Risk Management in Site Design
Don’t Forget to Look Offsite
W. Byron Hinchey, PE, CFM
Looking Off-Site

Case 1 - A Teaser
You Mean Off-Site
...or...
OFF-SITE?
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...or...
OFF-SITE?
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...or...
OFF-SITE?
You Mean Off-Site

...or...

OFF-SITE?
You Mean Off-Site
...or...
OFF-SITE?
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...or...
OFF-SITE?
Looking Off-Site
Case 2 – Lessons for Everybody
Typical Residential Development
Typical Residential Development
Typical Residential Development
Do I Need Detention?

Pre-Development
- DA = 38 ac.
- Agricultural (grass)

Post-Development
- DA = 38 ac.
- 73 Homes (Med. Density)

Usually Yes
Standards Vary

- 100 year
- 50 year
- 25 year
- 10 year
- 2 through 100 year
- Probably Others…

In this Case…
2-100 year, 24 hour
Easy Enough

- 2-acre Retention Pond
- Flood Storage = 3 ac-ft
- Outlet Control Structure
Will Homes Flood in Development?  No!

Minimum FFEs Recorded on Final Plat (lowest 1136.7)
Computed 100-yr Flood Elevation = 1133.5
Will Homes Flood in Development? No!

...but what if they do?
Drainage Report (Detention)

- No Narrative
- PondPack Software
- Pre-Post Criteria 2 through 100 year
- Rainfall Depth-Duration-Frequency Values
- SCS Hydrograph Method

### Table

<table>
<thead>
<tr>
<th>Pre</th>
<th>Variable</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 ac.</td>
<td>Area</td>
<td>38 ac.</td>
</tr>
<tr>
<td>Pasture</td>
<td>Landuse</td>
<td>Med Density Res.</td>
</tr>
<tr>
<td>0%</td>
<td>Impervious</td>
<td>31.3%</td>
</tr>
<tr>
<td>???</td>
<td>Soils</td>
<td>???</td>
</tr>
<tr>
<td>???</td>
<td>Curve Number</td>
<td>???</td>
</tr>
<tr>
<td>???</td>
<td>$T_c$</td>
<td>???</td>
</tr>
<tr>
<td>137 cfs</td>
<td>Peak $Q_{100}$</td>
<td>143 cfs</td>
</tr>
</tbody>
</table>

- With Detention Post $Q_{100} = 118$ cfs
Pond Outlet (Weir)

Modeled in PondPack as 2 weirs

Free Outfall Condition

Is it really a Weir?
But Wait…

- Anything Draining to Me?
- Regulatory Requirements?

In this Case…

Sub-D Regulations, “…drainage facility…accommodate potential developed property runoff from its entire upstream drainage area…”
...and...

- Do I Affect Flooding Downstream?
  - Two Downstream Crossings?
  - 10% Rule?
  - Hydrograph Timing Analysis?
  - No Adverse Impact?
  - Other?

In this Case... No Regulatory Requirement
...and...

- Do Downstream Conditions (Tailwater) Affect Design?
  - Downstream Inflow?
  - Downstream Channel?
  - Receiving Stream?
  - Downstream Crossings?
  - Other?

In this Case...
No Regulatory Requirement
Downstream Inflow
Downstream Channel

500 ft Channel
Zero Slope
Receiving Stream
Downstream Crossings

First

Second

Map showing locations and directions of the crossings.
Any Other Consideration?
Any Other Consideration?

excerpt from Final Plat

BFE = 1135.5
Pond Outlet (Weir)
Who Maintains Pond & Weir?

- Storage Volume?
- Weir Function?

In this Case…
Sub-D Declaration of Covenants…
“… responsibility of the Association to maintain these Common Areas.”
“The detention ponds are a part of the Common Area …”
Will Homes Flood in Development?

他们会！

他们会！

他们！

他们！

Pond 100-yr Flood Elevation = 1133.5 (maybe flawed)
Receiving Stream 100-yr Flood Elevation = 1135.5
Takeaways

- Regulations are a **Minimum** requirement to get a permit
- Minimum Permit Requirement **Does Not Equal** Standard of Care
- Technical Analysis **must** be Competent & Defendable
- Internal Reviewer (Designer) **must** actually perform a **Review**
- External Reviewer (Community Official) **must** actually perform a **Review**
- **Everyone** involved in Development is a potential Target
- Document well and **Manage Documentation**
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