Dow's Reservoir and the Realities of Flooding in Texas

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Dow Chemical Harris Reservoir Expansion

Jacobs

Memorandum

Support for EIS: Brazos River and Oyster Creek Additional Hydraulics Modeling

- Off the Brazos River in Brazoria County
- North of the Existing Harris Reservoir
- Dow Will Fill with Water from the Brazos / Store for Future Use
- Removes Almost 2000 Acres from the Existing Floodplain by Surrounding with 40-foot-tall embankments
- This area has a history of flooding
- The Brazos River and Oyster Creek Connect and Overflow Here During Flooding From Upstream

Figure 1. New HEC-RAS Cross Section Locations for the Brazos River and Oyster Creek Models

Research to Support Advocacy / Focus on Facts

Personal Interests in the Lower Brazos

History of Flooding from Upstream on the Lower Brazos

- Five Floods between 2015 and 2019 Driven by Upstream Rain

Such Large Reservoir Projects Require Corps of Engineers Approval

- Requires an Environmental Impact Statement
- National Environmental Policy Act

Concerns about Added Flooding Impacts from this Reservoir

Localized Rainfall Typically is a Minor Contributor to Flooding Here

National Environmental Policy Act / EIS

EIS Process Required for Major Federal Actions with Significant Impact on the Human Environment

Requires that a "Detailed Statement" address Impacts and Alternatives

- US Army Corps of Engineers Determine an EIS is Required
- Scoping Process – Public Shares Issues of Concern
- Draft EIS / Public Comments
- Final EIS / Public Comments / Agency Decision

EIS is Procedural – It Does Not Set Protective Standards

- Adds Information and Public Input

Participated in the NEPA/ EIS Process
Invitation for Commentary – Texas Observer

- Prepared Comments to the Corps at Each Step in the EIS Process
  - For the Brazos River Club, a Non-profit Hunting and Fishing Club
  - My Family
- Reviewed and Analyzed DEIS / Researched Additional Information
  - DEIS and Related Documents, including Modelling on Flooding
    - over 1600 pages
  - Considerable Additional Documentation
  - Found Many Deficiencies in the Modelling / Other Concerns
  - Formal Comments Were Technical and Detailed
    - Technical and Procedural Concerns Raised
- Invited by the Texas Observer to Prepare Commentary
  - Final EIS Shared by Corps During Final Editting
  - Challenge to Prioritize and Simplify

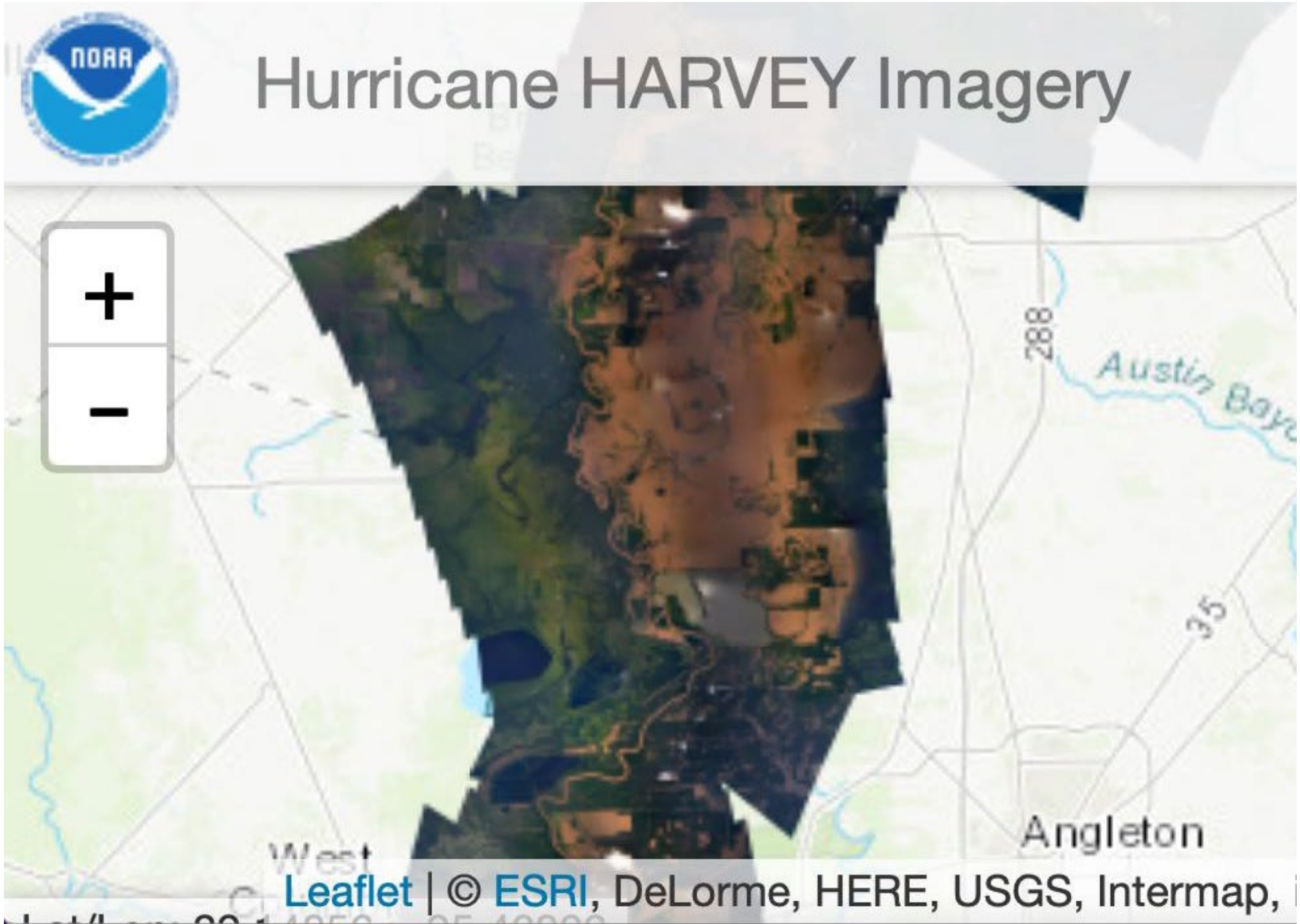
Flooding in the Local Flat Coastal Plain

- Floodwaters Spread Out / Are Slow to Drain
- Success with Detention Basins
  - Exploration Green, Willow Waterhole, and Many More Regionally
    - Exploration Green Saved Many Homes in Harvey
  - As Floodwater Rise, Water is Redirected to Basins
    - A "Notch" Structure in a Bayou or Stream Allows Overflows into Basins
  - Floodwaters Temporarily Stored in Planned Basins, Not Homes
- Dow's Reservoir – an Anti-Detention Basin
  - Almost 2000 Acres v 200 acres for all of Exploration Green
    - Surrounded by 40 Embankments v Space for Flood Waters
  - Historic "overflow" areas into Oyster Creek now "plugged"
  - Not Clear Where Floodwaters Are Redirected
  - Typically, When Levees are Built, It Creates Flooding Elsewhere
    - The Embankments Are Effectively Levees

Dow's Project's Flood Modelling

- Initial Permit Application Indicated Project was only within the Oyster Creek Watershed
  - True When Not Flooding
  - During Floods, the Brazos River and Oyster Creek Interconnect and Combine
  - The Brazos Overflows into Oyster Creek at this Location During Floods
- Submitted Modelling Focused on Localized 100-year Rainfall Event
  - Assumed most rain at the site would fall in the off-channel reservoir and not cause flooding
- Actual Flooding on the Lower Brazos Comes from Upstream
  - 5 Such Floods Between 2015 and 2019; and also previous floods
  - That upstream rain drove flooding incidents was acknowledged elsewhere in the EIS
  - Flooding Happens for Weeks at a Time from Upstream Rainfall
  - Not really modeled in hydrology documents in the DEIS
- Submitted Modelling Purportedly Showing No Increase in River Levels Due to the Project Still Had Now-Blocked Overflows Continuing to Occur After Completion
  - This Took Some Deep Digging to Confirm
  - Did Not Reflect Reality

Hurricane HARVEY Imagery



Project and NEPA Timeline

- Spring 2018 First Permit Notice on Corps of Engineers Website
  - Standard Permit Proposed; No EIS Requirement
  - Fall 2018 Significance Determination by Corps – EIS Required
- Summer 2020 NEPA Scoping Process / Comments
- Summer 2022 Draft EIS / Comments
- Summer 2023 Final EIS
  - Some Additional Flood Modelling Has Been Required
  - Most Concerns Not Resolved
  - Texas Observer Commentary Published
  - Some Additional Flood Flow Mitigation Required
- Fall 2023 – Dow's Permit Granted by Corps / Construction Begins

Updates / Conclusions

- The Texas Observer Commentary:
  - https://www.texasobserver.org/brazos-flood-dow-reservoir/
- Subsequently Have Talked With Dow Reps and Corps Rep
- Modelling Results Are Only as Good as the Model and its Assumptions and Inputs
- Agencies Have Limited Responsibilities and Resources
- Some Project Improvements Arguably Resulted
- Accountability Can Become Difficult with Technical Complexity

Ending with the Beginning

"The Texas coast regularly experiences major storms and flood events with devastating consequences to those of us who live and work in their paths. As each storm passed in recent decades—Allison, Rita, Ike, **Harvey,** and more—hard lessons were learned and improvements initiated. Future storms are inevitable. With appropriate planning, we can minimize future flooding impacts while still improving our overall economy and quality of life.

Unfortunately, some Texans instead continue to ignore foreseeable flood impacts and create avoidable future destruction.

Dow Chemical's proposed **Harris Reservoir Expansion** is a prime example of such poor planning."