Upper Garnock Valley Flood Protection Scheme

Overview and Detailed Design
Overview of Presentation

- Background and why we are here today
- Review of the scale of the flooding problem
- The Upper Garnock Scheme
  - Work Unit 1 – Storage Area
  - Work Unit 2 – Kilbirnie
  - Work Unit 3 – Glengarnock
  - Work Unit 4 – Dalry
    - DSM
    - Beith Road
    - Railway
A study looked at the urban areas of Kilbirnie, Glengarnock and Dalry with regards to flood risk from the River Garnock and its tributaries. The Upper Garnock scheme will provide improved flood protection to these communities.
Historical Flooding

• The area has a long history of flooding.
• Since 1990’s 6 times in 17 years with significant flood events in
  • October 1998
  • October 2000
  • August 2004
  • August 2008
  • September 2010
  • November 2010
Development of the Flood Protection Scheme

- Scheme developed to address flood risk to residents and business in the communities in the Upper Garnock Valley.
- Activate consultation with community and stakeholders
- Detailed numerical and physical modelling undertaken to develop scheme
- Extensive surveys taken to inform design
  - Ground Investigation
  - Services
  - Ecological
The Upper Garnock Valley Flood Protection Scheme

- Upstream storage
- Minor works in Kilbirnie
- Powgree Burn defences
- Dalry defences
An area of suitable ground upstream of Kilbirnie has the potential to attenuate greater volume of flood water.

This will reduce peak flood flows in the downstream reaches of the River Garnock and reduce flood risk.
Upstream Storage
On-line Storage on the River Garnock

- 300m long and up to 12m high
- Approx. 500,000m³ of flood storage provided
- Approx. 75,000m³ of imported material to construct embankment
- Bentonite Slurry cut off trench
- Geo-synthetic clay liner water proof element
- Rock fill embankment with topsoil surface
- RC concrete inlet structure and culvert
- Coarse Screen debris capture (hard wood post)
- Fish Pass
What will upstream storage look like?

Key features:

- Over the crest spillway for exceedance events – pre cast concrete blocks
- Grassed finish
- Passive System with no mechanical parts
- Flow control based on double baffle arrangement to optimise storage usage
- All Reservoir Panel Engineer needs to be satisfied with the execution of the works - approvals at key stages
What will upstream storage look like?
Overview of Storage Area Embankment
Key Embankment Design Considerations:

- GI findings
- Suitability and availability of material
- Cut off arrangement
- Filtration arrangement within the embankment
- Settlement of the structure
- Working within river and floodplain
- ARPE approvals at key stages
- Rigorous in-situ testing
- The need for river diversion channel and the agreement from APRE to allow partial impoundment before flows diverted to culvert
Embankment and Spillway
Culvert and Flow Control Inlet

Key Considerations:

- Divert river to allow the structure to be built in the dry
- Need for diversion channel to have sufficient capacity to protect the works
- Fish Passage
- Staged construction of the inlet arrangement
- The need for river diversion channel and the agreement from APRE to allow partial impoundment before flows diverted to culvert
Culvert Inlet Arrangement

Key Considerations:
- Fish Pass arrangement based on proprietary Larinier fish pass.
Debris Capture

**Key Considerations:**

- Hardwood Timber posts
- Works in river and to be carried out in line with CAR Licence requirements
Upper Garnock Flood Storage Area

Key Considerations:

- High Voltage overhead cables
- Access to the site
- Working within river and floodplain
- ARPE approvals at key stages
- Accommodation works for adjacent farming operations
- Land drainage reinstatement
  - Approved agricultural drainage contractor (by landowner)
- Main access to site for materials is via Dipple Road. Secondary access from the west through the town.
  - Road widening and passing places together with Traffic Management required in advance of bulk import of material
Work Unit 2
Paddockholm Industrial Estate

**Key features:**

- Wall strengthening
- Formalisation of existing embankments
- Footpath raised
- Weir lowered to reduce water levels and improve fish passage
Work Unit 2
Paddockholm Industrial Estate
Key Considerations:

- Working in the river
- Maintaining flood protection to the works and the local properties
- Tree felling and required surveys
- Seasonal working – comply with CAR licence
Work Unit 2
Paddockholm Industrial Estate

PLAN OF WORKS TO HU.MHEAD WEIR

CROSS SECTION ACROSS THE WEIR LOOKING UPSTREAM

B

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Work Unit 3
Powgree Burn Defences

Key features:
• Replacement of existing wall with formal flood defence wall
Work Unit 3
Powgeree Burn Defences

REDI-ROCK HOLLOW CORE BLOCKS

PROPOSED NEW WALL CONSTRUCTION SECTIONS B-B, C-C AND D-D

Work Unit 3
Powgree Burn Defences

Key Considerations:
• Working within the watercourse
• Proximity of property
• Maintaining flood defence standards during the works
• Access to the site
• Sequence of working
• Compliance with CAR licence requirements
Work Unit 4 - Dalry Defences
Work Unit 4 – Dalry Defences

Key features:
• Flood Wall with cut-off
• Railway embankment cut off
• Bund works along railway embankment
• Earth Embankment and pipe
Beith Road Flood Wall

**Key features:**

- Set-back flood wall along Beith Road maintains as much normal flood plain flow as possible
- Standard of protection provided is 1 in 50 year due to constraints, the impact of the scheme and the residual risks.
- 10m deep cut-off through course grained alluvium through to underlying fine grained alluvium
- Close proximity to houses – press-in pilling to minimise noise and vibration
- Pipe crossings and proximity to services
- Working from Beith Road (currently Trunk Road)
Beith Road Flood Wall

K CHAINAGE 185.0m

D SECTION AT TOP OF WALL

C SECTION - PILED WALL CLADDING SUPPORT CORBEL FOR FLOODWALLS

Scale 1:100
Beith Road Flood Wall

Key features:

- 3 Pipe Crossings (SW)
- Proximity to services (BT Fibre)
- Proximity to houses
- Traffic Management
- Pre and Post CCTV surveys
- Tie in to bridge parapet (Network Rail)
Key features:

- Works on Network Rail property
- On-going consultation with Network Rail
- Need Network Rail sign off prior to commencement of works (contractors method statement – Fail Safe Working Methodologies appropriate to electrified line)
Key features:

- To mitigate the impacts of increased flood levels, the following works are needed:
  - Low-level bunds at DSM factory
  - Raising of Scottish Water manholes
  - Low-level bund at Tofts

Dalry Flood Defences – Other Items
Works at DSM Plant

Key features:

- To mitigate the impacts of increased flood levels, the following works are needed:
- Low-level bunds at DSM factory
- Potential need to survey and determine requirement to extend electrical cables
- Agreed Induction process and site rules with DSM as its an operational site.
Low Level Embankment at Tofts

**Key features:**
- Low level flood bund
- Tie into railway embankment
- Short twin culvert and headwalls
- Flap valves