key:

Mayday Walk data
Umgeni Water dataset
Result of concern
Result of interest (mostly concern)
Good result

UMGENI WATER · AMANZI

			COD	Coliforms	Conductivity	*E. coli*	NH3	NO2	NO3	SRP	SS	TKN	TOC	TP	Turbidity	pH	Mini SASS
			mg O2/l	/100ml	mS/m	/100ml	mg N/l	mg N/l	mg N/l	ug P/l	mg/l	mg N/l	mg C/l	ug P/l	NTU	-log10[H+]	
Source	**Umgeni Source**	protected wetland	<20	980	4.18	10	<0.04	<0.050	<0.050	<3.00	<4.00	<1.00	<0.70	<15.00	0.72	7.31	
	Umgeni Poort Bridge	Upper Dargle: downstream of indig forest & grassland	<20	261	3.4	57	0.1	<0.050	<0.050	14.6	<4.00	<1.00	1.8	31.21	1.1	7.81	**7.1**.GOOD
	Singisi Bridge	Dargle: downstream of timber areas	<20	1158	5.46	54	<0.04	<0.050	0.13	<3.00	<4.00	<1.00	1.95	20.11	4.7	7.28	**7** GOOD
	Petrusstroom Farm #2	Dargle - d/s of intense irrigated crops & dairys	<20	310	7.23	60	0.04	<0.050	0.2	6.82	<4.00	<1.00	3.45	<15.00	6.6	7.57	**3.9**. VERY POOR
	Inlet to Midmar dam	Petrusstroom - 100m d/s of bridge	<20	910	7.83	90	0.04	<0.050	0.15	10.04	<4.00	<1.00	3.19	19.4	8.63	7.44	
	Nguklu Stream	Midmar - stream feeding bay between Ntinzima & Pylon Bays	<20	7100	13.86	2900	0.09	<0.050	0.39	26.72	64.4	<1.00	3.6	112.1	72.6	7.78	
	RMT006-uMthinzima	Stream running through Mpophomeni			28.5	5480	**4.9**	0.7	2.84	**352.13**	16		**6.63**	**456.84**	17.3	6.8	
Midmar																	
	Midmar Outlet Weir	d/s of Midmar Dam	<20	33	9.09	2	0.64	<0.050	<0.050	<3.00	10.8	<1.00	2.84	20.63	27.6	6.72	**5.1** POOR
	RMG034-uMngeni j	just u/s Howick WWW outfall*	<20.00		10.56	520	<0.50	<0.50	0.57	<100.00	11		2.26		14.2	7.6	
	RMG035-uMngeni d/s Howick WWW outfall u/s Merrivale str*	d/s Howick WWW outfall u/s Merrivale str	<20.00		11.09	680	<0.50	<0.50	0.94	<100.00	12		2.35		17.4	7.3	
	RMG036-uMngeni d	/s Merrivale Stream*	<20.00		12.2	660	<0.50	<0.50	1.08	<100.00	<4.00		2.63		14.4	7.9	
	Fish Jump Falls	about1km d/s of Howick WWTW outlet	<20	198600	12.05	3900	0.13	0.17	1.13	89.1	11.6	<1.00	2.88	235.6	12.5	8.25	**3.2**VERY POOR
Albert Falls																	
	Greytown Bridge	d/d of agriculture	<20	976	7.92	50	<0.04	<0.050	0.18	<3.00	<4.00	<1.00	2.17	19.86	5.62	6.99	
	Umgeni/Umshwathi Confluence	d/s of agriculture	<20	>4838	8.79	48	<0.04	<0.050	0.15	<3.00	8	<1.00	2.62	61.02	6.83	7.52	
	Approx 1km u/s of Valley of a 1000 Hills	d/s of feedlot, small holdings, cattle	<20	>4838	34.1	210	<0.04	<0.050	0.18	21.8	<4.00	<1.00	1.33	39.9	1.57	8	**6.4** FAIR
	Nagle Dam Inflow	Gauging weir	<20	649	9.16	23	<0.04	<0.050	0.18	3.1	<4.00	<1.00	6.48	16.21	7.3		
Nagle Dam																	
	RMG016-uMngeni	d/s of Nagle Dam			10.39	128	<0.04	<0.05	0.3	8.64	14		2.74	37.7	21.5	7.7	
	RMG017-uMngeni	just d/s Duzi confluence			34	60	0.08	<0.05	1.12	**62.54**	7.6		3.89	**103.2**	16.9	7.4	
	RMG020-uMngeni Inanda Dam	Inanda Dam inflow			29.1	120	0.11	<0.05	1.65	**52.73**	28		3.81	**132.35**	17.9	7.7	
Inanda Dam																	
	RMG022-uMngeni weir	weir d/s of Inanda Dam			24.3	62	0.2	<0.05	<0.05	12.76	<4.00		2.88	26.11	1.48	7.5	
	Molweni	Outer Durban	<20	2419	26.4	221	0.24	<0.050	0.46	41.04	6.4	<1.00		74.85	6.11	7.31	**6.75** POOR
	Reservoir Hills	Durban	<20	198600	33.5	10500	0.8	0.7	1.86	132.11	80	2.03		718.15	41.6	6.93	**2.5** VERY POOR
	N2 Bridge	Durban	<20	>2419	33.4	1046	0.5	<0.050	0.71	19.86	8	<1.00		94.87	8.28	7.31	**4.67** VERY POOR

Appendix 9

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