Flood Risk
• Flood risk is identifying flood hazards, assesses risks from flooding and planning and outreach support to communities to help them take action.
• Flood Insurance
• Emergency Response
FEMA – Flood severity grids

- FEMA – Flood Severity Grids
  - As per FEMA Guidance Document 14 - Section 8, May 2014 –
  - Depth x Velocity – The flood severity grid represents the combined effect of depth and velocity.
  - Most often communicated in categories of Low, Medium, High, Very High and Extreme Hazard
  - FEMA Non-regulated Flood risk product
  - FEMA HAZUS
  - Application is already in use globally

Flood Severity Grids – Global perspective

- UK DEFRA – Flood hazard in form of multi-criteria analysis to identify probability of people seriously harmed during event of flood
  - Commercial Damage
  - Flood Risk Portal

Flood Severity Grids – Global perspective

- Australia
  - Evaluate hazard level from hydraulic principles and then factors affecting safety of individuals and property
  - Velocity and depth are starting point for determination of hazard categories
    - 2 Hazard categories – Low, High
    - 3 hydraulic categories – floodway, flood storage and flood fringe
US Flood Risk Dataset

- FEMA is controlling body
- Flood risk information and to inform actions that can be taken to reduce flood risk is to deliver detailed information on depth of flooding, probability of flooding, and other flooding characteristics in the form of grid datasets (Regulatory Dataset)
- Flood Depth and analysis grids

Generating Flood severity grids

- Model Output
  - Depends on model output
  - Depth and velocity grids
  - Can be generated from outputs using softwares such as HEC RAS (Ver 5) etc
  - Steady v/s Unsteady simulations
  - 1D / 2D modeling

Generating Flood severity grids

- Using GIS
  - Input
    - Depth or Velocity grid
    - Use Raster Calculator in GIS
    - Classify Raster to Flood severity categories
FEMA – Flood severity grids

- How this helps
  - It depends on analysis – humans, vehicle or buildings
  - Slower velocity with deep water surface elevation can add to hydrostatic pressure on banks
  - Faster velocity with shallow water depth has potential for erosion, headcuts etc
  - Flood resilience design
  - Emergency Response

Flood Severity Grids – Bank Encroachment

<table>
<thead>
<tr>
<th>Existing</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>~7.6 ft</td>
</tr>
<tr>
<td>D x V</td>
<td>High</td>
</tr>
<tr>
<td>Flood Severity Grid</td>
<td>Very High</td>
</tr>
<tr>
<td>Bank Velocity</td>
<td>6 fps</td>
</tr>
</tbody>
</table>

Resilient Design Areas

- Slope failure (depends on slope)
- Seepage in foundation
- Flood proofing
- Erosion
- Loss of land
- Cost implications
Flood Severity Grids - channel applications

Resilient Design Areas
- Stream power (Ω = ρgQ²)
- Stream Profile change
  - Head cut
- Sediment Transport
  - Channel Bed material

Flood Severity Grids - Emergency Response
- Evacuation Routes
- Plan Construction Activities
- Flood Sensors
Summary

- Flood Severity Grid (Depth x Vel) is good tool that helps quantify flood risk which is easy to understand for all stakeholder
- Helps identify or compare critical areas especially from design risk and stability point of view
- Emergency Planning tool