City of College Station

City of Bryan

Texas A&M University

Impact of Large Groundwater Withdrawals on the Economies of Brazos and Robertson Counties

Presented to GMA 12

October 30, 2008

HDR Engineering, Inc.

October 30, 2008

HDR

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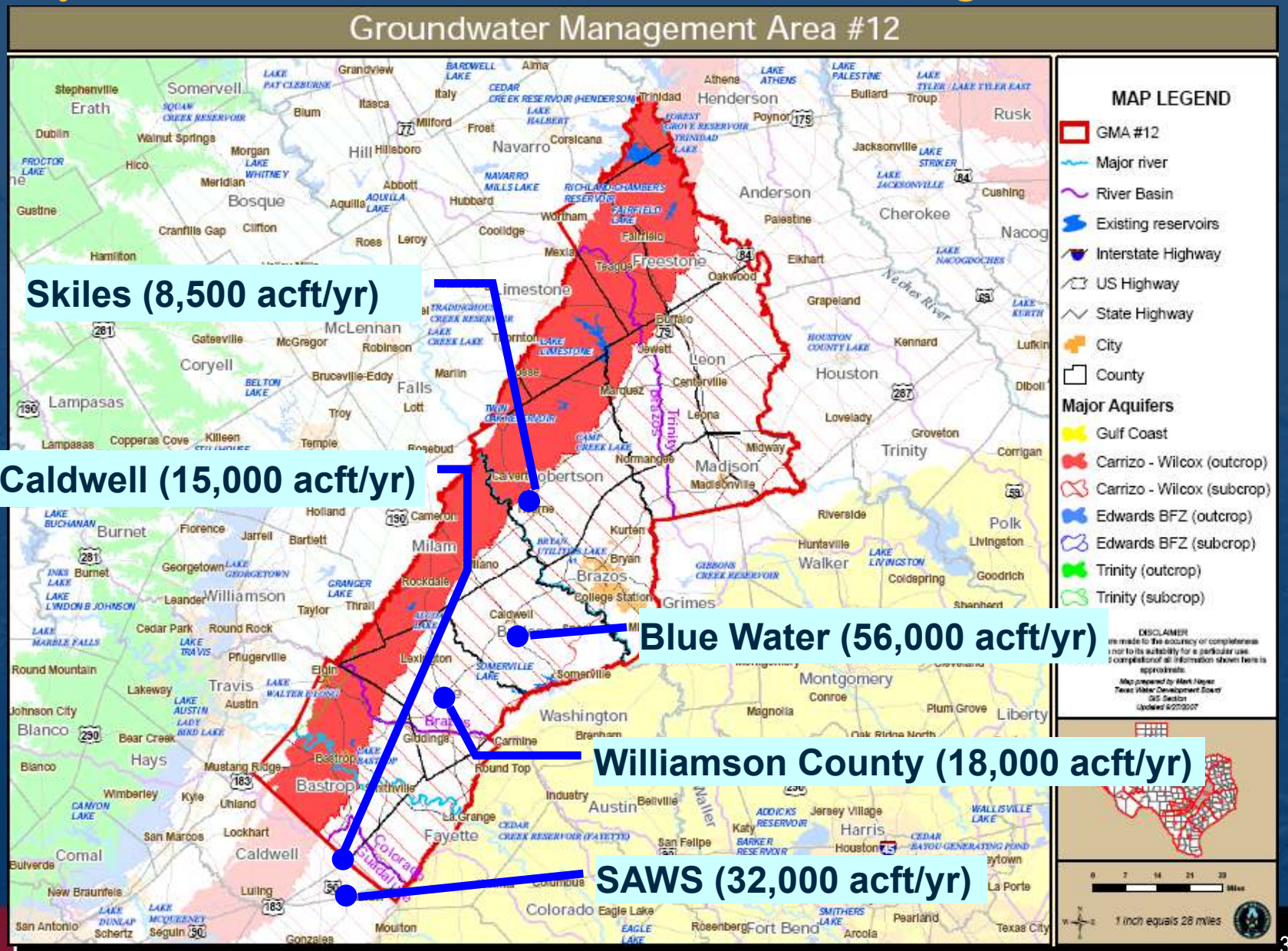
Purpose of Study

"Assist the GMA 12 process by providing input regarding potential economic impacts within the Brazos Valley Groundwater Conservation District (GCD) of future large groundwater withdrawals from GMA 12."

Proposed Carrizo-Wilcox Projects



Study Overview

- Impacts to Brazos and Robertson Counties (Brazos Valley GCD)
- Potential future aquifer conditions
  - Baseline: Growth of existing uses using TWDB projections
  - GMA-12 Scenario: Existing uses plus currently-known development plans
  - Worst-Case Scenario: Full use of estimated groundwater availability
- Modeling includes projected uses in all GMA 12 counties

Direct Costs – Two Types Determined

1. Costs to existing well owners
   - Costs to rehab wells (lower pumps)
   - Costs to replace wells
   - Increased pumping costs
2. Increased costs for Bryan and College Station to develop future supplies
   - Greater well costs, **or**
   - Develop new surface water supply
     - Brazos River Diversion
     - Millican Reservoir
   - Existing users typically bear 30 to 60 percent of these costs

Methodology

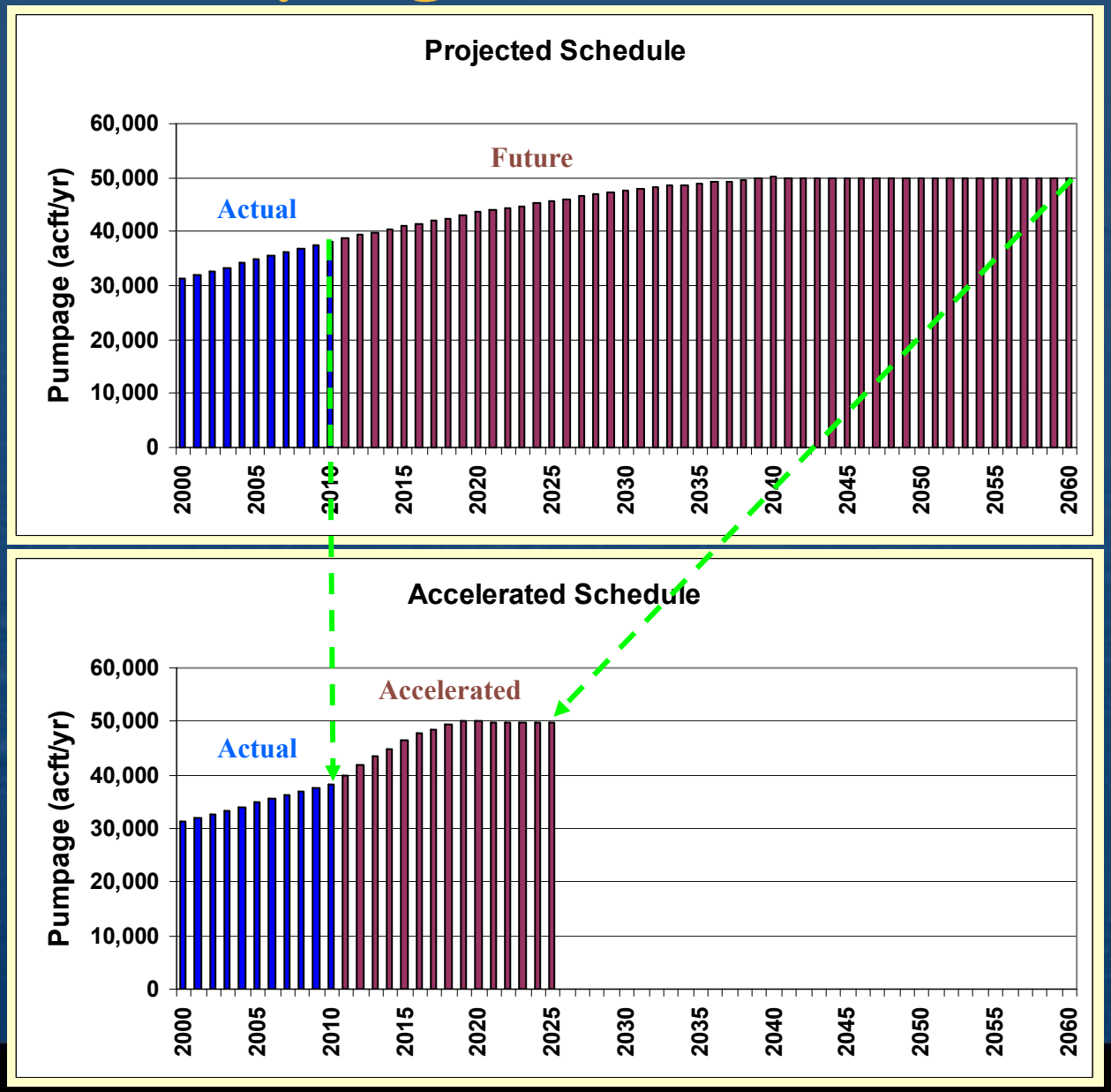
- Groundwater modeling to determine future hydrologic conditions
- Characterize existing wells
- Determine impacts of future hydrology on existing wells
- Estimate costs to existing wells
- Evaluate costs for new supplies for Bryan and College Station
- Input direct costs to IMPLAN (“analysis by parts”)
- IMPLAN analysis
  - Direct, indirect, induced costs

Groundwater Modeling

- Central Carrizo-Wilcox GAM
- GMA 12 pumping scenario GMA 12-3A
- Accelerated groundwater development
  - Achieve 2060 pumping levels by 2025
  - Stresses the aquifer so a response to increased pumping is seen
  - Allows impacts to be realized within a reasonable planning window
  - Actual development could occur faster than current plans show

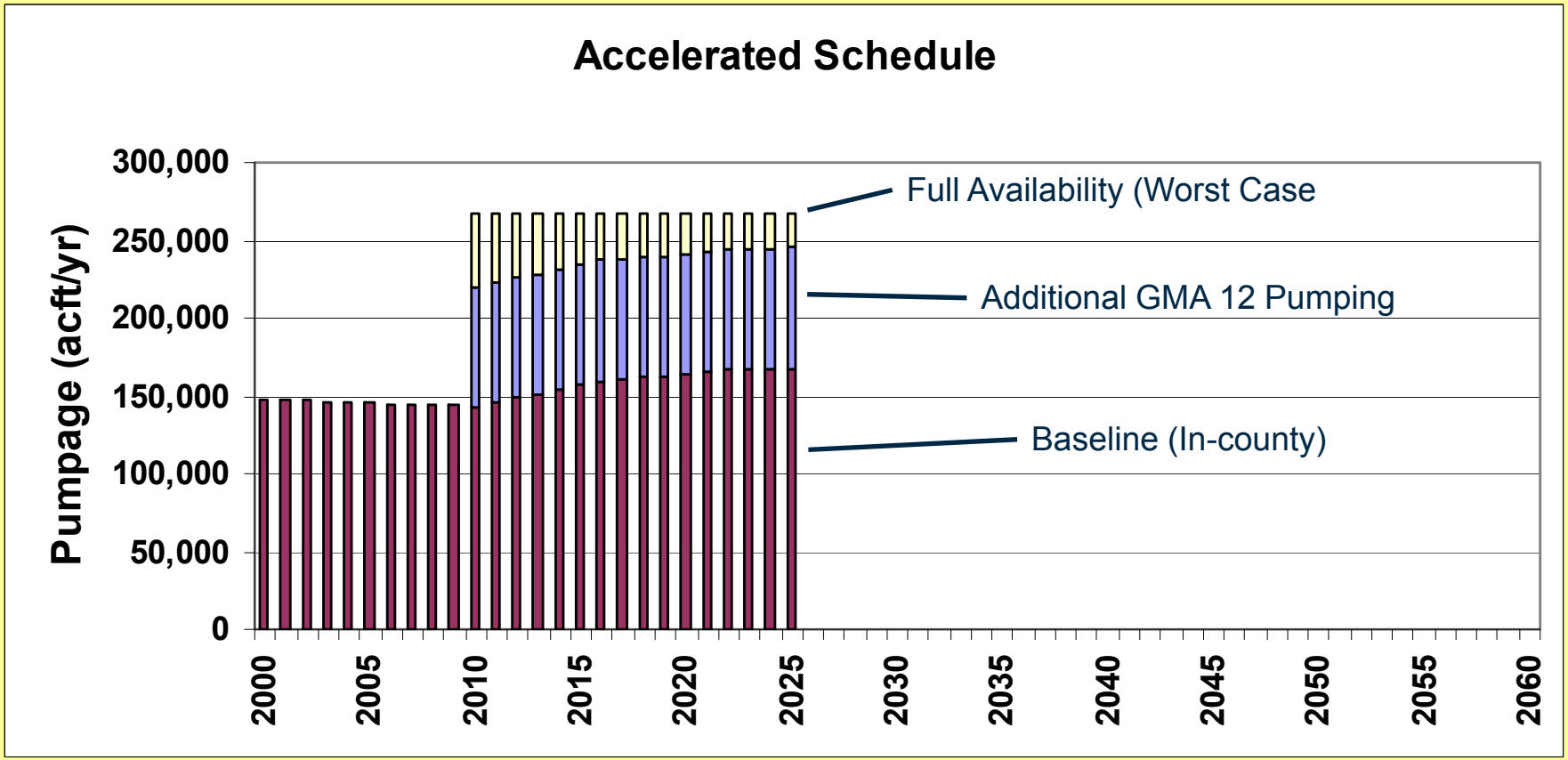
Accelerated Pumping Schedule

GMA 12-3A Pumping in Brazos County

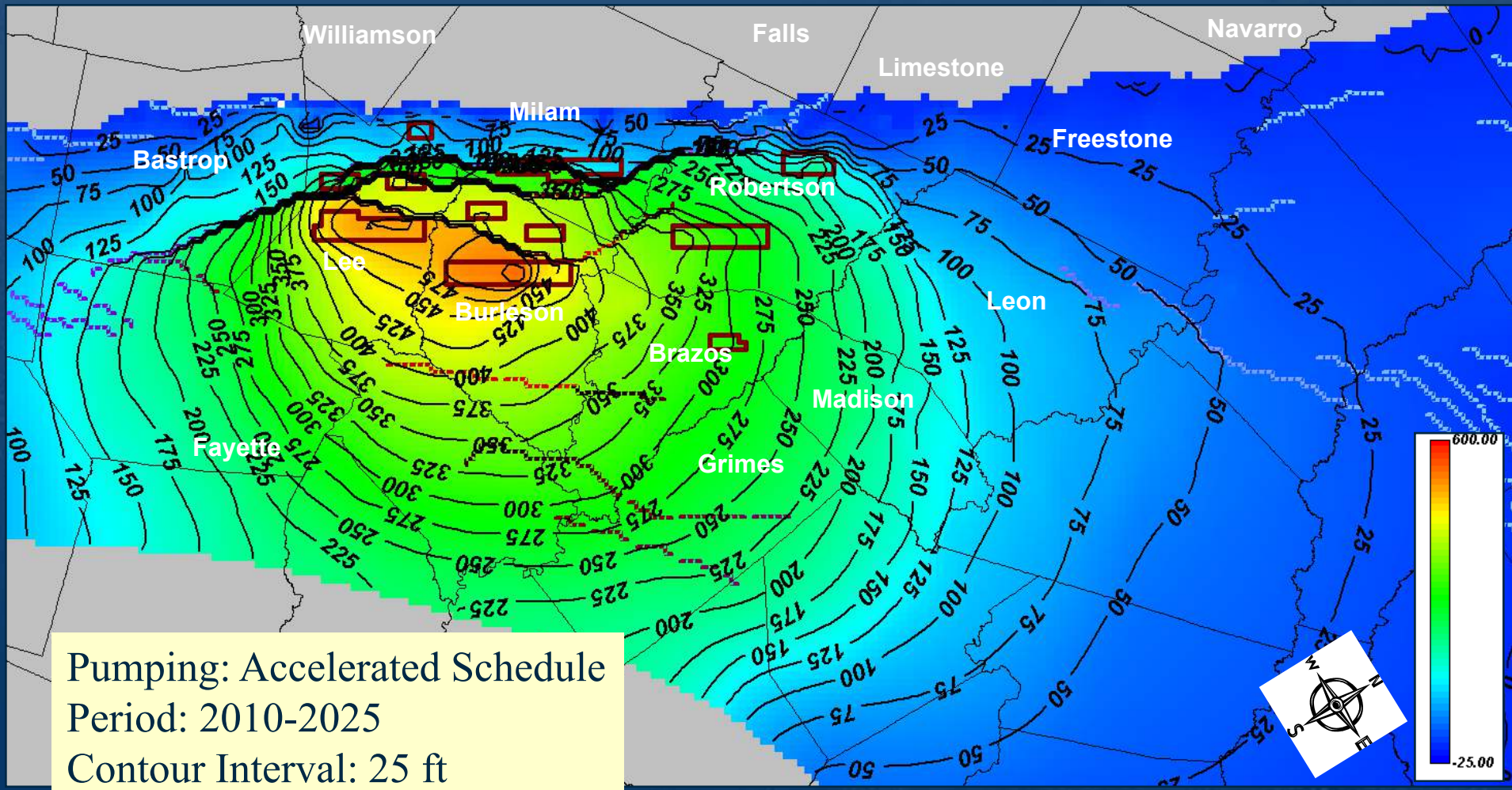


GMA 12 Pumping, 2000-2060

All GMA-12 Counties



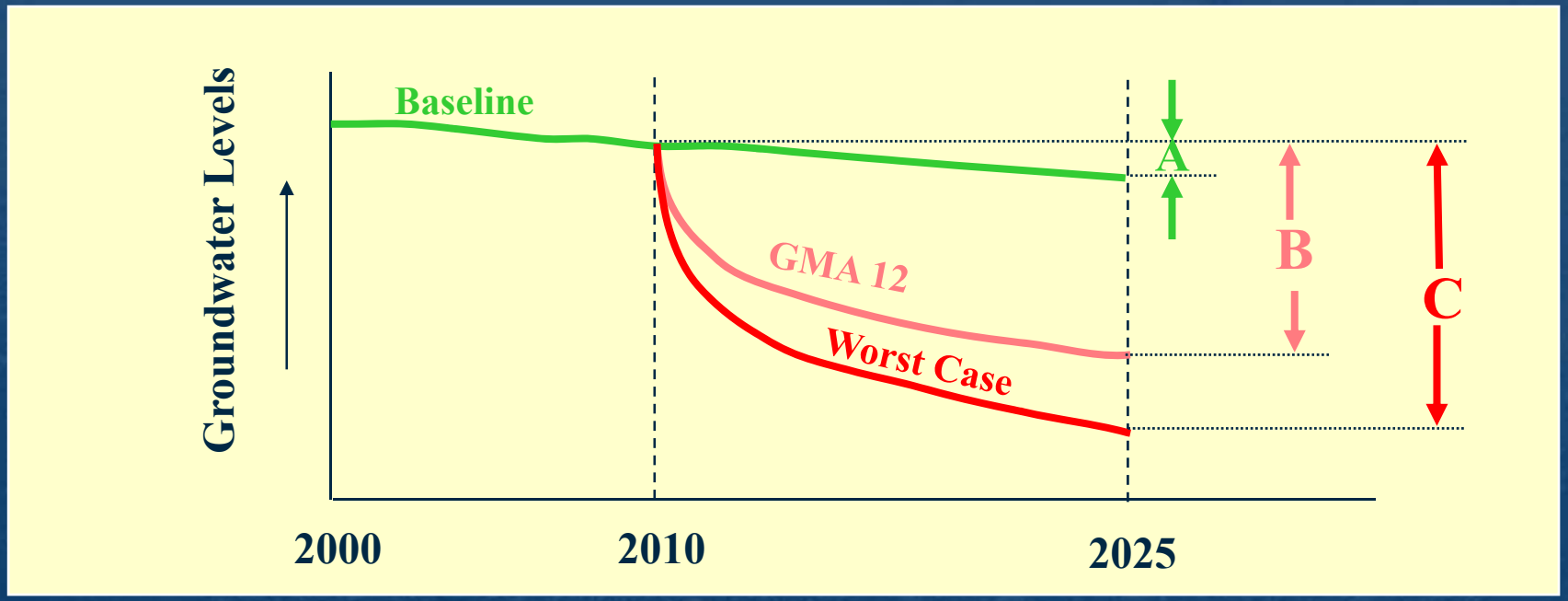
Groundwater Modeling (Worst Case): Additional Drawdown for Simsboro



Pumping: Accelerated Schedule
Period: 2010-2025
Contour Interval: 25 ft

Ground Water Level Declines

Impact on Groundwater Levels: Drawdown from 2010 to 2025

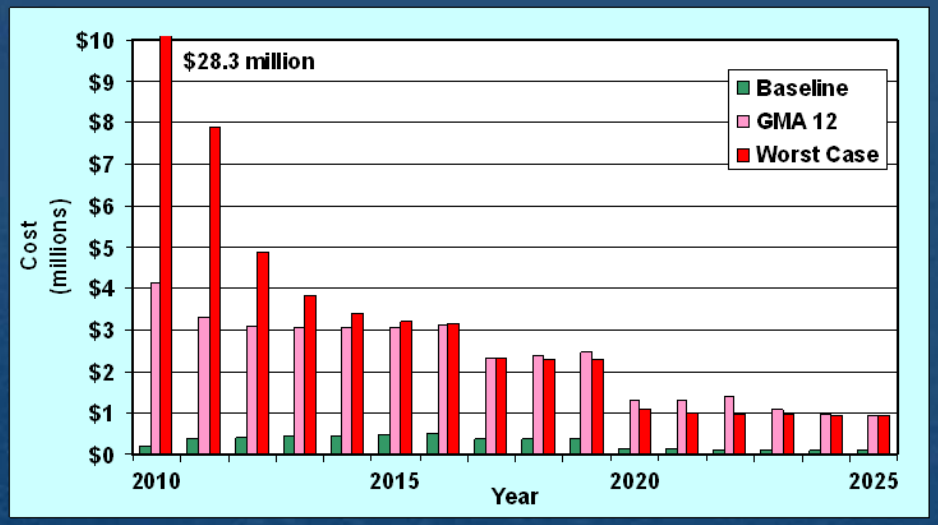


A = Baseline (In-County Uses)
B = GMA 12 (Baseline plus Additional Large Projects)
C = Worst Case (Brazos G Availability Estimates)

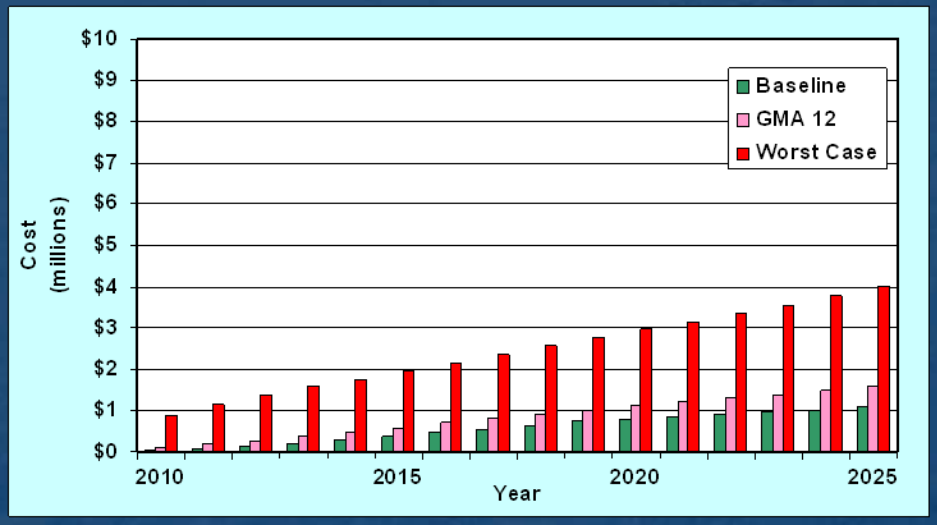
Annual Direct Well Costs

Brazos and Robertson Counties

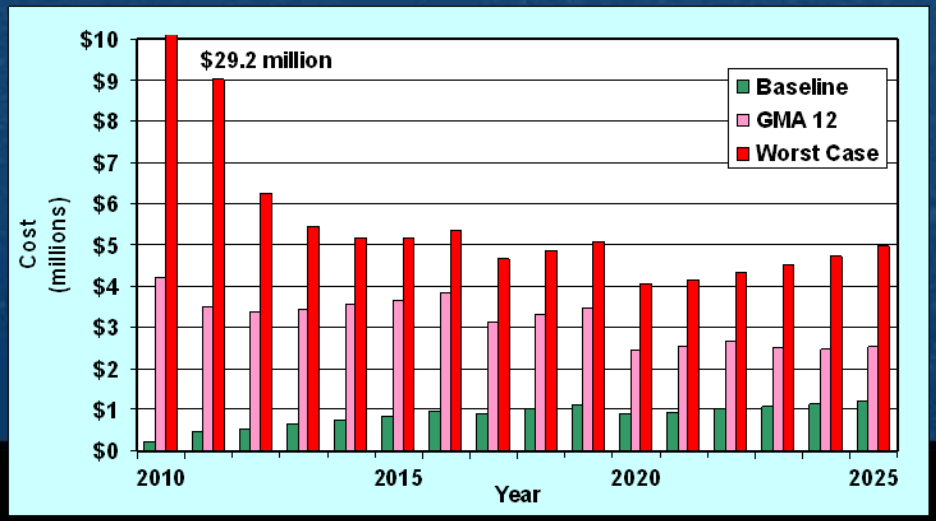
Amortized Well Cost



Power Cost



Total Cost



Costs for New Supplies for Bryan and College Station

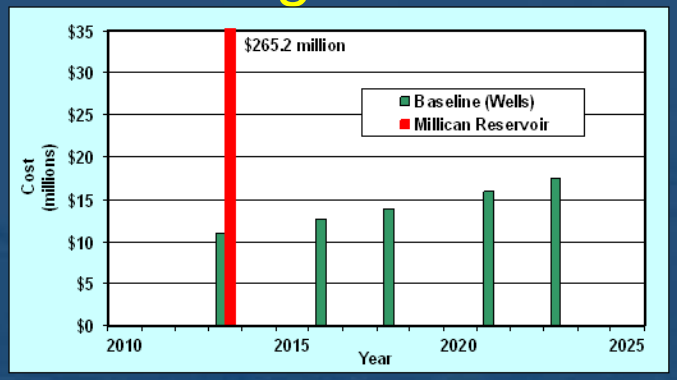
- Decreased aquifer levels will increase the cost of new supplies for Bryan and College Station
- Three alternatives for new supply
  - New wells (5 for College Station, 1 for Bryan)
  - New surface water supply from Brazos River (assumes new wells prohibited by GCD)
  - New surface water supply from proposed Millican Reservoir

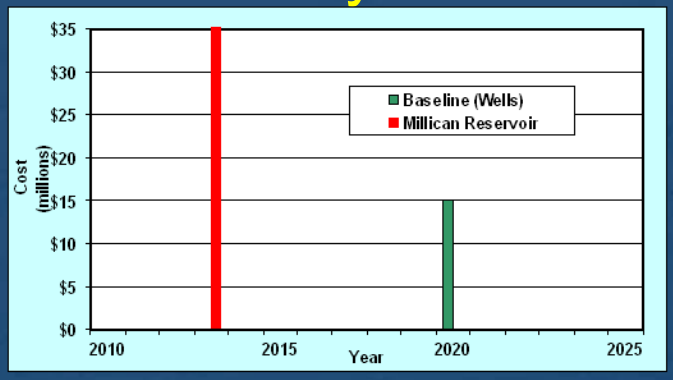
Costs of New Supplies – Millican Reservoir

College Station

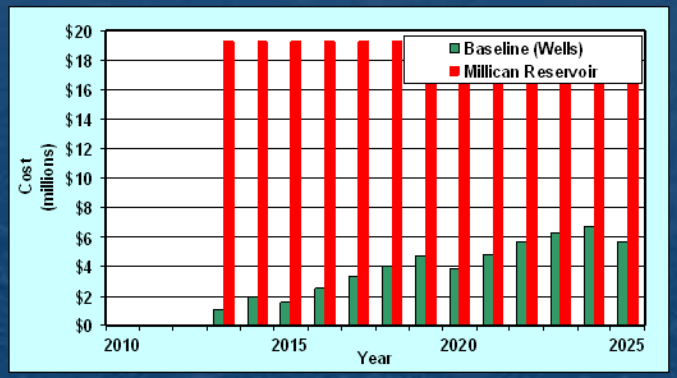
Bryan

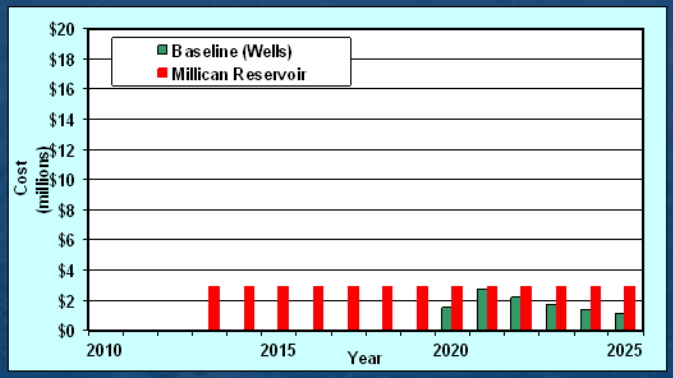
Capital Cost



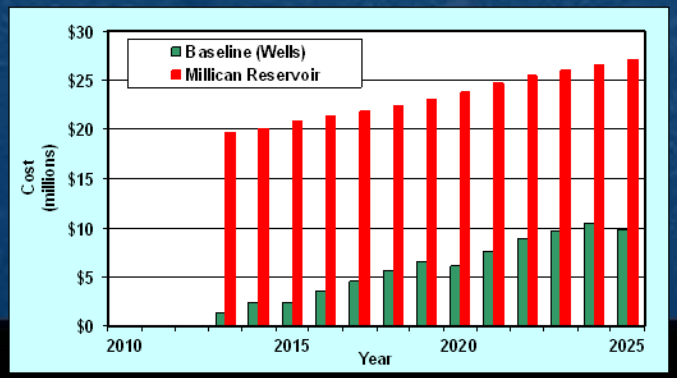


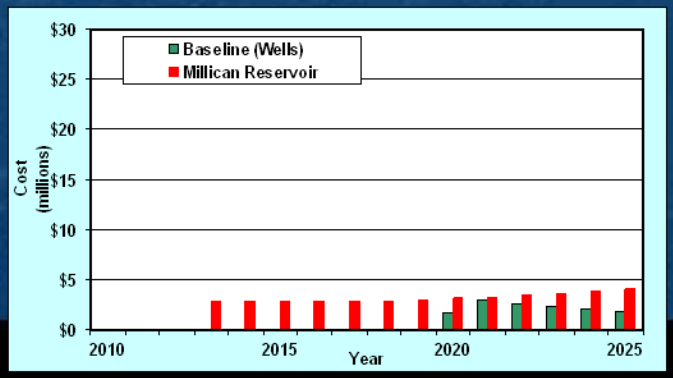
Amortized Cost





Annual Cost





Economic Impacts

- Impacts arising from direct costs to existing uses
  - Includes all current uses outside Bryan and College Station
  - Includes current Bryan, College Station and TAMU uses

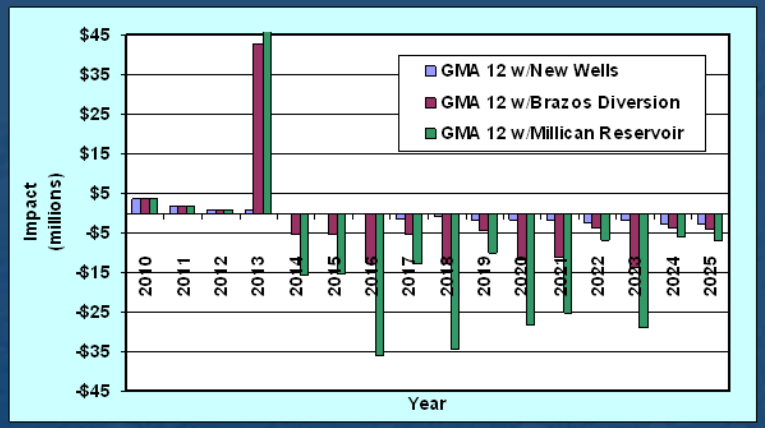
- Impacts arising from additional costs to Bryan and College Station to develop new supplies as they grow
  - Groundwater only – continued ability to develop all new supplies from fresh groundwater
  - Surface Water – necessity to develop surface water supplies
    - Brazos River diversion
    - Millican Reservoir

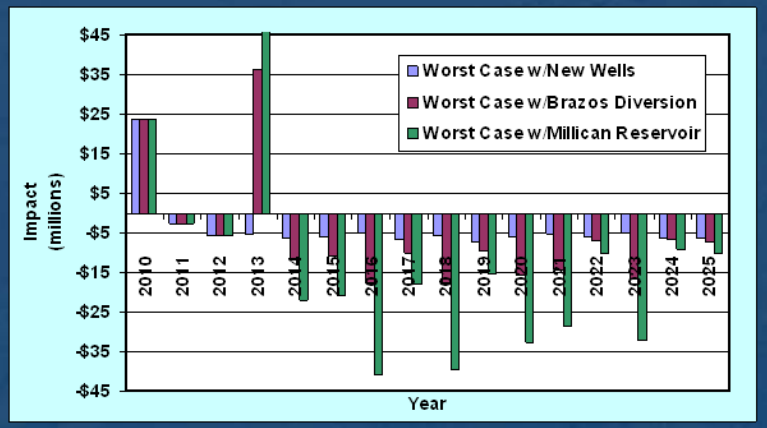
Economic Impacts of New Supplies

GMA 12

Worst Case

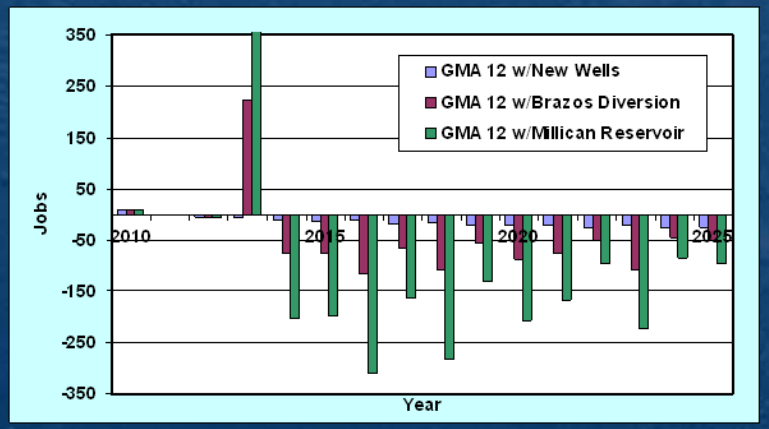
Economic Output

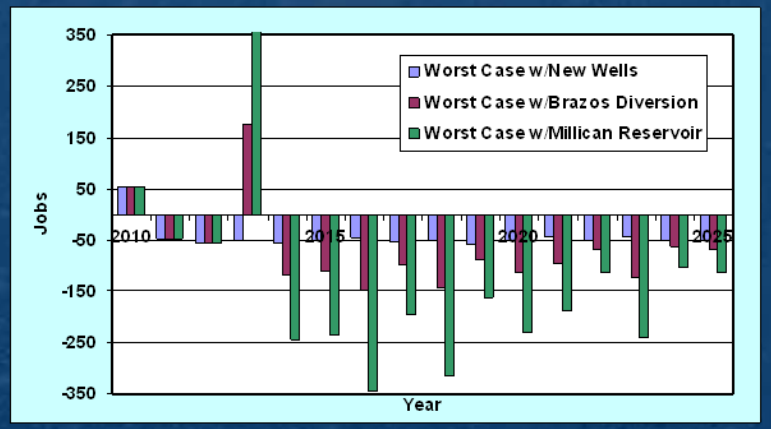




Est. 2008 Output = $10.66 billion

Employment





Est. 2008 Employment = 112,589

Economic Impacts of New Supplies

- Annual economic output decreases sharply in 2015
  - $287 thousand decrease with new supplies not considered (GMA 12 case)
  - $532 thousand decrease if additional wells provide new supplies
  - $5.58 million decrease if Brazos River diversion project is necessary
  - $15.67 million decrease if Millican Reservoir is necessary
- Impacts depend on relative timing of capital construction between scenarios

Summary

Assumptions

- Impacts are applied to existing uses. Impacts to future uses are not considered.
- Impacts are based on accelerated groundwater use
  - In-county 2060 use accelerated to 2025
  - Large additional withdrawals assumed to begin in 2010 at full quantity
  - Impacts will be less if groundwater use (including large withdrawals) increases at slower pace
  - Impacts in years past 2025 will continue and will be based largely on the annual pumping volumes
    - Year 2060 impacts (not accelerated) will be similar to or more severe than 2025 under accelerated pumping
- All economic impacts are based on 2006 economy
  - Provides "snapshot" look at a possible future
  - Future economy not guaranteed to look like 2006

Results

- Additional large groundwater withdrawals will increase costs to existing uses
  - Negative overall impact to economy
    - Modest impacts – less than one tenth of one percent, even in worst case
    - Output will slow, income will decrease and some jobs could be lost
- Costs to develop new supplies will increase economic impacts
  - Costs for future Bryan and College Station wells will almost double economic impact
  - Economic impacts will increase 10-fold if cities are forced to develop expensive surface water source

Discussion and Questions