Recent experience and issues with embankment dams

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Recent experience and issues with embankment dams

- Sinthe Dam Myanmar
- La Ferme Dam Mauritius
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Sinthe Dam in Myanmar

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Sinthe Dam in Myanmar

- Dam located in the Nay Pyi Taw Region
- Completed in 2000 for irrigation water supply
- Embankment dam of homogeneous earthfill
- Chimney filter to control seepage
- 33m high
- Crest length of 1350m

Design section

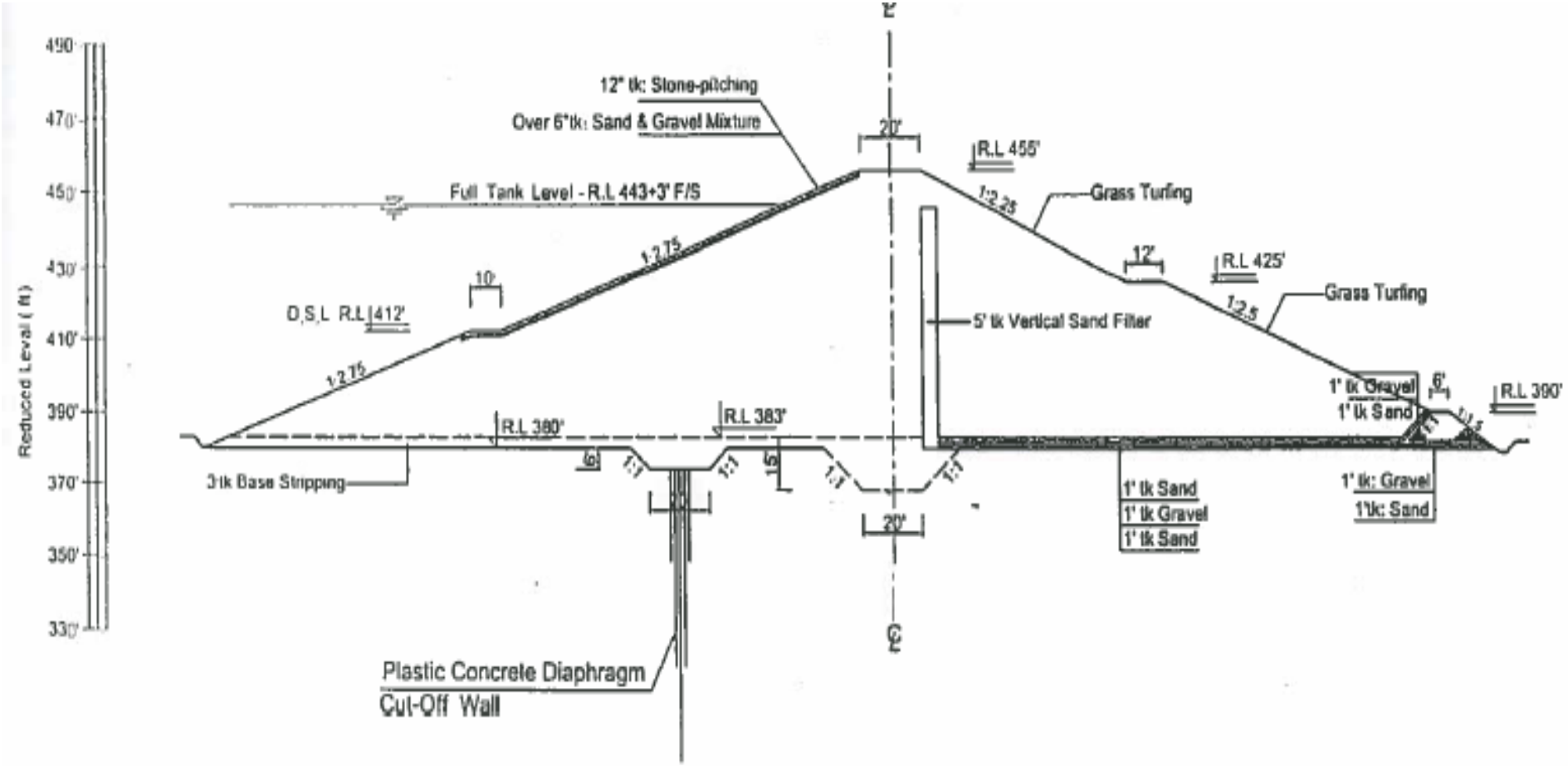

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Figure 7.18. Deep erosion gullying in dispersive soils (Soil Conservation Se

Sinthe dam: Outlet irrigation canal

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Definition of Dispersive soils

Dispersive soils are those which by the nature of their mineralogy, and the chemistry of the water in the soil, are susceptible to separation of the individual clay particles and subsequent erosion of these very small particles through even fine fissures or cracks in the soil under seepage flows.

Construction material dispersivity

- Crumb tests during construction:
  - ECN Class 5 to 6 obtained (mid scale)
  - some results as low as 1 and 2 (very dispersive).
- Sherard and Decker (1977) suggest four tests should be used:

  Soil Conservation Service, Pinhole, Emerson, Chemical test.
- They were of the opinion that the pinhole test was best.

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Main issues identified during site visit

- Dispersive soils within the embankment fill susceptible to erosion
- Severe surface erosion gully, internal erosion / piping / sinkholes
- Drainage collecting gutter and chute heavily under designed
- Sloughing, bulging, uneven settlement

Immediate remediation

- Backfilling of sinkholes
- Repair of drainage channels

Recommendations

- Map the areas that show high erosion, sample and test for dispersivity by performing the Pinhole Test
- Undertake seepage and stability analysis for higher permeability in the fill and foundations
- Check adequacy of the surface drainage channels to collect and discharge the surface run-off

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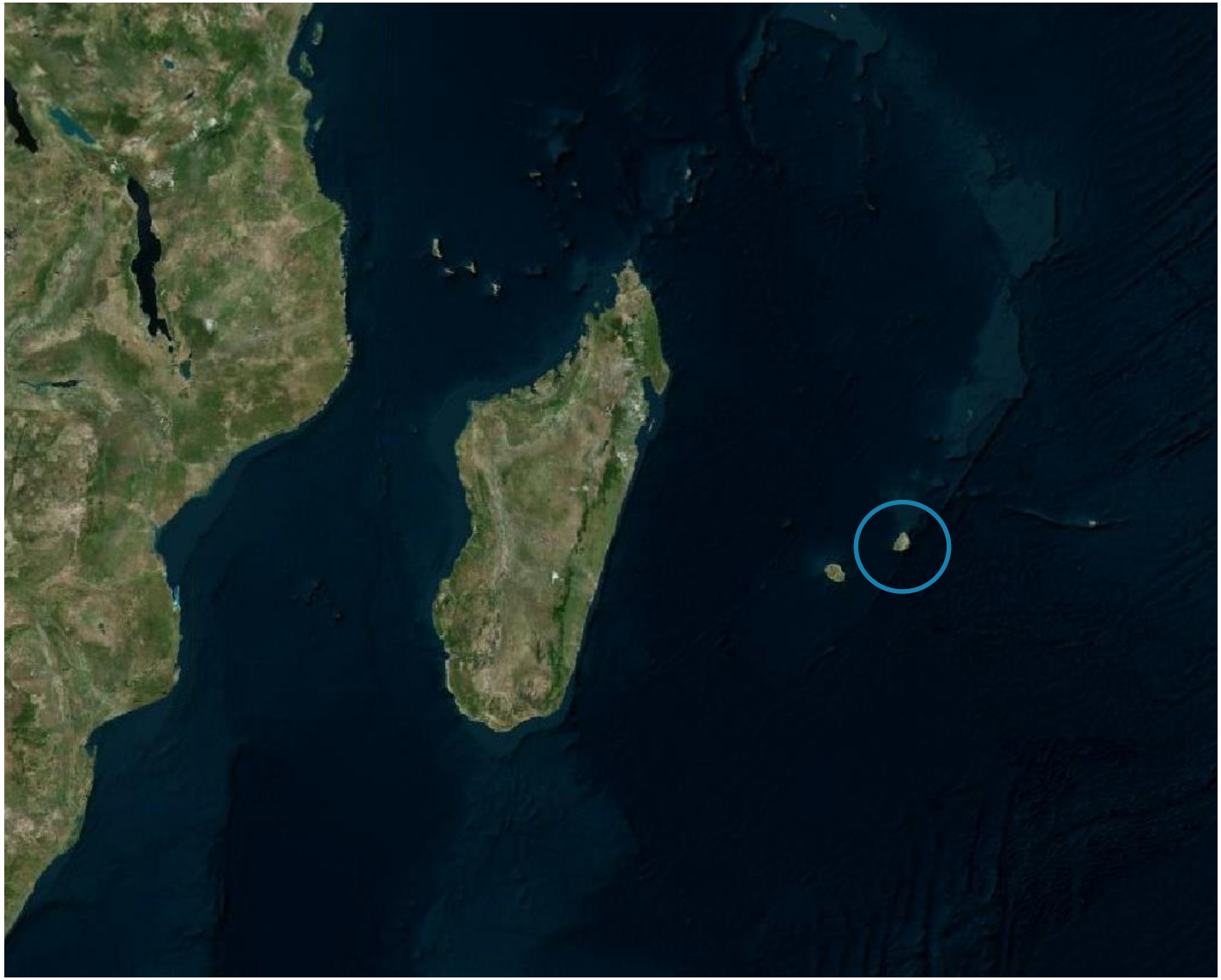
La Ferme Dam, Mauritius



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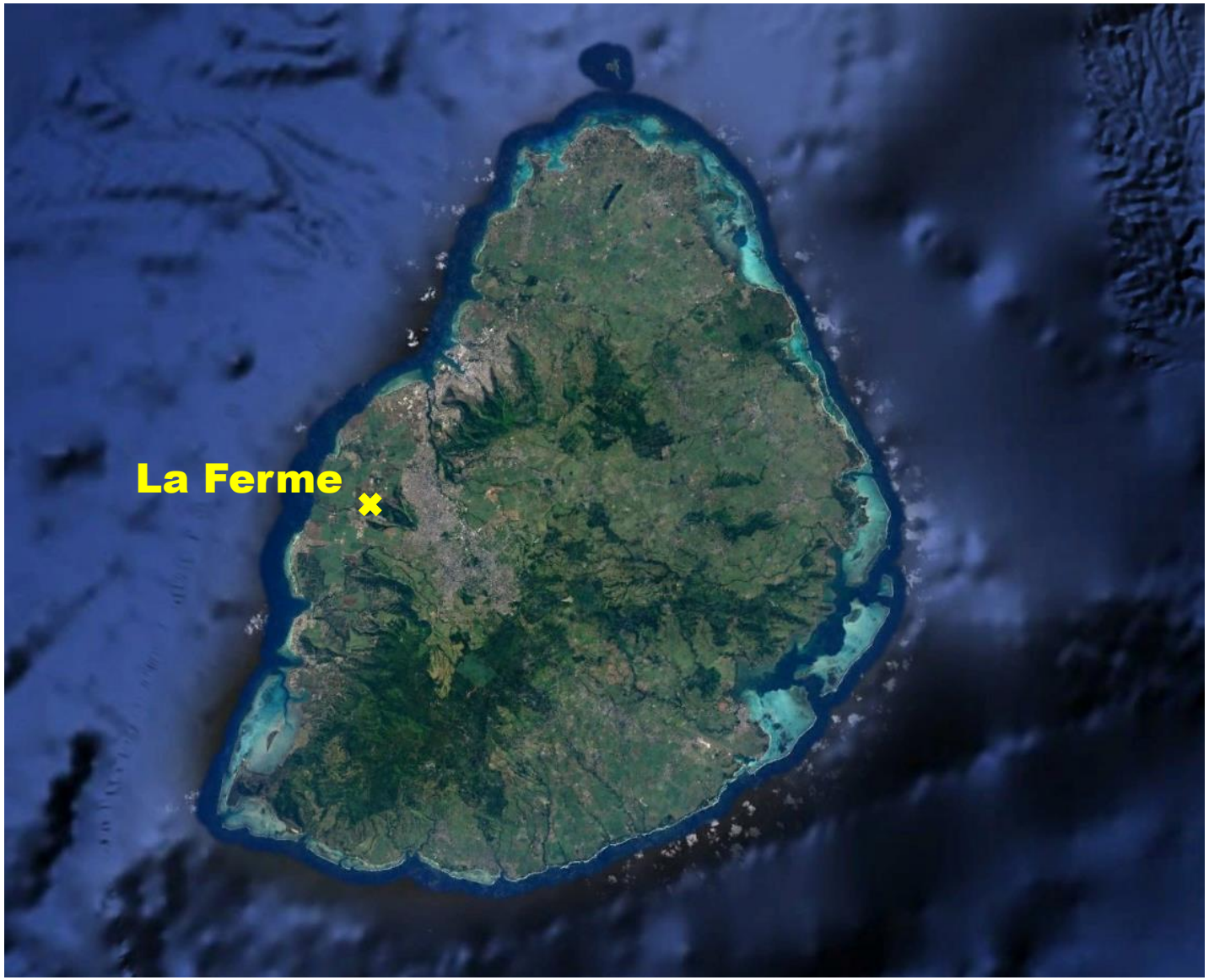
La Ferme Dam, Mauritius



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La Ferme Dam, Mauritius

- Constructed in 1914 to store water for irrigation purposes
- Combined gravity and embankment dam
- Max height 15m, 1500m long
- Rehabilitated to improve its safety to extreme flood and raise the dam to increase the storage capacity


Right Abutment Extension (471m)
Right Embankment
Fuseplug Section (232m)
Irrigation Outlet, Stilling Basin &
Flow Gauging Station U04
(Refer to drawing 2854-CE-406)
Right Embankment (627m)
Existing penstocks to
be replaced and
aquaduct removed
La Ferme Irrigation Canal
New Flow Gauging Station
on River Belle Isle
(Refer to drawing 2854-CE-436)
River Belle Isle
River Belle Isle Flow Compensation
Canal with New Gauging Station
(Refer to drawing 2854-CE-435)
RC/Masonry Right Non-Overflow Section (80m)
RC/Masonry Spillway (146m)
Masonry Left Non-Overflow Section (45m)
Left Embankment (338m)
Left Abutment Extension
BAMBOUS
LA FERME RESERVOIR
Trianon Grosses Roches Feeder Canal
Flow Gauging Station W018B
(Refer to drawing 2854-CE-600)
New Flow Gauging Station
on upper River Belle Isle
(Refer to drawing 2854-CE-437)
Upper River Belle Isle
La Fenêtre Feeder
CEB Hydropower Station and Flow Gauging Station
(Refer to drawing 2854-CE-610)

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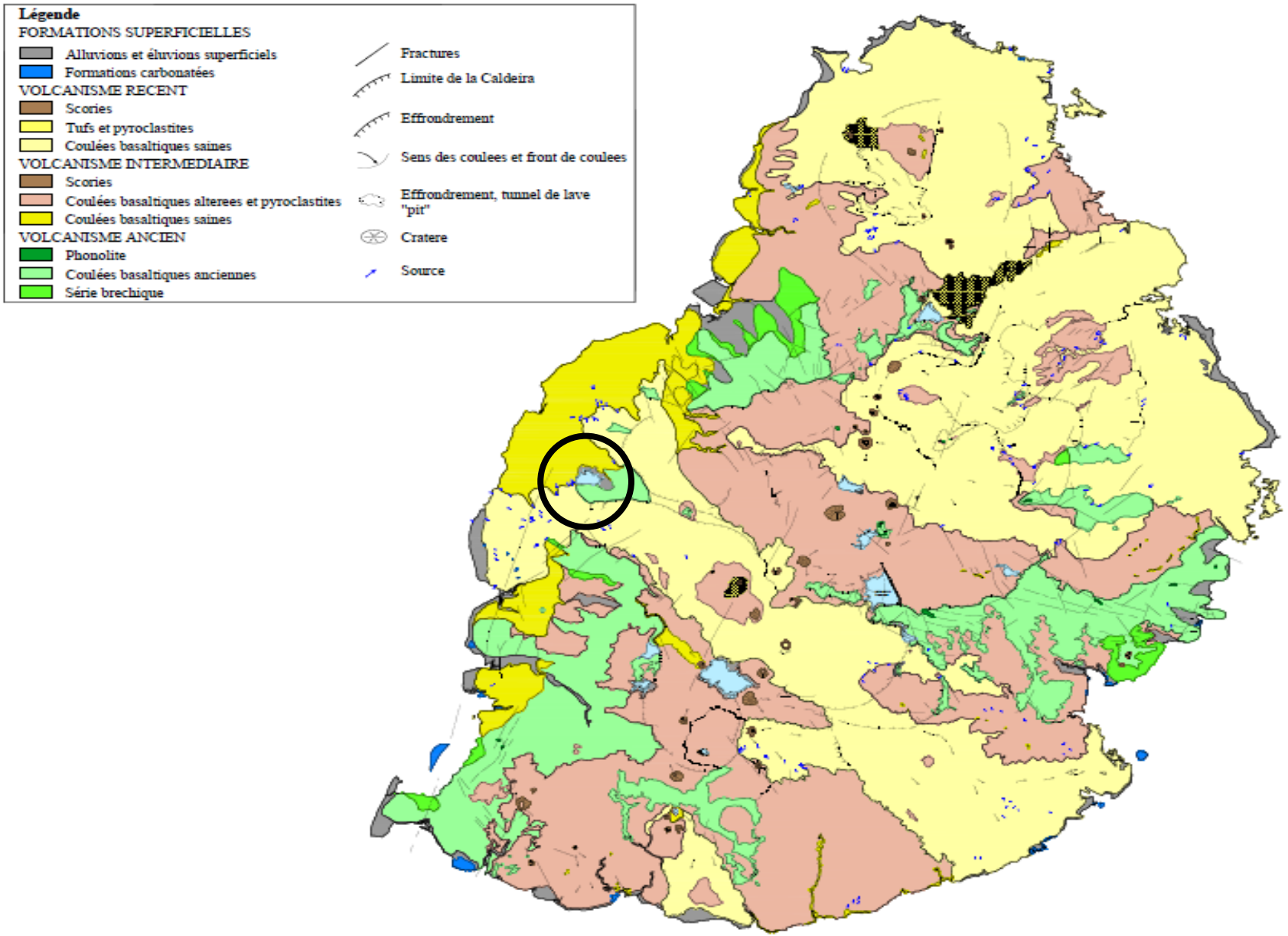
Légende
FORMATIONS SUPERFICIELLES
Alluvions et éluvions superficiels
Formations carbonatées
VOLCANISME RECENT
Scories
Tufs et pyroclastites
Coulées basaltiques saines
VOLCANISME INTERMEDIAIRE
Scories
Coulées basaltiques alterees et pyroclastites
Coulées basaltiques saines
VOLCANISME ANCIEN
Phonolite
Coulées basaltiques anciennes
Série brechique
Fractures
Limite de la Caldeira
Effrondrement
Sens des coulees et front de coulees
Effrondrement, tunnel de lave "pit"
Cratere
Source

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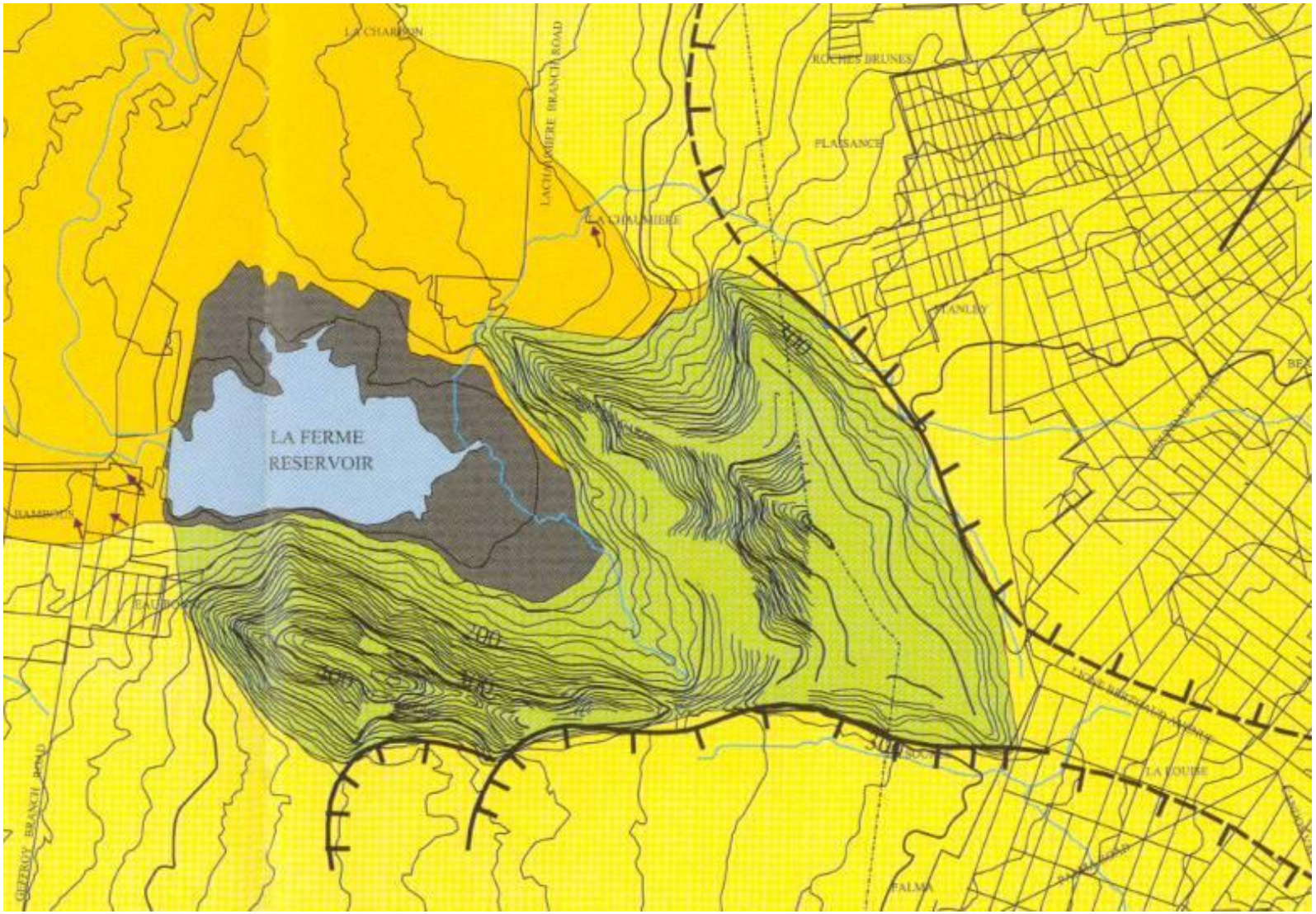
LA FERME
RESERVOIR
LA CHARBON
LACHAMBRE BRANCH ROAD
ROCHES BRUNES
PLAISANCE
LA CHAUMIERE
STANLEY
LA FOURIE
PALMA
GERROT BRANCH ROAD
300
400

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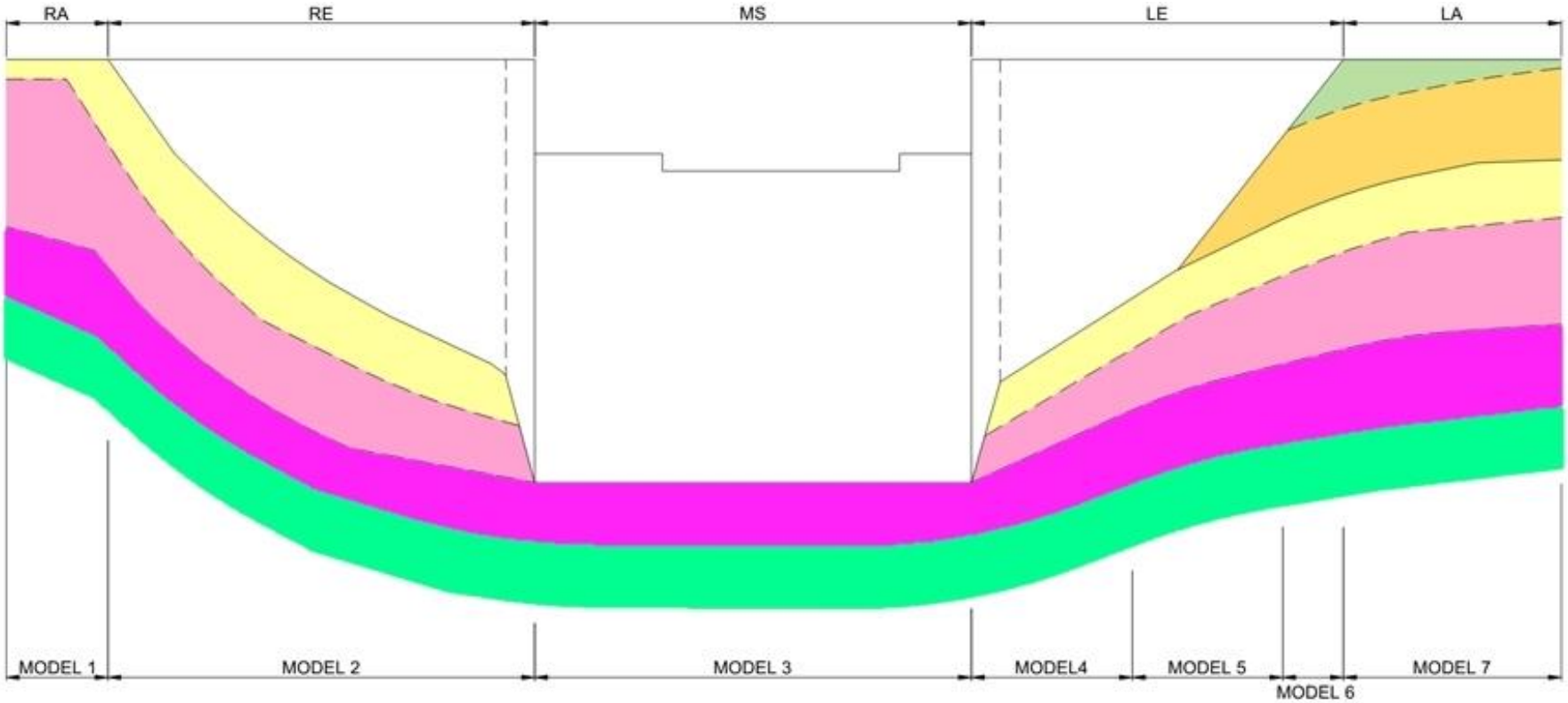
Schematic geological model - dam axis



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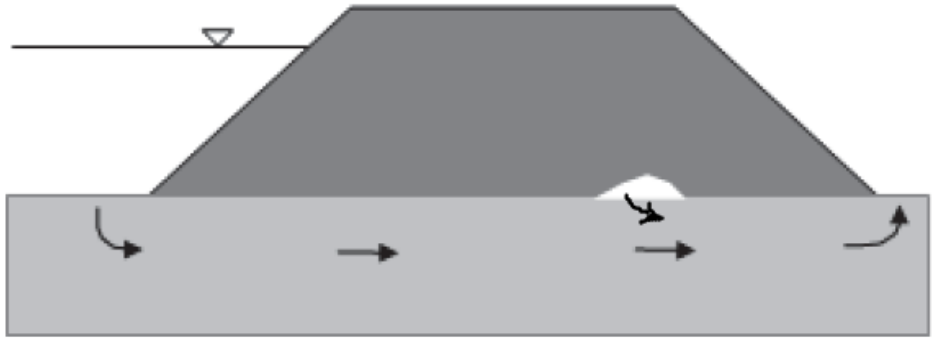
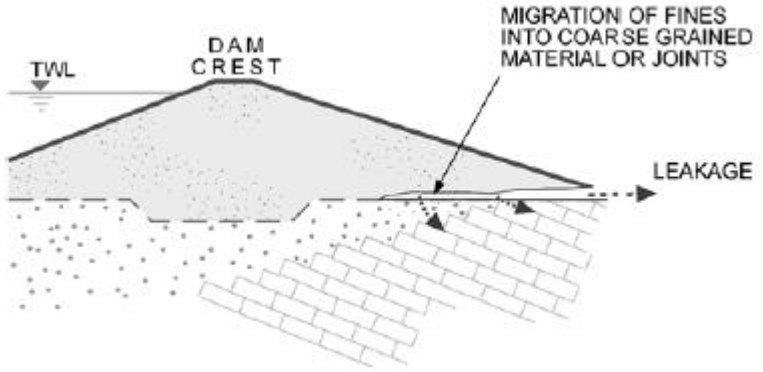
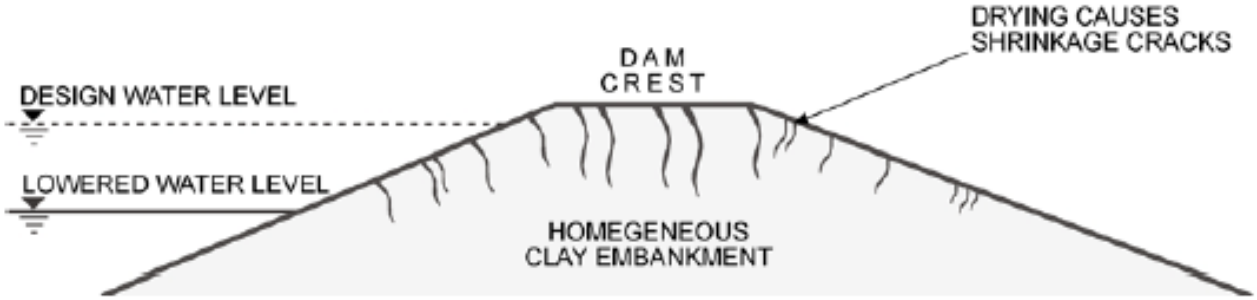
Modes of failure







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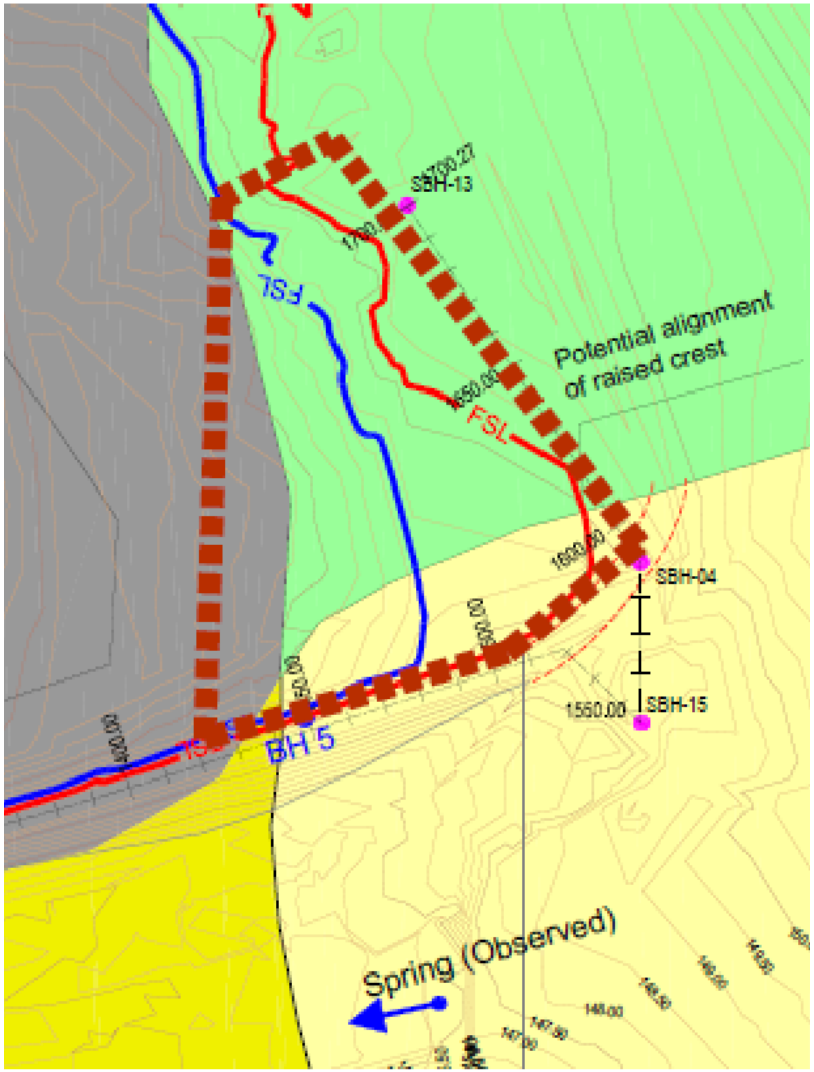
Seepage through the foundation



- Seepage is likely to occur where the basalt is exposed
- Estimate of seepage losses is around 3.5Mm3/year in the existing condition and 5.0Mm3/year for the raised FSL
- It is recommended to construct a clay blanket at the left abutment

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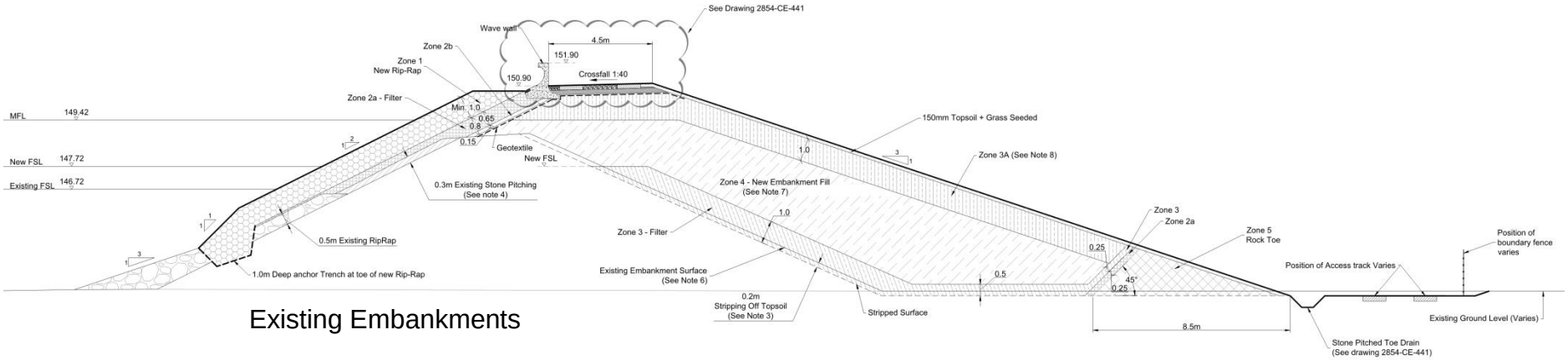
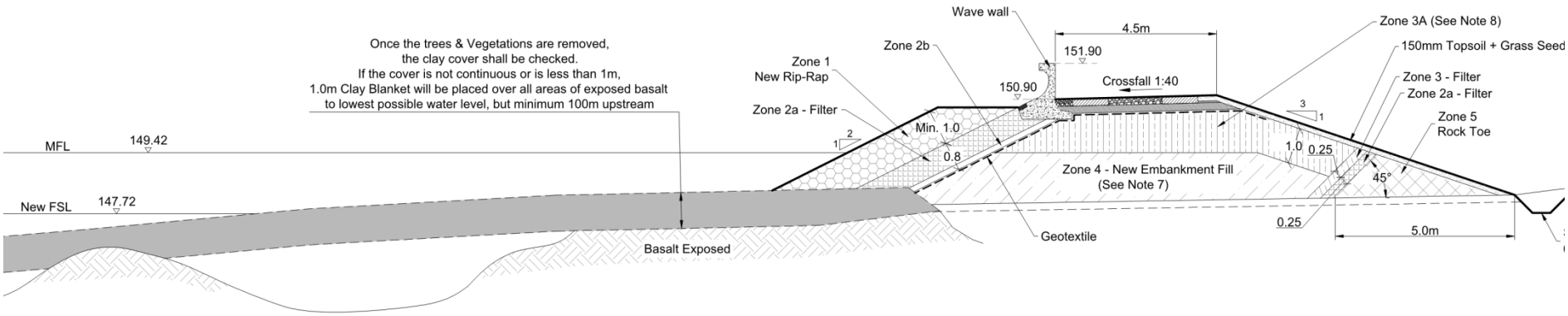
Rehabilitation Measures to Embankment Dam



Existing Embankments



New Left Abutment

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Common issues for theses examples

- Silty clay materials can be very exposed to internal erosion and seepage
- Robust internal drainage
- Quality external slope protection – properly designed to climatic conditions

Thank you