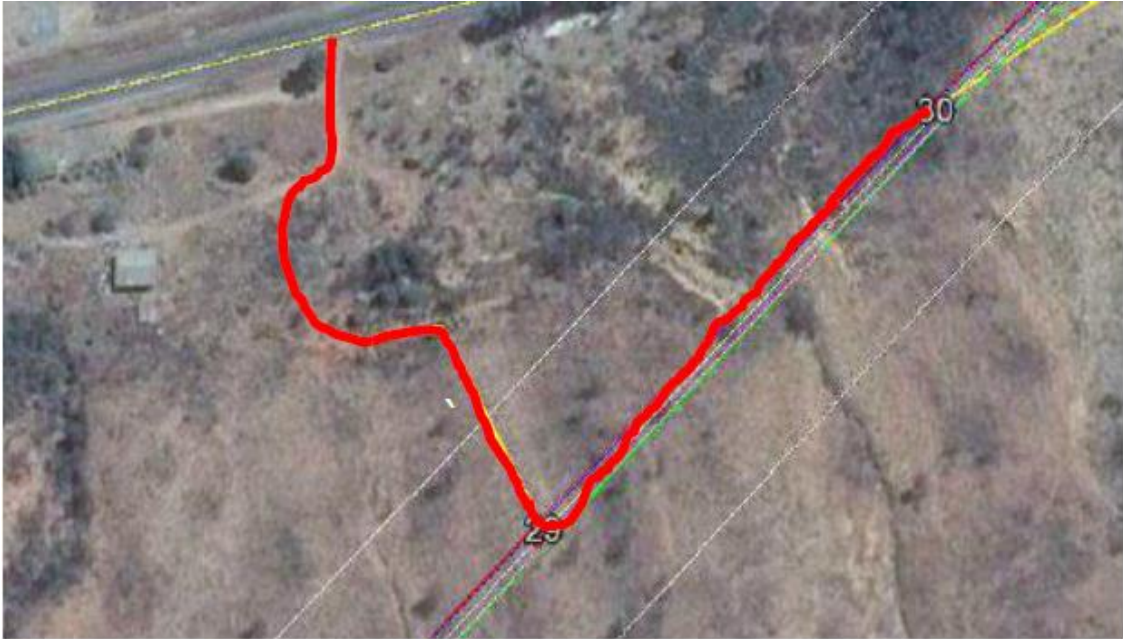


1. ACCESS ROADS TO EACH STRUCTURE

Structures 29 – 30

- Access from R43 into Quarry on private property.
- Existing gravel road on relative flat area.
- Access to proposed structures on 1m Cut/Fill.



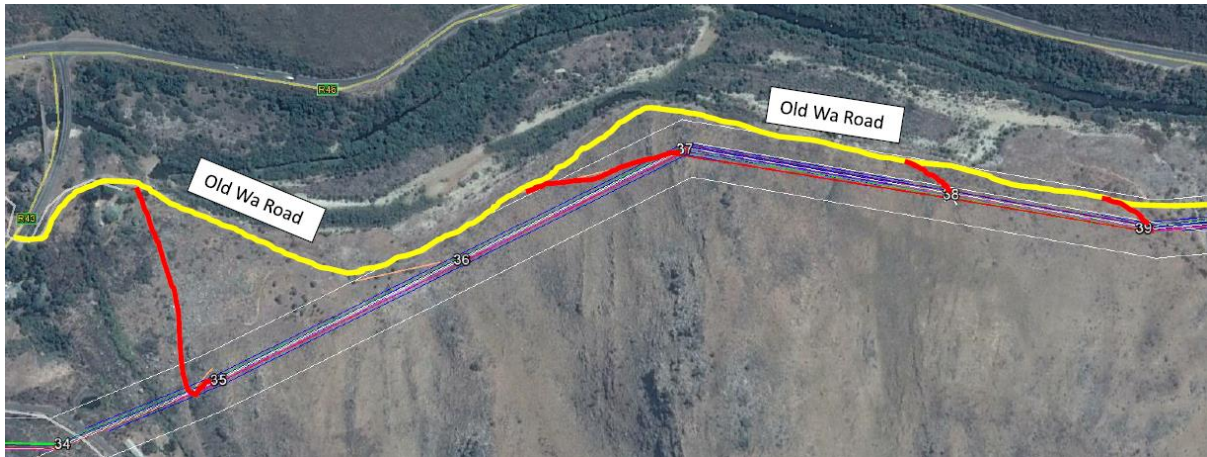
Structures 30 – 34

- Construct road from structure 30 on the same contour line all the way to structure 34.
- 1m – 1.5m Cut/Fill and rocks to be moved.
- New gate after structure 34 to get access to Wolwekloof road.



Structures 35-39

- From R43 into private property and onto existing gravel road (Old Wa Road).
- Stay on existing road with access roads to each structure.
- 1.5-2m Cut/Fill for access roads



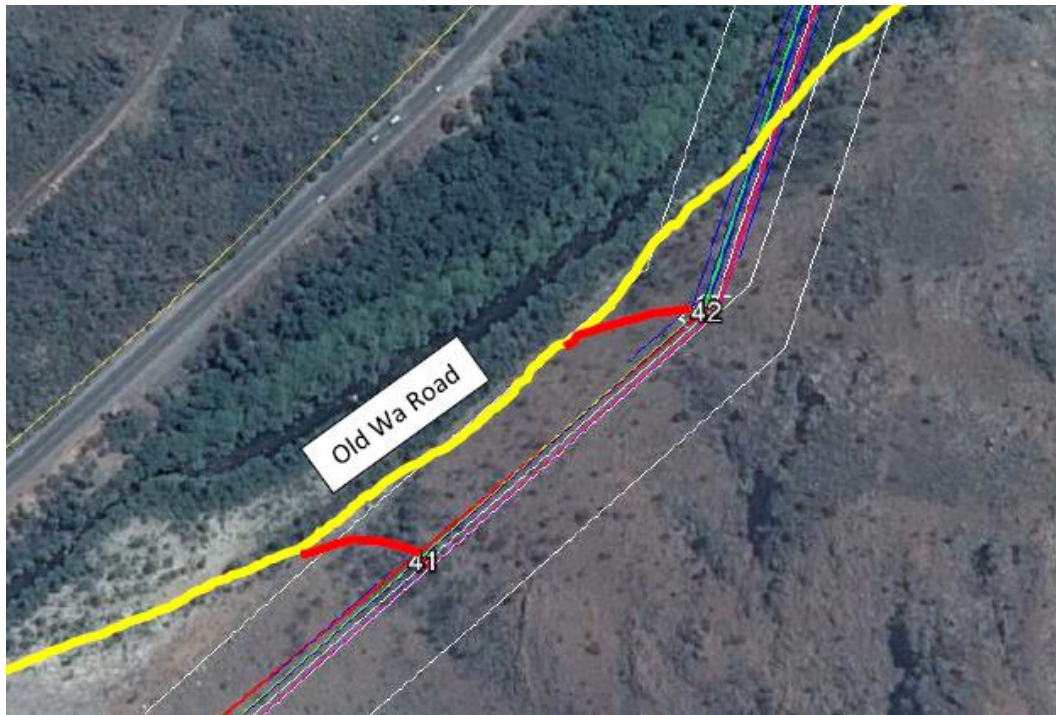
Low level structure between structures 39 and 40

- See heading 2 for typical low level river crossing structure description.



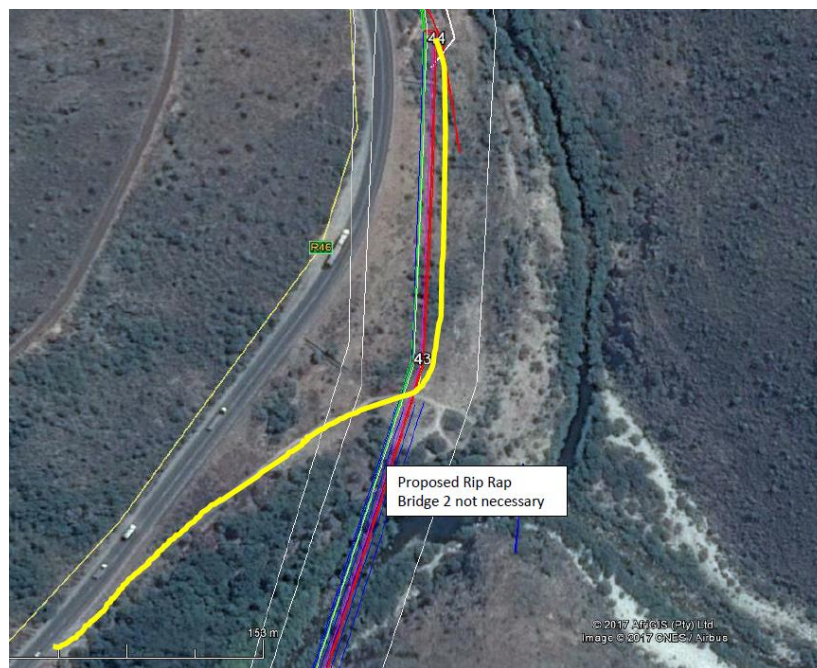
Structures 40 – 42

- Use Old Wa Road with new access roads to both structures.
- 1.5m – 2m Cut/Fill for access roads



Structures 43 and 44

- Access from R46 onto existing gravel road.
- 1.5-2m Cut/Fill between structures 43 and 44.
- Proposed Rip Rap Bridge 2 not necessary.



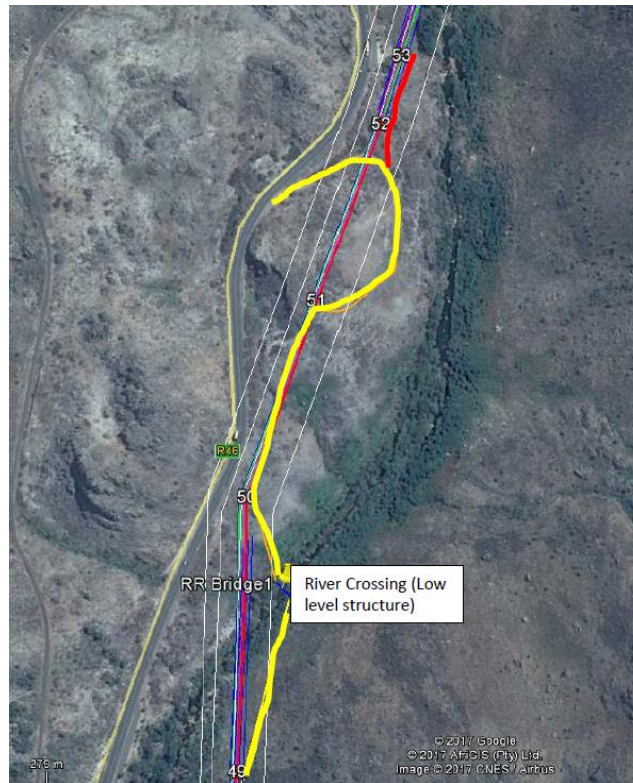
Structures 45 – 49

- Access from R46 between proposed structures 51 and 52.
- Construct river crossing between structures 50 and 49 (See heading 2 for description of typical low level structure)
- Follow Old Wa Road from structure 49 back to structure 45.
- 1m Cut/Fill between Old Wa Road and proposed structures.



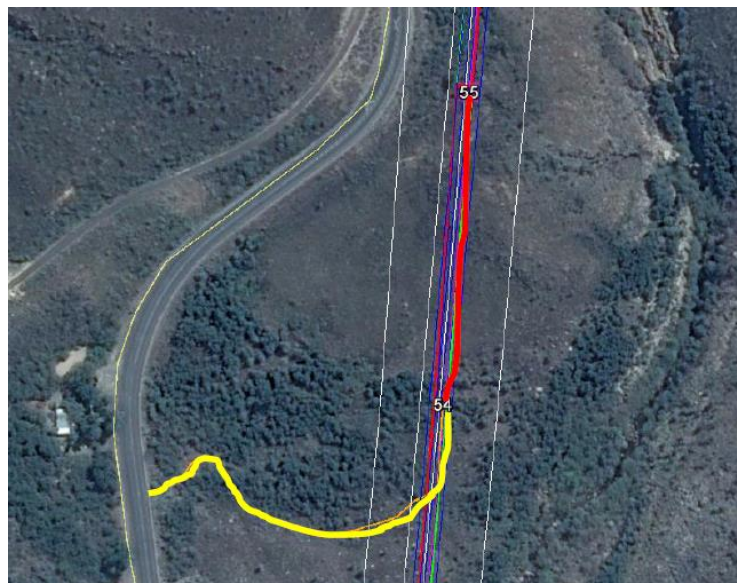
Structures 50 – 53

- Access from R46 between proposed structures 51 and 52 onto existing gravel road.
- 1m Cut/Fill between 51 and 53.



Structures 54 – 55

- Access from R46 (Close to Tolhuis Restaurant).
- Follow existing gravel road to structure 55.
- New road with 1m Cut/Fill to structure 55.
- Rocks to be moved.



Structure 56

- Next to R46
- Build steps to get access from R46

Structure 57

- Access from R46 onto existing Ceres Bergfynbos gravel road



Structure 58

- Next to view point parking.
- Minor works required for access

Structures 59 – 62

- Helicopter assisted.
- Alternative: Construct a road from structure 64 on same contour line. Major rocks to be moved.

Structure 62 - 66

- Construct road from Ceres water works site.
- Construct suspension bridge over stream. Approximately 5m wide.
- 1m – 1.5m Cut/Fill
- Structure 66 alternative: Helicopter assisted



2. LOW LEVEL RIVERBED CROSSING

The river crossings of the service road can be described as low-level structures which convey minor river flows through pipes and allow for regular overtopping of the structure in significant flood events.

The conceptual design for a typical river crossing of the service road entails stormwater conduits perpendicular to the flow direction. These conduits/pipes should be encased in mass concrete with a reinforced concrete slab to cover them. Earth embankments on the river banks will follow the service road alignment to tie the low-level structure in with the vertical alignment of the service road.

Typically, two 900 mm diameter stormwater pipes centre aligned with the main stream, with two 750 mm diameter stormwater pipes adjacent to 900mm diameter pipes will be required. The minimum width of the low-level structure, perpendicular to flow, is approximately 5 m. The minimum height is approximately 1.3 m from the invert level of the pipes to the top of the cover slab. On either side of the structure gabions and/or reno-mattresses will serve as erosion/scour protection for the approaches/embankments of the service road. These low-level structures cannot be constructed with stone pitching or rip-rap, as the available energy during flood events easily displaces individual components. Hence the use of gabions, reno-mattresses and concrete structures are proposed.

Although the size can be optimised for the specific site and topography, the design of these low-level structures is to convey low flows (minor floods) through conduits/pipes and to allow safe overtopping during bigger flood events.

The figure below shows an example of a low level river crossing structure. This one is located on the Slanghoek road over the Bree River.



The drawing below shows a typical plan view of a low level river crossing structure:

