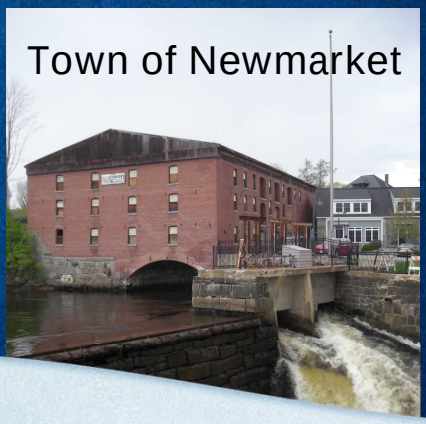
Macallen Dam
Final Report - Dam Breach Analysis

Town of Newmarket



Presented by:

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Scope of Services

May 2008 Letter of Deficiency from NHDES

- Structural Investigation of Dam
- Preliminary Construction Cost Estimate
- Dam Breach Analysis
- Dam Classification
- Inundation Mapping
- Spillway Capacity Analysis

Analysis – Recent History

05/10 – Preliminary Dam Breach Analysis

06/10 – Reclassification Request (H-S)

09/10 – NHDES denies reclassification and 100-year flood flow (8,302 cfs)

07/12 – Revised flood flow (10,350 cfs)

09/12 – NHDES denies flood flow

02/13 – Revised flood flow (10,259 cfs)

02/13 – Final Report

03/13 – NHDES Approval

Structural Investigation

- Visual inspection November 2009
- Recommendations for repairs needed within 2 +/- years
- Repairs required for maintenance of existing structure
- Additional modifications will be required to pass the design storm flows

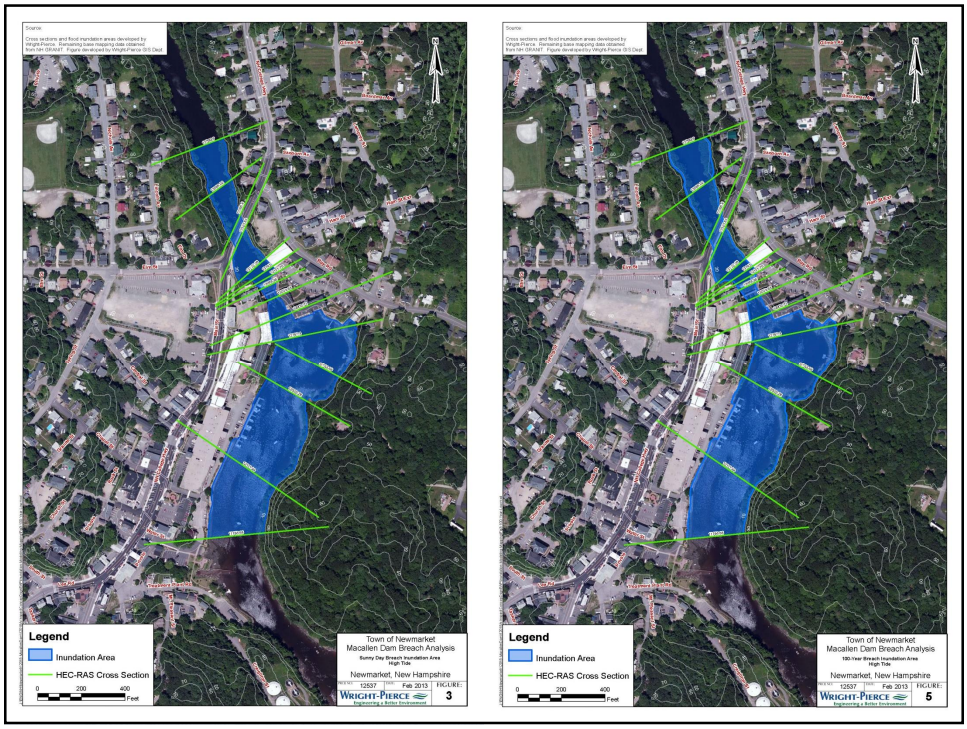
Estimated Construction Costs

- Phase I
  - Gate Structure
  - East Retaining Wall
  - $234,000*
- Phase II
  - Dam Structure
  - West Retaining Wall
  - $315,500*

*Adjusted to April 2013

Breach Analysis

- Confirm NHDES Dam Classification
  - Remains High Hazard
  - Building foundation and dam abutment integral
- Updated Inundation Mapping
- Verify Spillway Capacity
  - Required to pass IDF (100-year = 10,259 cfs)
- Verify Impact of Route 108 Bridge



Spillway Capacity Analysis

- Required to pass 100-year (10,259 cfs)
  - With 1 foot of freeboard without operations
- Existing conditions
  - Overtopped by 1.7 feet with gates open
- Requires spillway modifications to pass the 100-year flood flow with 1 foot of freeboard without gate operations

Alt	Description	Crest Elev.	Crest Length	Freeboard	Feasible	Cost
Ex.	Existing	22.18	70	-5.84	No	$0
1	Increase Spillway Length	22.18	350	1	No	N/A
2	Lower Crest Elevation	12.59	70	1	Potential	$1.1M
3	Increase Spillway Length and Lower Crest Elevation	17.30	140	1	Potential	$2.9M
4	Raise West Abutment and Increase Spillway Length	22.18	265	1	No	N/A
5	Raise West Abutment and Lower Crest Elevation	14.39	70	1	Potential	$1.3M
6	Raise West Abutment, Lower Crest Elevation and Increase Crest Length	19.10	140	1	Potential	$3.0M
7	Raise West Abutment, Lower Crest Elevation, Increase Crest Length and add 3' Tall Crest Gate	22.18	140	1	Potential	$4.6M

Spillway Alternative Notes

- Spillway length vs. site constraints
  - 70 feet to 350 feet
- Lower dam crest vs. partial dam removal
  - 22.2 feet to 12.6 feet (9.6 foot drop)
- Crest gate vs. "No Operations"
  - May not be in accordance with NHDES rules
- Costs include $234k for recommended Phase I structural repairs

Another Alternative May Exist

- Overtopping
  - Allow water to flow around spillway
  - May need to armor overtopped area
  - Will require geotech and structural analysis
    - Impacts to existing paved area?
    - Impacts to existing buildings?
    - Analysis of weak points
    - Depends on depth, duration, and velocity
      - Depth = 2-3 feet
      - Duration = unknown
      - Velocity = 2 feet/sec

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The Take Home Message

- $234k to address existing structural repairs (Phase I)
- Spillway modifications required to pass the 100-year flood flow (10,259 cfs)
- Alternatives range from $1.1M to $4.6M*
  - Consider site constrains
  - Potential dam removal
- Overtopping could be considered

*includes $234k for structural repairs

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Questions & Answers

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