Stantec & Christchurch City Council

# Cashmere Valley – Applying Dam Principles to Stormwater

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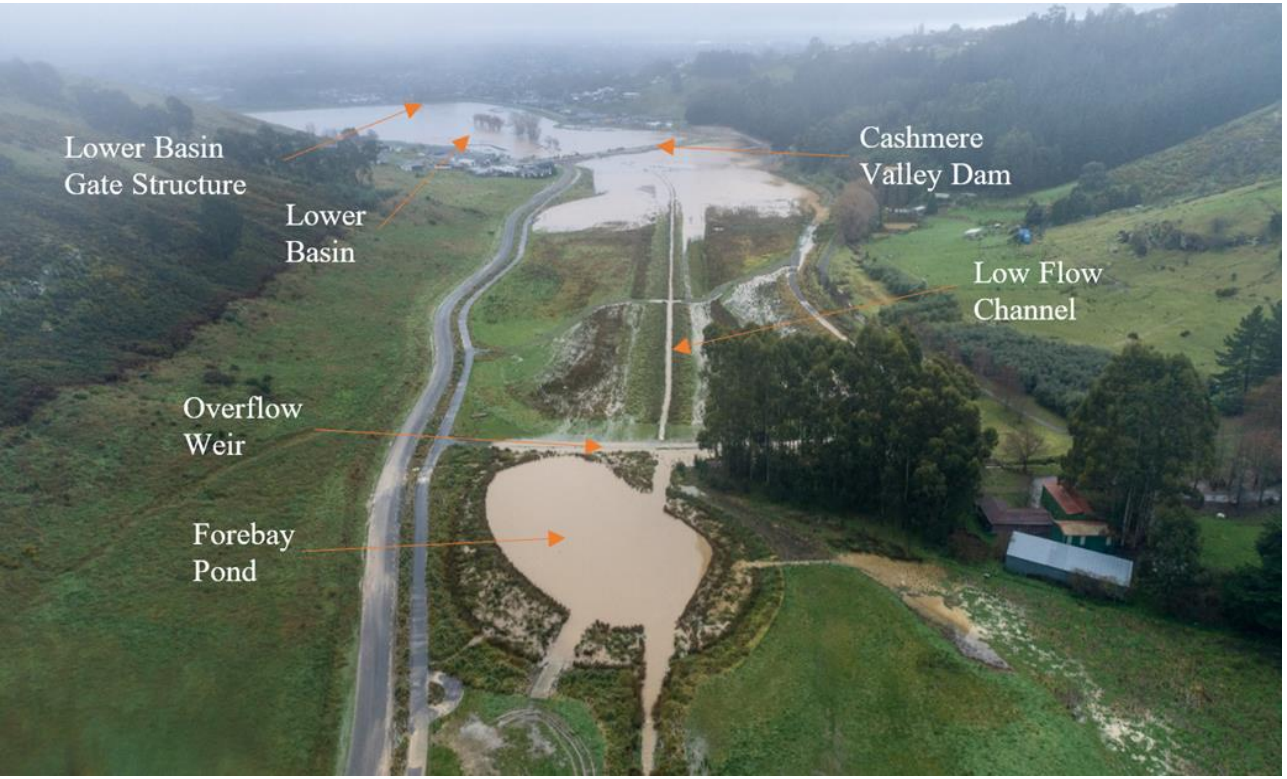
# Ōpāwaho Heathcote Stormwater Network


- Predominately urban catchment
- Changes after the 2010/2011 earthquakes
- Land Drainage Recovery Program formed 2012
- Network of flood storage basins

# Cashmere Valley Dam and Site



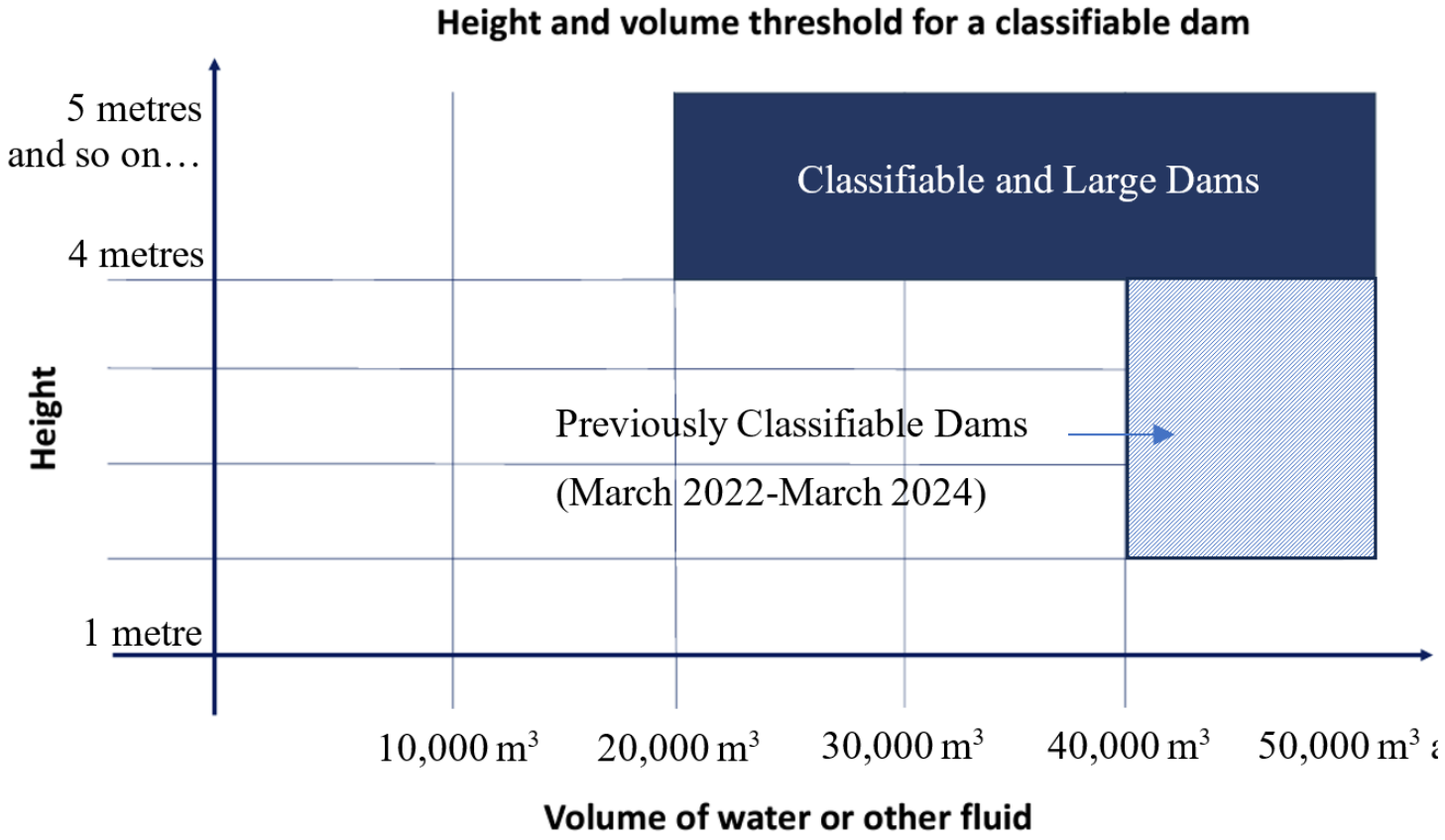

Cashmere Valley stormwater detention system (in flood during dam construction, 2023)


Cashmere Valley Dam general arrangement

# Dam Safety Regulations

Dam Regulations in NZ:

- Building Act 2004
- Building (Dam Safety) Regulations 2022
- Late changes to regulations in March 2024 increased thresholds.
- Future thresholds may change
- Cashmere is a Large and Classifiable Dam



# Dam Safety Regulations

Owners of a Classifiable Dam have specific obligations under the Regulations, including:

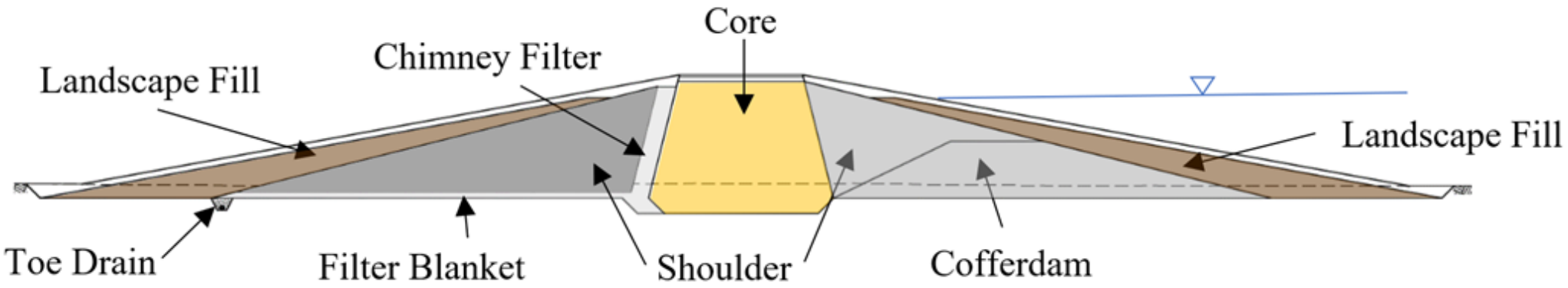
- Provision of a dams Potential Impact Classification (PIC) to the Regional Authority.
- If the dam PIC is medium or high, provision of a Dam Safety Assurance Programme (DSAP).
- Provision of an annual compliance certificate confirming compliance with the DSAP.

The PIC, DSAP, and annual compliance certificate are required to be audited and certified by a Recognised Engineer.

# Dam Design – Dam Break

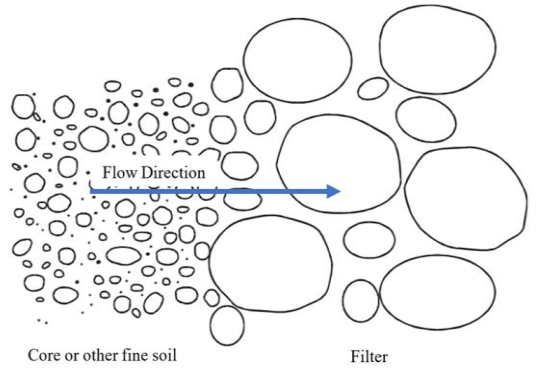

- Hypothetically dam failure scenario
- Model downstream impacts
- For flood detention dams, incremental impacts are used
- Population at Risk (PAR) is defined
- Cashmere Valley Dam is classified as Low PIC

# Dam Design – Embankment

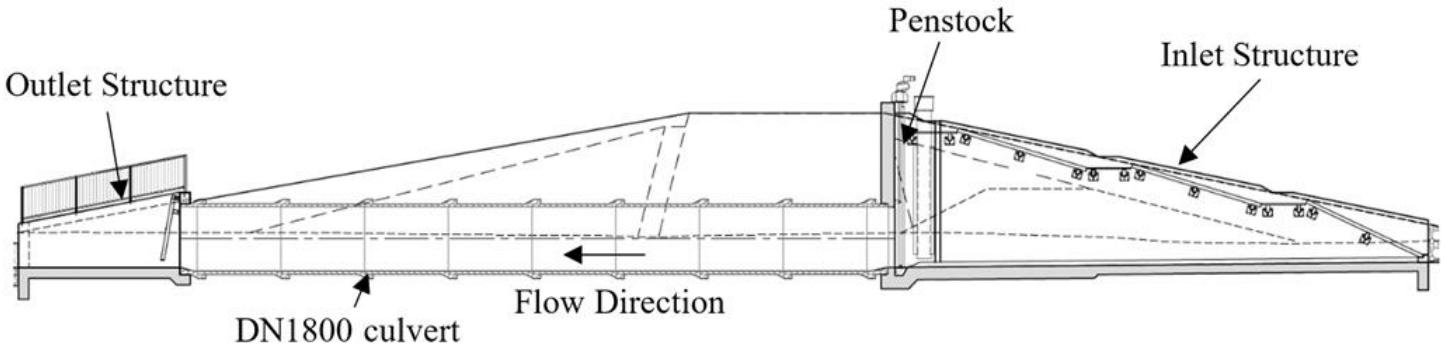



Embankment comprises zones of engineered material with different roles:

| | |
|---|---|
| Core | Low permeability, water retaining |
| Shoulders | Provides strength and protection |
| Filters | Prevent internal erosion and provide drainage |



# Dam Design – Structure and Spillway




- Reinforced concrete structure with vertical penstock gate which closes in floods
- Spillway designed to safely pass a 1/500 AEP event which equates to flows up to 22 m3/s and velocity of 3 m/s over the spillway
- Enkamat reinforced grass spillway

# Dam Construction – Foundations

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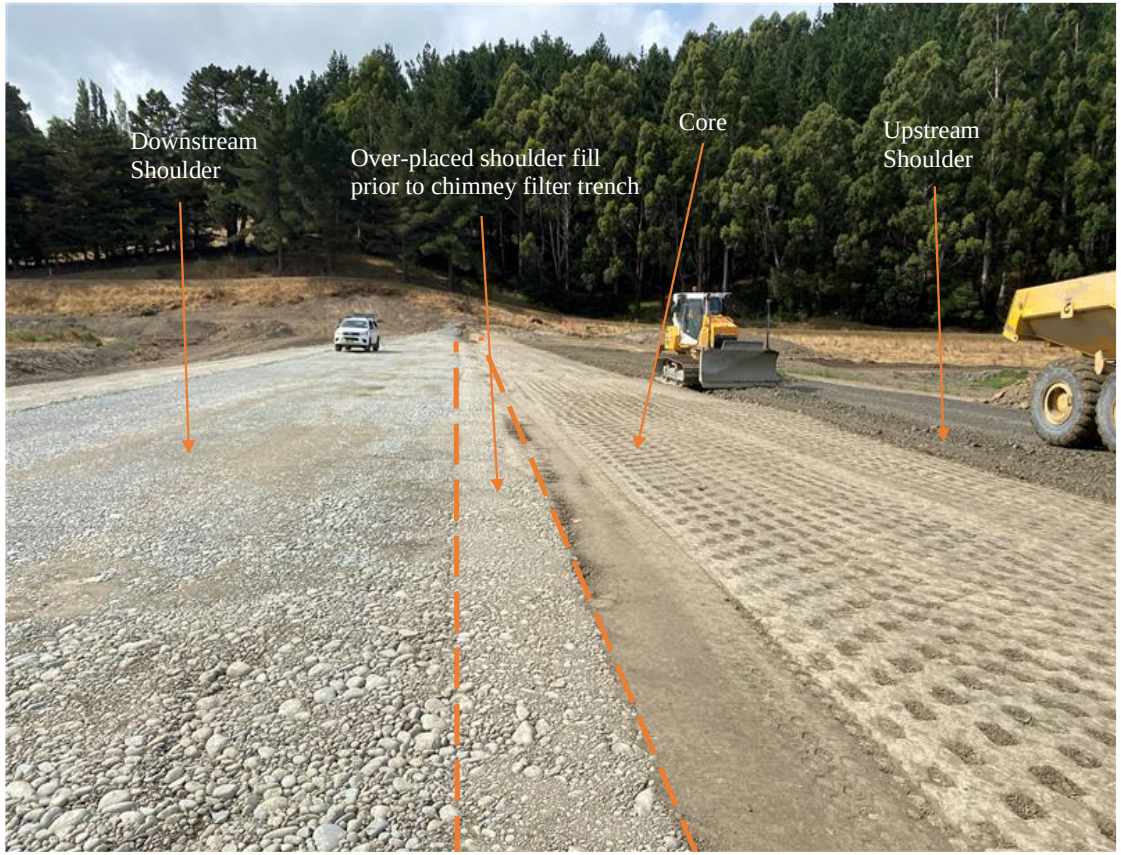
# Dam Construction – Embankment




- Placement of all fills is carefully monitored throughout construction
- Trials undertaken to establish methodology
- Onsite engineering required

# Dam Construction – Soil-Structure Interface

Compaction of Cashmere interface fills

Example of dam failure at conduit

# Dam Construction – Wetland Environment

- Large construction area with highly erodible soils. Good planning and management
- Careful management of nesting birds and fish with support of an ornithologist and ecologist

Bird nesting deterrent measures

Stream diversion day

# Natural Environment Enhancement


- Shallow dam slopes and at a natural point in the valley to blend in with topography.
- 35 ha of native wetland planting
- Ponded areas for native birds
- Lizard habitat created

# Valley Users and Stakeholders

- Popular recreational area for hikers, cyclists, and local residents
- Paths winding around the reservoirs.
- Informal seating and rest areas
- Information boards

# Summary

Stormwater infrastructure addressing urban flooding including the effects of climate change is likely to be increasingly required in the future.

The Cashmere Valley Dam demonstrates resilient infrastructure to reduce flood risk, and has been completed in a way to enhance the natural values of the valley.

# Acknowledgements

Christchurch City Council

Grounds and Services Limited Contractors

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# Thank you!
# Questions? Patai?

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