Implementation of Small Community Owned Water Access Schemes

Vimbukhalo Village

August 2022

1. Background

The Vimbukhalo community is located near Emmaus and falls under the Okhahlamba Local Municipality within the Uthukela District Municipality of KwaZulu-Natal. Vimbukhalo is approximately 9km and 19km travel distance from the centres of Emmaus and Winterton respectively.

There is currently no reticulated municipal water supply in the area. Current water sources accessed by the community include:

- a municipal installed spring fed tank and communal tap located in one section of the village
- a community borehole feeding a tank and communal tap (donated by Sappi)
- an old spring fed tank and communal tap
- a few boreholes with hand pumps around the community
- a few undeveloped springs

A site visit was conducted on 12 August 2022 to assess some of the existing and potential water sources and supplies, and look at possible assistance in further developing these in order to provide additional or better access to water for community households.

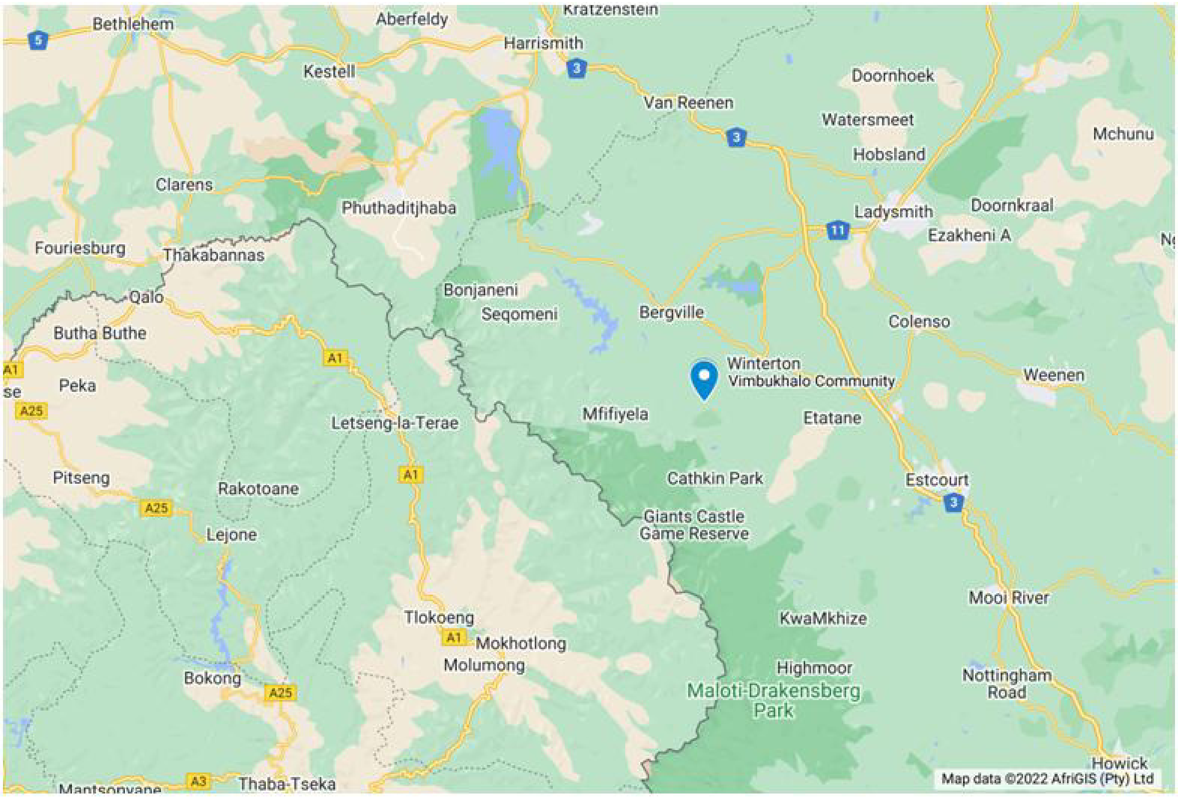

Fig1: Map showing project location

Fig2 Map showing project area and location of some identified water sources

2. Water Sources

2.1 Borehole with single phase electric submersible (Location: 28° 53’ 04.5”S, 29° 24’ 51.86”E)

There is an existing borehole equipped with a single phase submersible pump. The borehole pump was donated to the community by Sappi in 2012. The borehole feeds a nearby 5000l tank on a 2m high stand and water is accessed through a single communal standpipe located near the tank. The electrical supply for the borehole is from a private household prepaid connection and the community contributes towards the cost of the electricity usage. There was an electrical issue awhile back and the community tried to repair this, including replacing the electrical cable between the household and the borehole. However, the pump is currently not operational. The community has requested assistance in repairing the borehole equipment and has also expressed interest in reticulating this supply to a few more access points around the village.

Figs 3 & 4: 5000l water tank and standpipe fed by borehole

Figs 5 & 6: Borehole and control box

Figs 7 & 8: Borehole baseplate and state of electrical work

2.2 Spring 1 (Location: 28° 53' 10.5"S, 29° 25' 06.64"E)

The community took the visiting team to a spring situated outside the community area and within Sappi lands, about 300m from the nearest household. This is an undeveloped gravity spring that the nearby households walk up to, to collect water. This spring is perennial although has a low flow in the dry months. At the time of the visit the flow was estimated to be approximately 3 litres per minute. The community requested assistance in developing the spring and piping water closer to the village. Any work conducted at this spring would need to involve discussions with Sappi in order to obtain approval to do so. It would also be advisable to check whether the land directly around the spring is intended to be used for plantations as this could impact the availability of water in the future.

Figs 9, 10 & 11: Spring1

2.3 Spring2 (Location: 28° 53’ 13”S, 29° 24’ 37.2”E)

A second “spring” location was also shown by the community. This comprised two small collection points built by the community using concrete blocks around two small “seeps” within a natural drainage channel / watercourse. Flow appears very low and it is not apparent whether the water at these two collection points are definitely from “springs” or whether from the surface water in the channel working its way through the rock at that point.

At the time of the site visit no further investigation was conducted higher up towards the head of the channel. This area also appears to be heavily trafficked by livestock making it difficult to collect uncontaminated water. It is not recommended to undertake any development of this water source.

Figs 12, 13, 14 & 15: ”Spring2”

2.4 Spring3 (Location: 28° 53’ 26.6”S, 29° 24’ 19.2”E)

A third spring viewed is an existing system developed many years ago. This spring feeds an old concrete tank that supplies two standpipes near the tank. Water leaks and a fairly flat terrain have resulted in ponding of water around the standpipes, making them difficult to access. Some repair work to the concrete tank is also required as it is leaking through the sides of the structure. The spring source was not evident but its position was pointed out by the community. No water or physical structure (other than some rocks) could be seen as these lie under grassland, but the system is functioning and water is available at the tank and standpipes. There is no fencing around the spring source.

Figs 16 & 17: Spring3 source and tank and standpipes

Figs 18 & 19: Standpipes and concrete tank

2.5 Other Sources

A spring on a hillside on the western side of the village has been protected by the municipality and supplies a tank and standpipe. The community mentioned that there are issues at the spring protection structure and that they are still waiting for the municipality to attend to this.

There a few municipal boreholes with hand pumps situated around the village.

The community mentioned a further old spring fed system. There used to be two concrete tanks in the eastern and southern sections of the village, similar to the tank at "spring 3", that got water from one or two springs higher up above the village. One of the tanks is no longer there but some water is still accessed out of an old feeder pipe. The second tank still exists but it seems there is no water at this tank. The facilitation team working with the community will investigate this old system further to see if it can still be repaired or used in some way.

3. Proposed Interventions

3.1 Borehole

The refurbishment of the borehole has been indicated as the priority work under this project. The work required to refurbish the borehole is described as follows and includes assessing the existing pump, repairing the electrical works and possibly supplying an additional storage tank.

- The existing borehole pump will need to be removed and assessed to see if it can still be used or whether a replacement pump will be required. It is recommended to test the yield of the borehole in order to check the suitability of the existing pump, or to guide in sizing a suitable replacement. Water samples can also be taken at the time of yield testing and sent to test for suitability of the water for drinking purposes.

- The electrical works for the borehole need to be redone irrespective of whether the existing pump can be used or whether a new pump is needed. The existing pump control / electrics in the lockable steel enclosure at the borehole is in a bad state and needs to be replaced. The cable installed by the community between the borehole and household with the electrical connection is not the recommended cable type and may not have been suitably sized and the installation not done to standard. Some unsafe and/or incorrect cable joins were noted at the visit. It is recommended to replace this cable with a cable advised by the pump specialist appointed to work on the borehole equipment. The electrical works should also be carried out by a registered electrician / wireman. It would be further proposed to wire the pump connection with its own circuit breaker at the household DB board rather than to plug into a household electrical socket.

- The community indicated that the borehole used to fill the existing 5000l tank in approximately 4-5 hours. Given this flow it should be possible to provide a second 5000l tank to increase storage and potential to supply further houses in the village. However, this would be guided by the results of the pump test to be conducted.

Currently there is only one tap installed near the elevated storage tank. Part of the communities request for assistance was for extending the supply to additional access points around the village. This should be possible for village sections that lie below the tank position. One possible reticulation layout and coverage from the borehole has been shown in figures 20 and 21. This has been worked out based on the following assumptions and calculations:

- the borehole yield is not less than the estimated 1000 litres per hour
- communal standpipes and not yard connections are provided
- it is possible for the pipeline to cross the gravel road running through the village
- usage of 25 litres per capita per day and average of 8 members per household (200 litres per household per day). The guideline for yard taps is more at 55 l/c/day)
- storage capacity of 10 000l
- borehole pumping 10 hours per day
- maximum walking distance to standpipe (+-250m)
- number of standpipes = 6
- total households served = +-50

This layout is provided as a starting point for discussions with the community around the type and extent of the supply, and it is anticipated that revisions to the layout and position of taps etc will be necessary. If yard connections (taps or drums) are preferred then coverage would need to be reduced and/or a system of water rationing implemented.

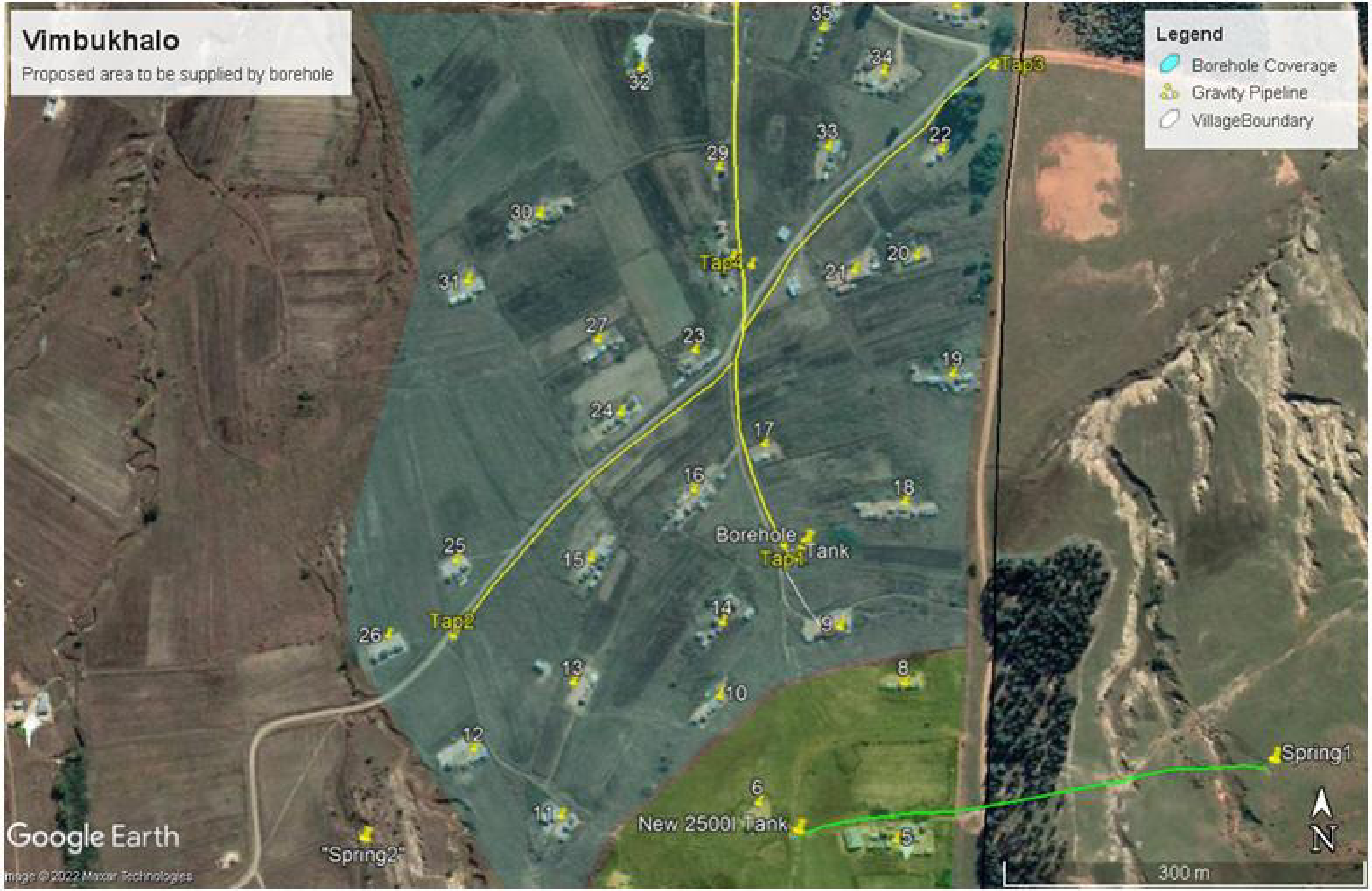

Fig 20: Example layout of borehole supply to village standpipes(map 1 of 2)

Fig 21: Example layout of borehole supply to village standpipes (map 2 of 2)

Fig 22: Example layout of supply from spring1

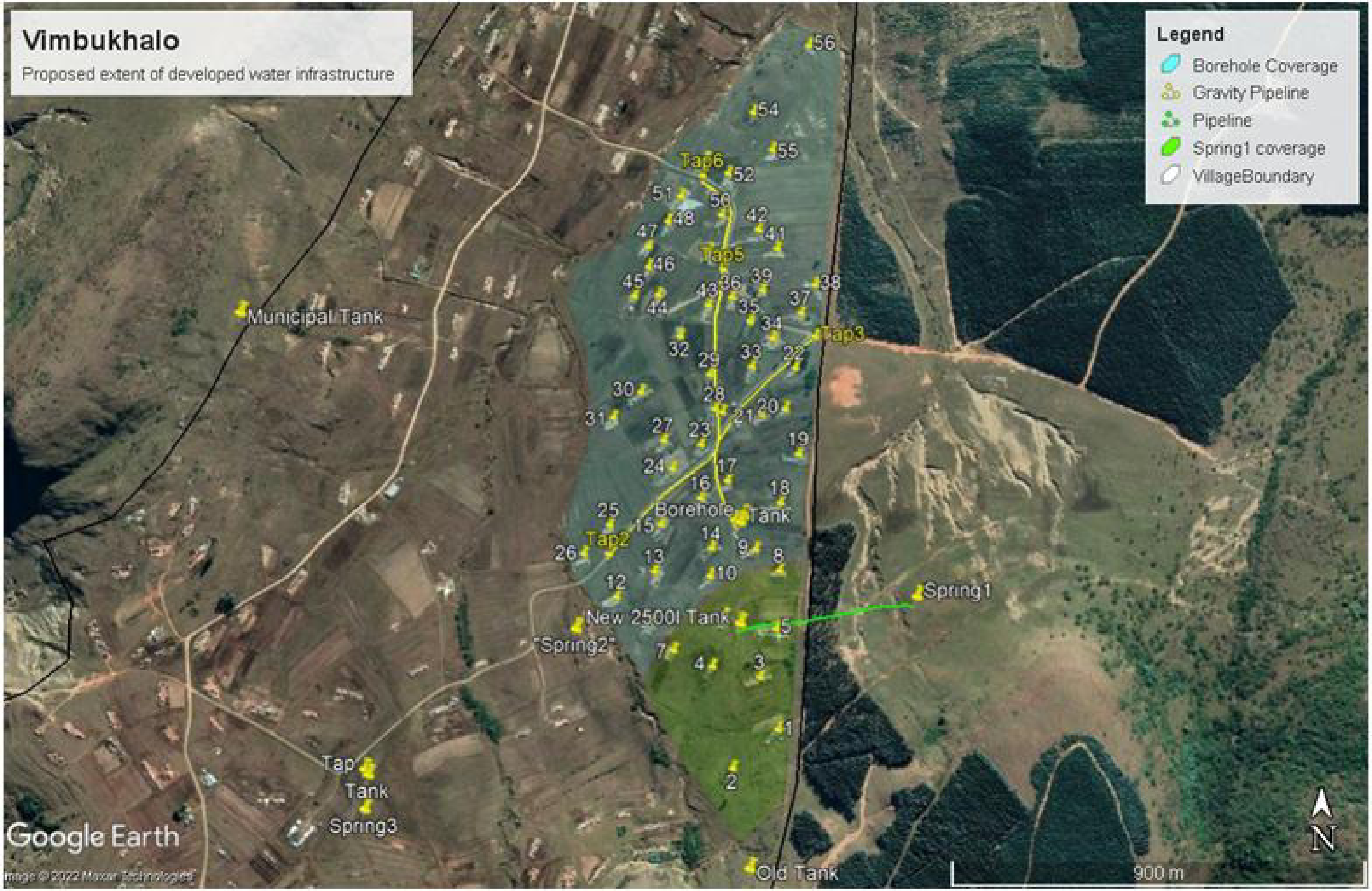

Fig 23: Possible overall extent of water supply from spring1 and borehole

3.2 Spring1

If required this spring could be protected and water piped to a storage tank in the village. The current flow from the spring (dry season) was estimated to be low at only 2-3 l/min. This would be sufficient to fill a 2500l tank overnight and could serve some of the higher lying households above the borehole position. Households at the top of the hill would, however, still need to walk down to the water access point at the tank. Development of this spring and running a pipeline to the village would involve discussions with Sappi as the spring lies on their land.

3.3 Spring2

No work is proposed to be undertaken at this source.

3.4 Spring3

The source and development of this supply is below ground so the condition of any collection structure here is unknown. However, water is flowing through to the old storage tank so no work is proposed to be undertaken at this source. Fencing could be added in this area to limit possible contamination of the water by livestock.

The concrete tank is leaking and would need some repair work. It is proposed to open the roof access, drain the tank, and then further inspect and line the interior of the tank with a membrane and waterproofing product.

A concrete walkway to provide easier access to the standpipes could be constructed. Local rock could be collected by the community and used as fill to create the base of the walkway that would then be topped with a concrete slab. The community could also look to open up the channel to allow drainage of the standing water along the existing natural drainage channel.

No further reticulation of this supply is recommended at this stage. Due to the position (elevation) of the water source and tank, reticulation would only be possible to houses further down the valley. The bulk of the households that rely on and that are closer to this supply, are located at a higher elevation i.e. water from this supply could not be reticulated (by gravity) closer to those households. The amount of water available from this supply is also unknown and the community did indicate water shortages experienced during a recent time of higher than normal usage from this supply.

4 Costings

The costing of the proposed work to be undertaken is presented below. The following assumptions are made in this costing:

- Borehole
  - depth of 100m (the costs will increase if the actual depth is more than this)
  - borehole is not dry or damaged and pump testing yields favourable results
  - pump to be replaced (if existing pump is in working order costs will reduce)
  - pumping 10 000l per day is possible
  - extra tank placed on ground next to existing tank (extra cost for elevated stand)
  - reticulation of water to 6 x communal standpipes

- Spring1
  - approval can be obtained from Sappi
  - developed to supply one 2500l tank with tap

This is one possible option and is subject to discussions with the community. It is anticipated that revisions will be required depending on the community's preference for the type of water access, the households that are to be part of this project, and the suitable and agreed positioning of the water access points.

A	Spring1 - Develop Spring1	Unit	Qty	Rate	Amount
1	V-box	sum	1	R3 500.00	R3 500.00
2	Fencing	sum	1	R3 500.00	R3 500.00
3	2500l Storage Tank	no	1	R3 500.00	R3 500.00
4	Concrete Slab	sum	1	R2 500.00	R2 500.00
5	32mm HDPE Pipe	m	500	R14.00	R7 000.00
6	Fittings	sum	1	R2 000.00	R2 000.00
	Sub Total				**R22 000.00**

B	Borehole -Rehabilitate Existing Borehole	Unit	Qty	Rate	Amount
1	Borehole pump testing (24hr)	sum	1	R28 000.00	R28 000
2	Borehole water testing (drinking water)	sum	1	R3 200.00	R3 200
3	Borehole single phase pump including pipe, fittings, control panel, protective cover and labour	sum	1	R50 000.00	R50 000
4	Installation of new cable	sum	1	R10 800.00	R10 800
5	Contingencies (15%)	sum	1	R13 800.00	R13 800
	Sub Total				**R105 800**

C	Reticulation	Unit	Qty	Rate	Amount
1	5000l Storage Tank	no	1	R6 000.00	R6 000.00
2	Concrete slab	sum	1	R3 000.00	R3 000.00
3	25mm HDPE	m	1500	R8.00	R12 000.00
4	32mm HDPE	m	100	R14.00	R1 400.00
5	40mm HDPE	m	300	R16.00	R4 800.00
6	Fittings	sum	1	R8 000.00	R8 000.00
7	Contingencies (15%)	sum	1	R5 280.00	R5 280.00
	Sub Total				**R40 480.00**

D	Spring3 - Repair Tank	Unit	Qty	Rate	Amount
1	Tank Repair (Brilatex + membrane)	sum	1	R4 000.00	R4 000.00
2	Walkway (Concrete)	sum	1	R4 000.00	R4 000.00
	Sub Total				**R8 000.00**

TOTAL (incl VAT)	**R176 280.00**

Some adaptations on the above are as follows:

- Use solar borehole pump +R100 000 = Total R276 280
  (Possible to consider leaving out the extra tank and reduce coverage to reduce costs if a solar option is preferred)
- Pump to higher elevation in village using the single phase electric pump priced above but with a reduced flow and therefore reduced household coverage = R196 280
  (Note: This omits development of spring1. Use of a larger pump to deliver more water to a higher elevation would most likely require a new dedicated pre-paid electrical connection)
- 3m Galvanised stand = + R25 000