UMDLOTI APRIL 2022 FLOODS: CSCM STORM DISASTER RESPONSE

UMDLOTI STORM DAMAGE
APRIL 2022

RAINFALL RECORDS

- 11/12 April 2022 – recorded rainfall 295 mm in 24 hours.
- 1 in 80 year rainfall event for a 24 hour period
- 22 May 2022 – recorded rainfall 351mm in 24 hours.

Date	Residents rain gauge	Umdloti WWTW Municipal rain gauge	Umhlanga RES51 Municipal rain gauge
	24 hr rainfall depth (mm)	24 hr rainfall depth (mm)	24 hr rainfall depth (mm)
26 March 2022	10	41.8	18.6
27 March 2022	50.6	27	9.6
2 April 2022	23.4	30.6	24.8
6 April 2022	3	3.6	4
7 April 2022	0.6	0.8	2.4
8 April 2022	46.4	40.2	25.2
9 April 2022	44.4	43	41.2
10 April 2022	62.2	49.2	44.8
11 April 2022	239.4	213.6	181
12 April 2022	48.6	37.2	96
21 May 2022	333.8	230.6	226
22 May 2022	32.4	31.8	45.8

Impact of the April 2022 Floods

- 2 major slips and multiple smaller scours.
- 26 apartments and 7 homes condemned/ demolished.
- Damage to infrastructure. Including a water treatment works.

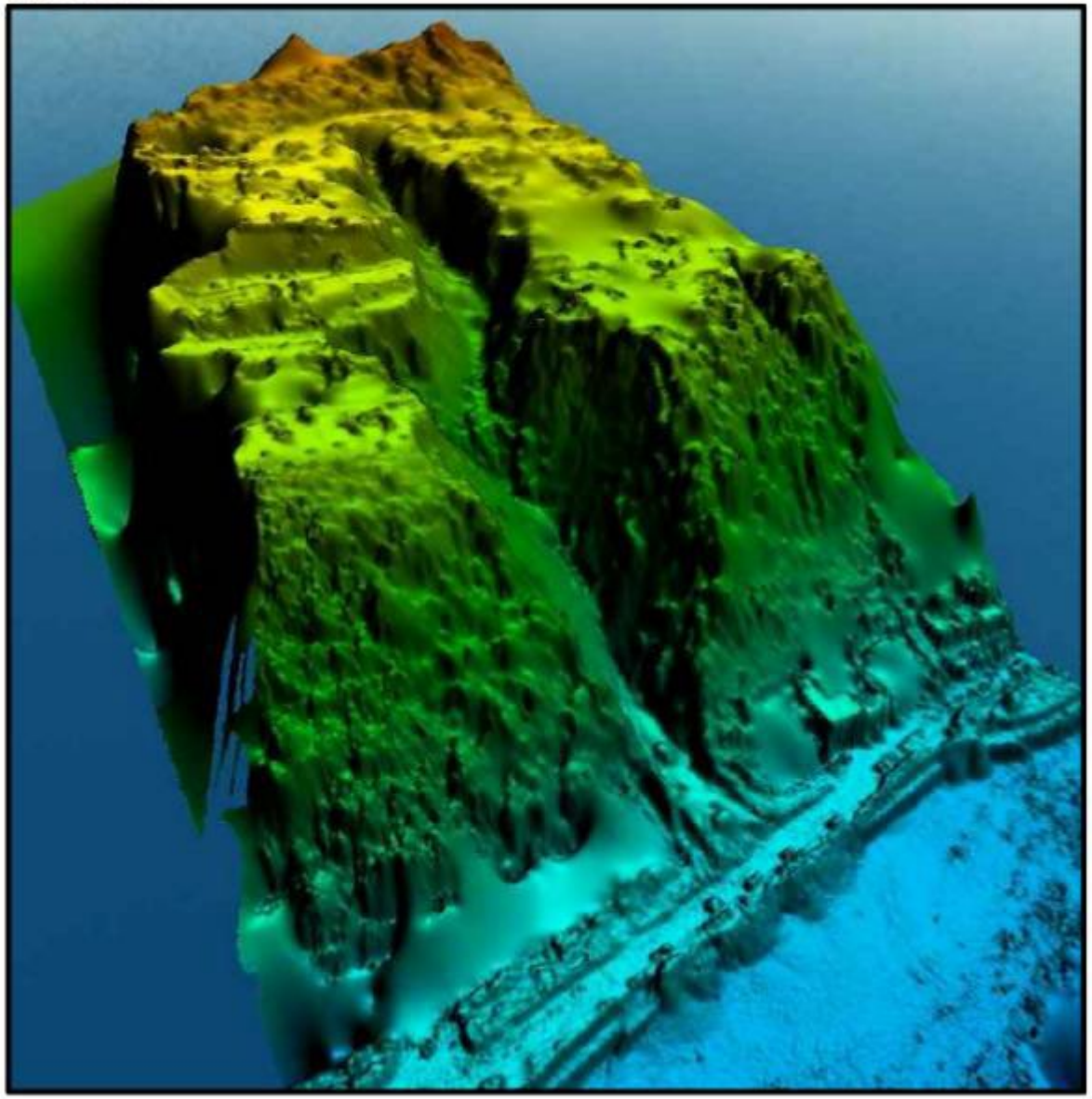
CAUSE OF WASHAWAY

- Steady rainfall in early April .
- Increased harden surfaces and removal of vegetation within the Umdloti catchment area.
- Large volumes of water concentrated at low points.
- The concentrated flow point along the dune sand created erosion channels.
- Dune sand is highly erodible.
- The erosion channels attracted more surface water thereby accelerating the erosion rate.
- Contributed to various washaways along the Umdloti Dunes.

35/36 Bellamont Road

- Scour depth of greater than 50 m.
- 76 300m3 of material was washed away.

3D VIEW



CONSTRUCTION RESTRICTION

- Health and safety analysis was critical due to the unstable nature of the site.
- Access was limited, material was end-tipped at the top of Bellamont Road and excavators were used to carry the fill material further down the scour.
- Surrounding building were unstable. Vibration had to be minimized. Until they were demolished.

Original Stormwater System

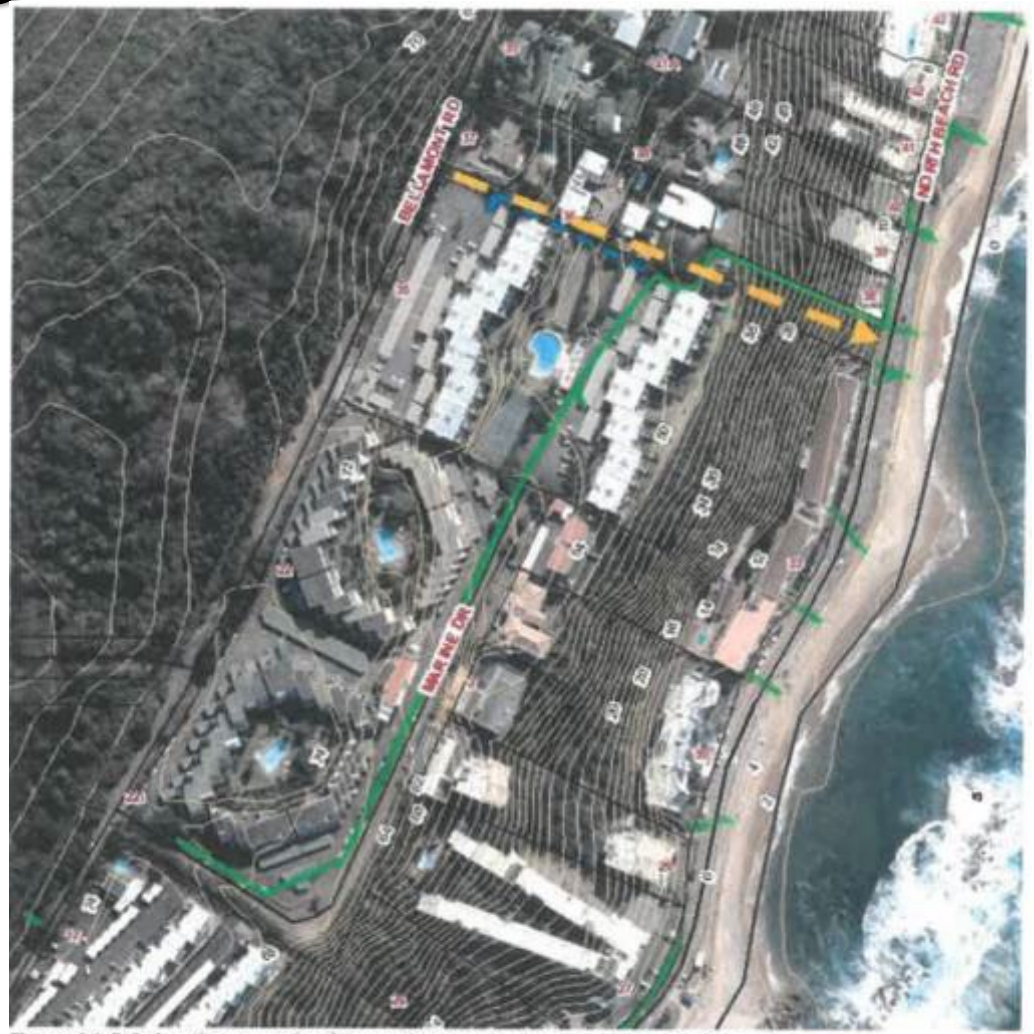


Figure 24 GIS showing records of Council Stormwater at Southern Erosion Line

900mm concrete stormwater pipe from 35 Bellamont discharging onto beach.

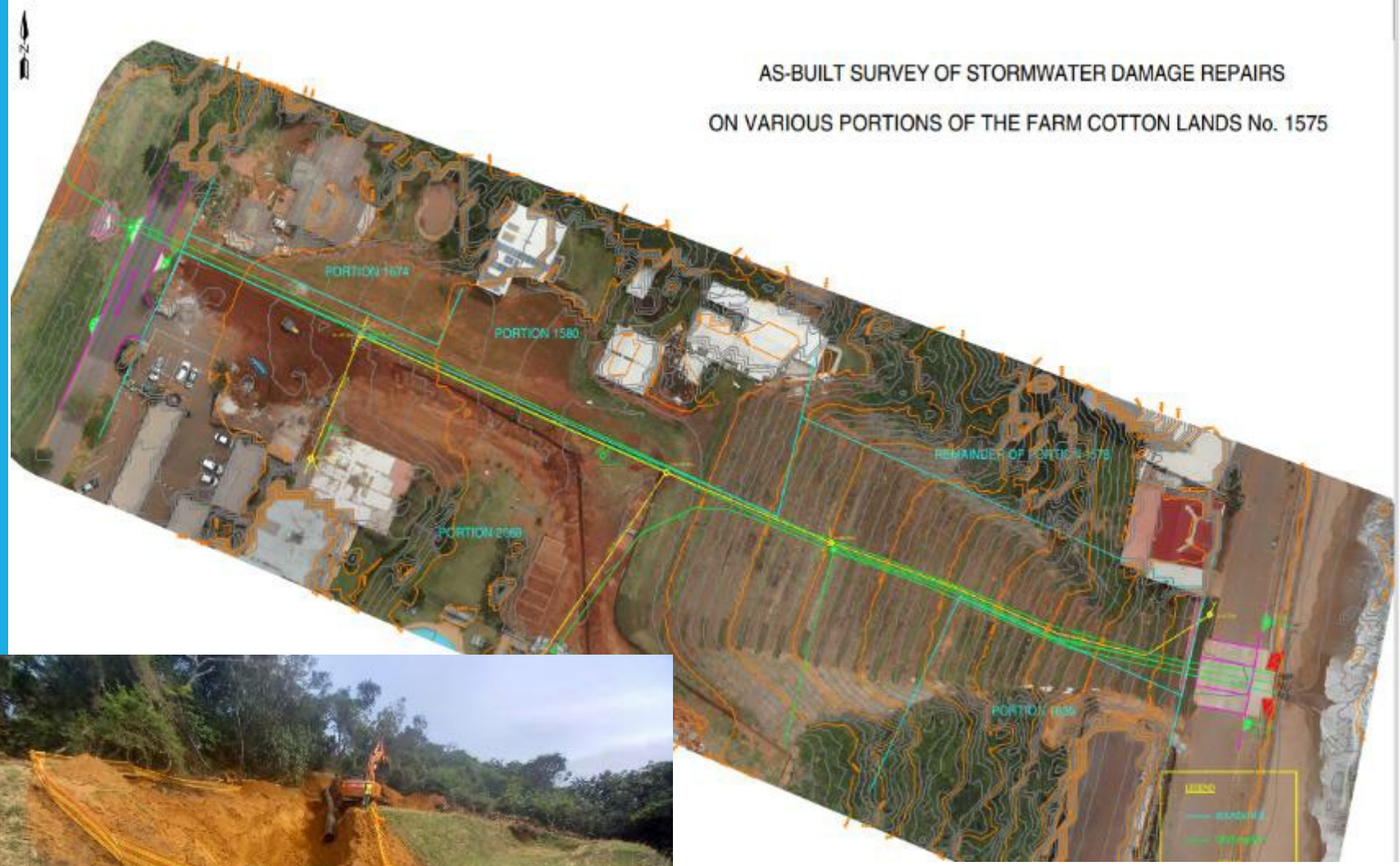
Stormwater Management

- Catchment Area = 14.83 ha
- April 2022 peak rainfall intensity = 119,2mm/hr.

- The max flow rate during the April 2022 storms:
  Q = 1.3m^3/s

New Stormwater System

- 3 Stormwater HDPE solid wall pipes were installed.
- 2 x 710mm HDPE stormwater pipe. 1 710 pipe connecting to the forest opposite Bellamont Road. 1 x 710 water connecting to Marine drive. 1 x 900 connecting to Bellamont Road.
- An attenuation pond was constructed between the forest and Bellamont Road to reduce the velocity and volume of water entering onto Bellamont Road.



COASTAL, STORMWATER & CATCHMENT MANAGEMENT DEPARTMENT
ENGINEERING UNIT

HDPE Pipes

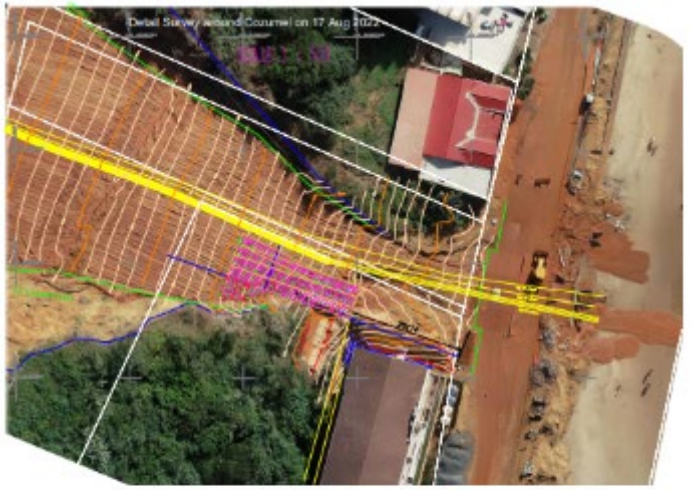
- HDPE pipes are more durable and flexible.
- HDPE was preferred given the grade as HDPE is less susceptible to surge shock.
- Due restricted construction conditions HDPE was easier to weld into continuous lengths and drag into place.

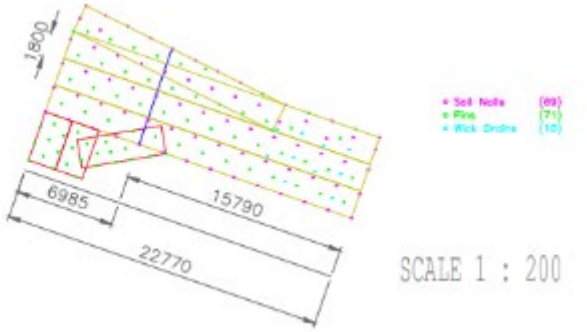
Butt welding of HDPE Pipes

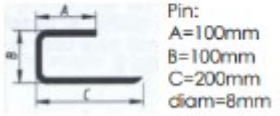
Slope stability

Soil Nailing

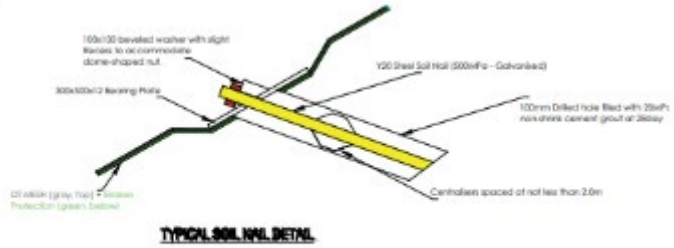
- Soil nailing was used to reinforce the slope and increase global slope stability.
- 7.5m long soil nails were installed where the slope was greater than 30 degrees.

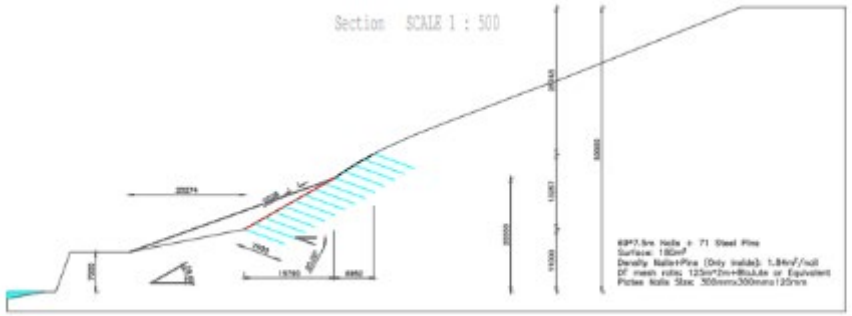






Pin:
A=100mm
B=100mm
C=200mm
diam=8mm





COASTAL, STORMWATER & CATCHMENT MANAGEMENT DEPARTMENT
ENGINEERING UNIT

Erosion Protection

- Field inlets reduced the overland flow over the embankment prevent scouring from surface run-off.
- The berms along the embankment reduced velocity of water. Allowing for infiltration of stormwater over the embankment.
- Reinstate of vegetation was critical to ensure erosion protection an overall slope stability

Vegetation

- The site was hydroseeded using fast –germinating seeds to provide initial protection against erosion.
- Grass, forbs and trees were interplanted to reintroduce biodiversity and original ecological integrity.
- Vetiver was planted along berms to trap sediment and the deep roots aid in preventing erosion.

May 2022

ETHEKWINI MUNICIPALITY

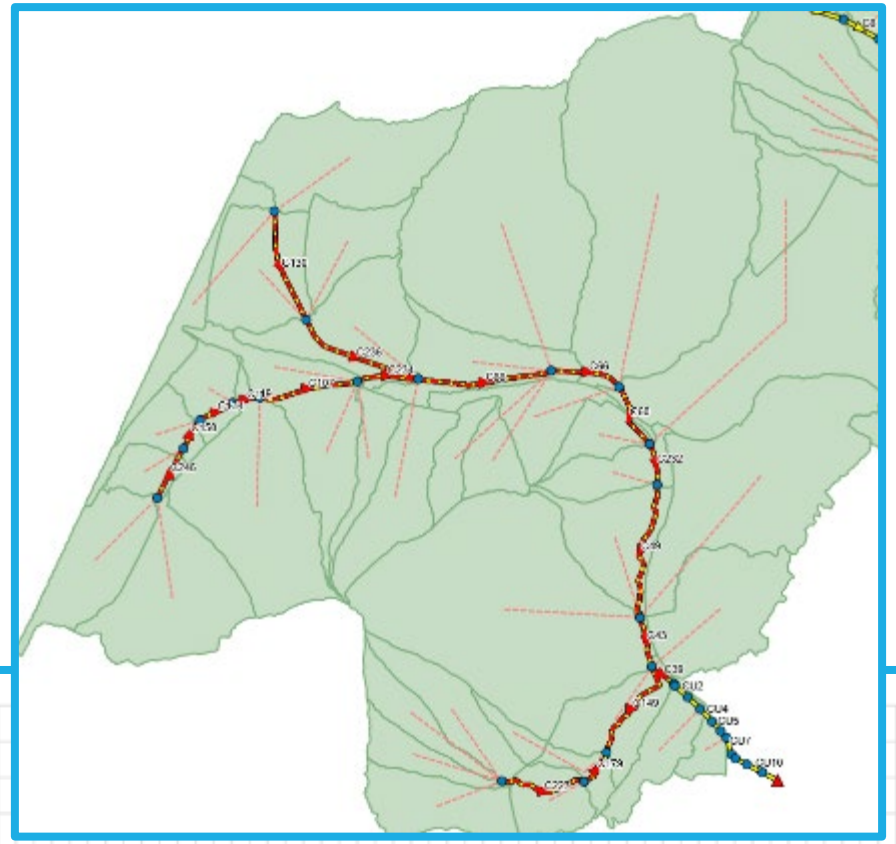
December 2022

JABU NGCOBU DRIVE CULVERT

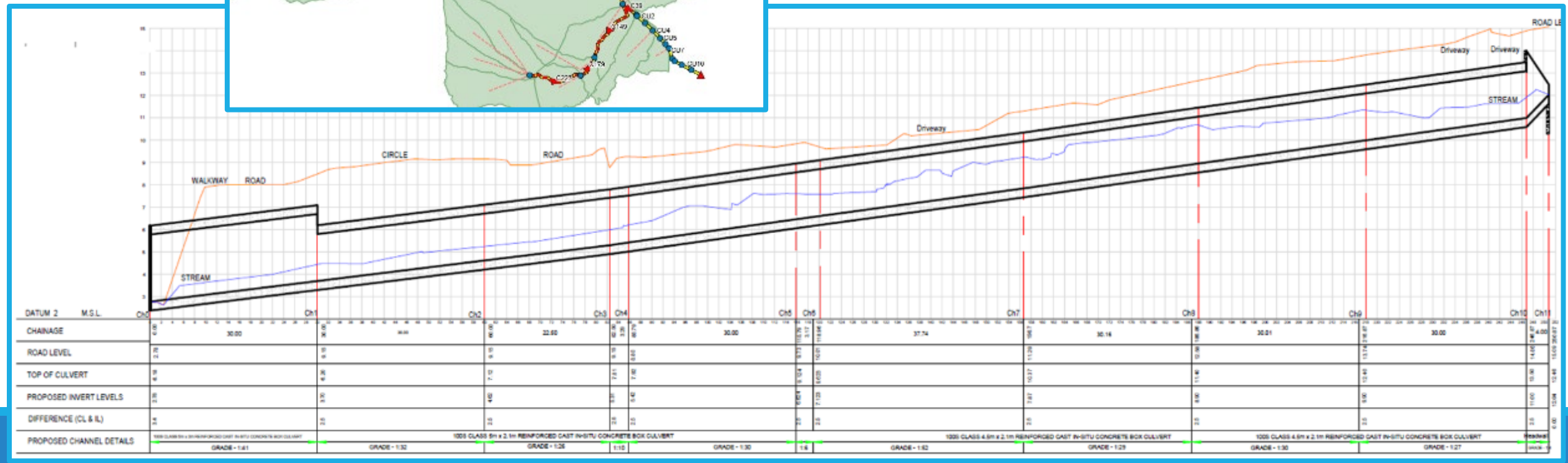
- Existing Culvert Overtopped.
- Only access road into Umdloti restricted.
- Water treatment infrastructure damaged.
- Flooding of Sewer Pump Station.

DESIGN CONSIDERATIONS:

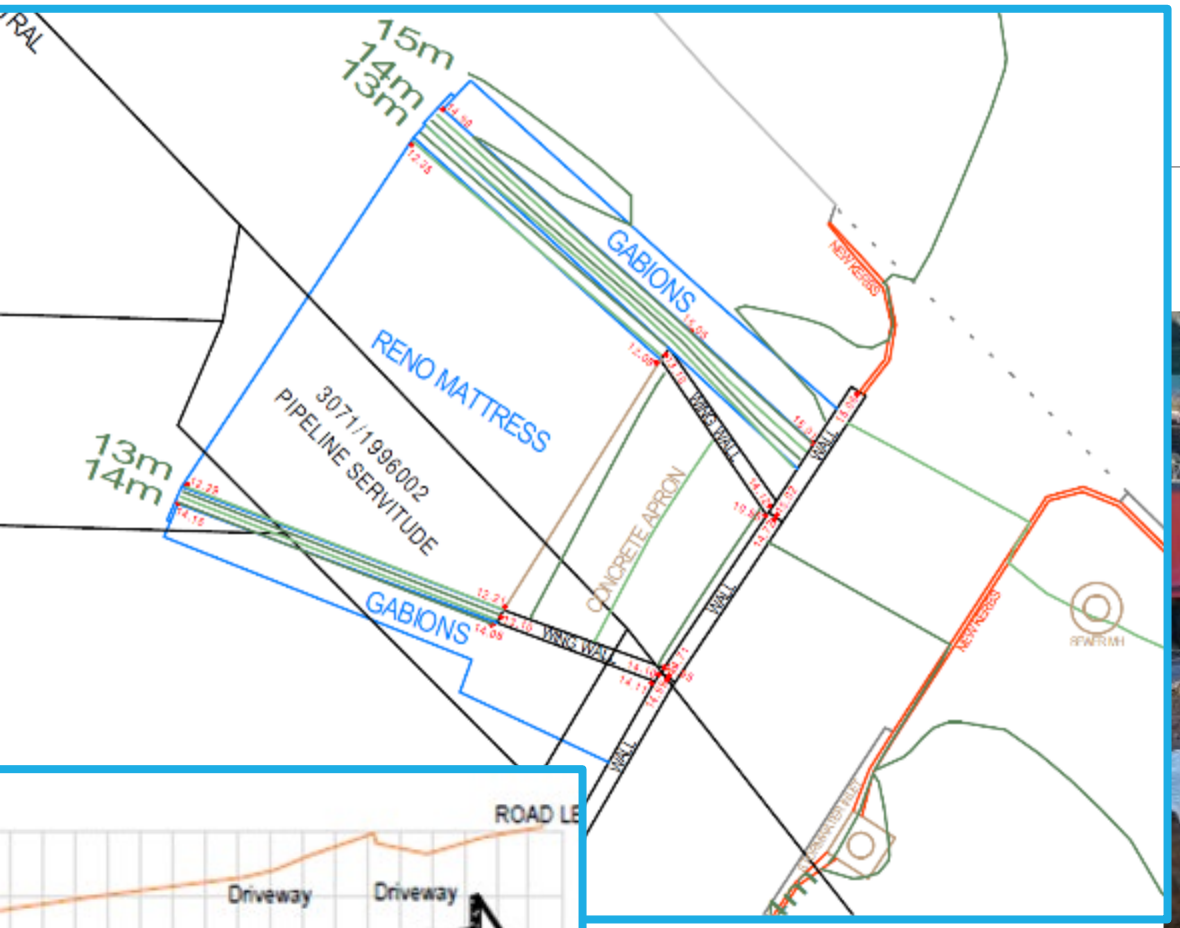
- Prevention of Over Topping.
- Stabilization of embankment along the Road edge.
- Protection of existing infrastructure.
- Emergency overflow.

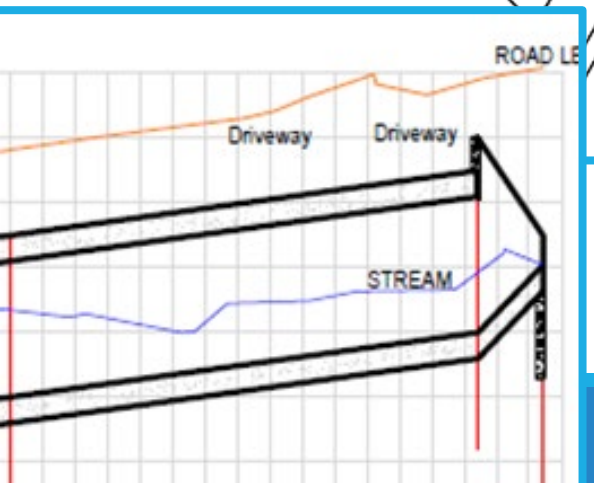


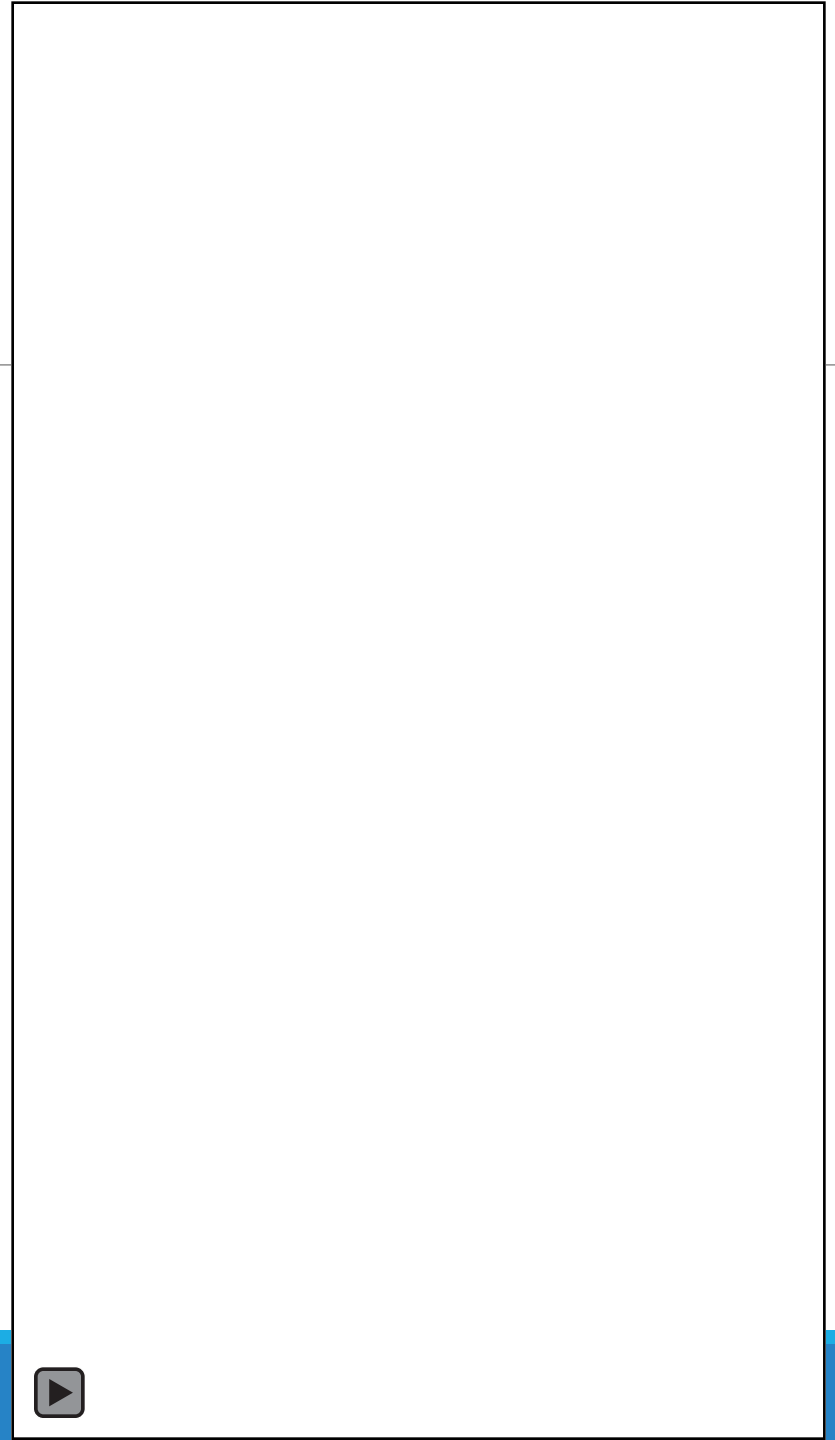
Designing for a 1:200 Year Return Period



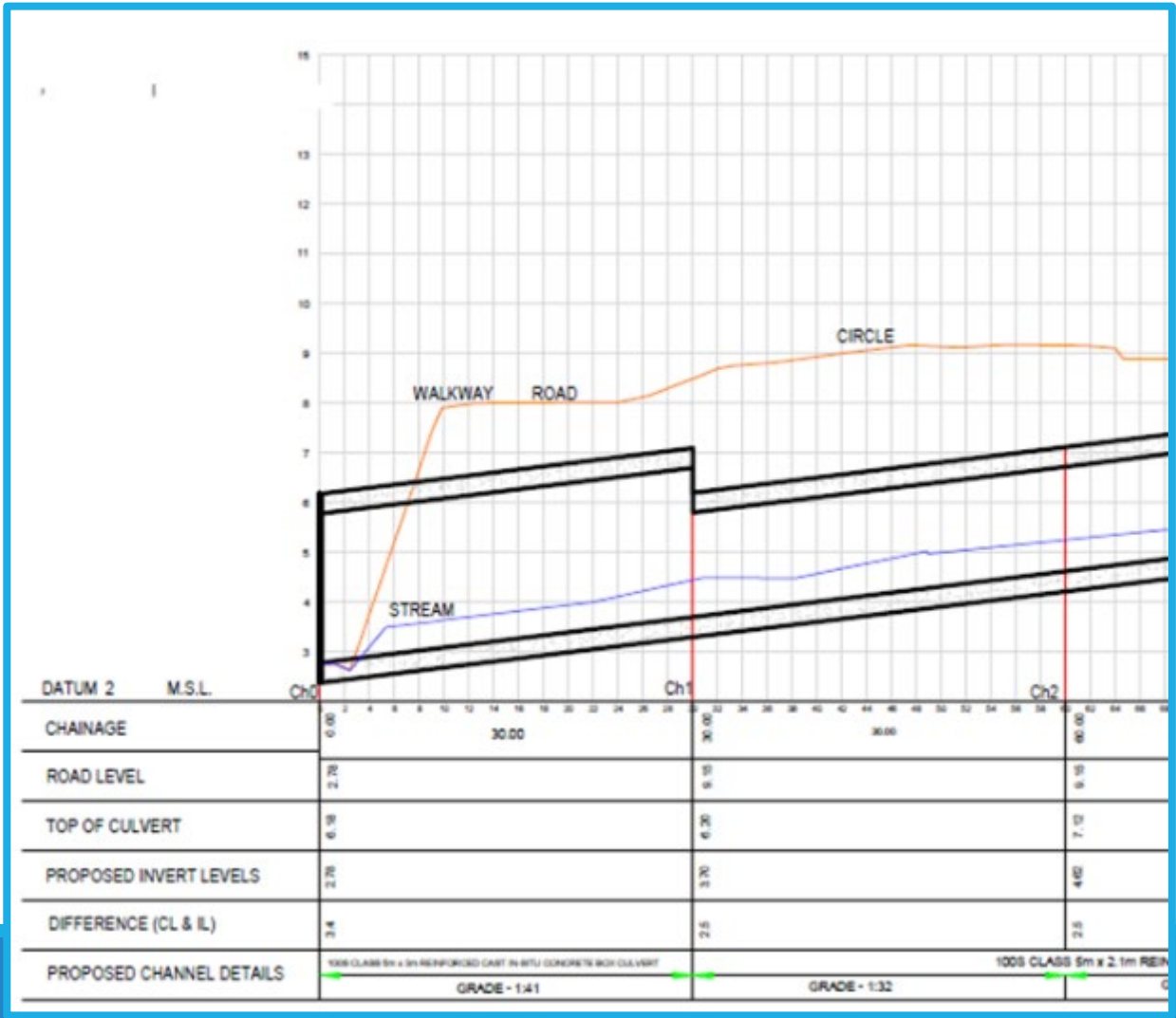
OPTIMIZING INLET CONDITIONS







OPTIMIZING OUTLET DESIGN FOR COASTAL CONDITIONS



Cost of Outlet Modification: R 384 000.00

SECONDARY CONSIDERATIONS

- Isolation and improvement of the Water Treatment Works.
- Provision for present and future services.

REDUNDANCY

1. Upstand wall on the inlet, limit risk of overtopping.
2. Location of inlets and the overland flow path, to allow overland flow to efficiently enter the system.
3. Utilisation of Debris walls to reduce blockages.