CarbonSAFE Phase II – Storage Complex Feasibility: Coastal Bend Offshore Carbon Storage Corpus Christi, TX

Project Number DE-FE0032271

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TEXAS Geosciences
Bureau of Economic Geology
Jackson School of Geosciences
The University of Texas at Austin

Gulf Coast Carbon Center

U.S. Department of Energy
National Energy Technology Laboratory
2024 FECM / NETL Carbon Management Research Project Review Meeting
August 8, 2024

Corpus Christi - The Energy Port of the Americas

By the Numbers

#1
U.S. Port by Annual Revenue Tonnage

#1
U.S. Crude Oil Gateway

7,736
Vessels moved in 2022

187.9M Tons
of goods moved in 2022 | New annual record

$400M
Per day goods value movement

$65B
In private investment over the last 8 years

95,448 FTE
Direct, indirect, and related positions | Over 40% of regional workforce

$5M
In direct community investment in 2022

#2
U.S. Port in LNG Exports
Estimated 808 Bcf in 2022

Sources: U.S. Census Bureau; Port of Corpus Christi commercial data; Dr. Jim Lee, South Texas Economic Development Center at Texas A&M University-Corpus Christi

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Commercial Partnerships

ExxonMobil
CITGO FUELING GOOD
SIEMENS Gamesa RENEWABLE ENERGY
PHILLIPS 66
FLINT HILLS resources
Valero
HOWARD ENERGY PARTNERS
KOCH
AEP TEXAS
CHENIERE
GULF COAST GROWTH VENTURES An ExxonMobil and SABIC joint venture
NuStar
Kiewit
Vestas
PIN OAK TERMINALS
GE Energy
AIR LIQUIDE
EPIC
PLAINS ALL AMERICAN PIPELINE, L.P.
BUCKEYE PARTNERS, L.P.
TRAFIGURA
ENBRIDGE Life Takes Energy
Mexichem
Chemours
MARATHON
sabic
ADM
Steel Dynamics, Inc.
ArcelorMittal
lyondellbasell
Celanese The chemistry inside innovation
Vopak
MAGELLAN MIDSTREAM PARTNERS L.P.
OXY
BNSF RAILWAY
Kansas City Southern Lines
HALLIBURTON
subsea 7
UNION PACIFIC
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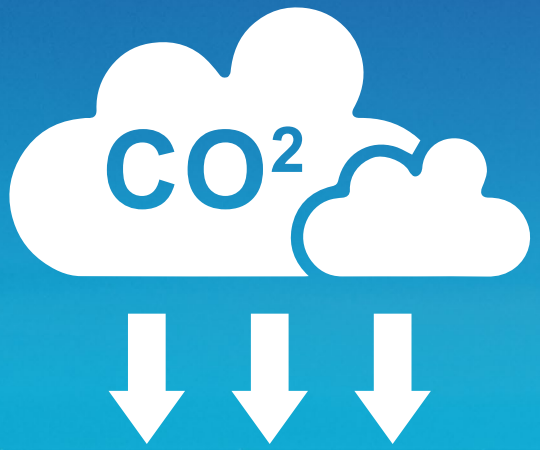
The Port of Corpus Christi's Role in CCUS



- Send clear signal to marketplace that centralized CCUS solution IS coming
- Cultivate CCU opportunities (new projects/Port customers)
- Identify/vet/permit route alternatives for CO_2 delivery infrastructure
- Lease Port-owned pore space for CO_2 injection and storage
- Facilitate logistical/commercial connections between emitters & CCS service providers
- Deploy Port capital to fund key infrastructure elements
- Pursue/leverage federal capital
- Advocate for appropriate state and federal policy

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Program Overview

US DOE awards Port of Corpus Christi with $16.4M in CarbonSAFE grants

BUSINESS DEVELOPMENTS & PROJECTS

February 2, 2023, by Aida Čučuk

The Port of Corpus Christi has been allocated $16.4 million through the US Department of Energy's (DOE) Carbon Storage Assurance Facility Enterprise (CarbonSAFE) initiative to evaluate the technical and economic feasibility of permanently storing captured carbon dioxide (CO2) from industrial operations.

OFFshore:

Partners/Sub-Recipients

- University of Texas Bureau of Economic Geology Gulf Coast Carbon Center
- Strategic Sequestration Development, SSD
- Geostock Sandia
- Geosurveys
- MRSW

Total Project Cost $12,079,448

- DOE Award $7,357,327
- Partner Match $1,839,332

Objectives

- Address, meet, and/or exceed criteria for CarbonSAFE Phase III eligibility
- Contribute to development of scalable carbon management solution in Coastal Bend, via offshore storage resources
- Enable access to large volume storage in deep saline stratigraphy in western Gulf of Mexico
- Reduce risks/costs for future projects by bringing new storage resources into commercial classifications to foster an innovative, diverse, and inclusive geological storage industry

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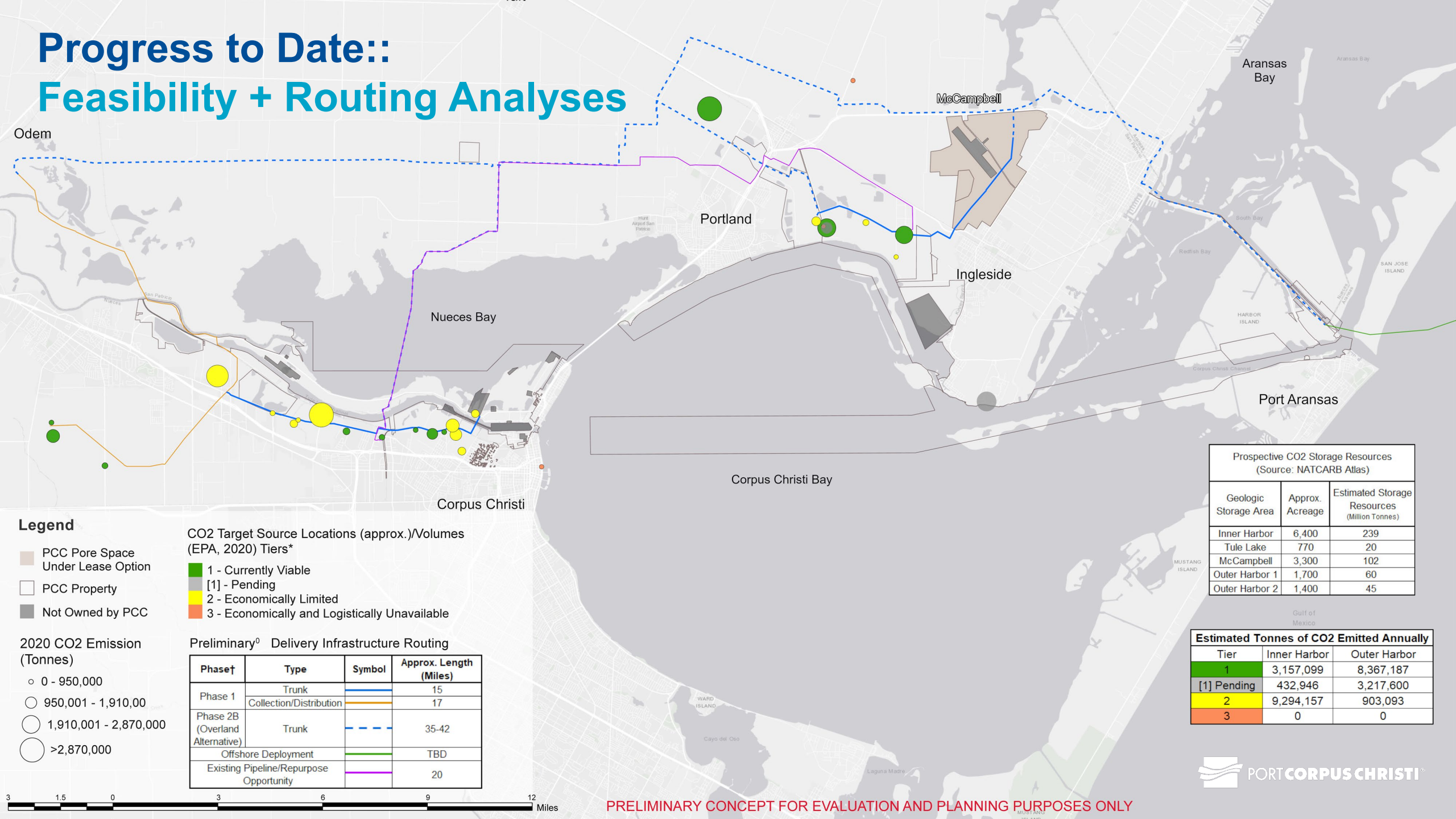
Progress to Date::
Feasibility + Routing Analyses



Prospective CO2 Storage Resources (Source: NATCARB Atlas)		
Geologic Storage Area	Approx. Acreage	Estimated Storage Resources (Million Tonnes)
Inner Harbor	6,400	239
Tule Lake	770	20
McCampbell	3,300	102
Outer Harbor 1	1,700	60
Outer Harbor 2	1,400	45

Legend

- PCC Pore Space Under Lease Option
- PCC Property
- Not Owned by PCC

CO2 Target Source Locations (approx.)/Volumes (EPA, 2020) Tiers*

- 1 - Currently Viable
- [1] - Pending
- 2 - Economically Limited
- 3 - Economically and Logistically Unavailable

2020 CO2 Emission (Tonnes)

- 0 - 950,000
- 950,001 - 1,910,00
- 1,910,001 - 2,870,000
- >2,870,000

Preliminary[0] Delivery Infrastructure Routing

Phase†	Type	Symbol	Approx. Length (Miles)
Phase 1	Trunk		15
	Collection/Distribution		17
Phase 2B (Overland Alternative)	Trunk		35-42
Offshore Deployment			TBD
Existing Pipeline/Repurpose Opportunity			20

Estimated Tonnes of CO2 Emitted Annually		
Tier	Inner Harbor	Outer Harbor
1	3,157,099	8,367,187
[1] Pending	432,946	3,217,600
2	9,294,157	903,093
3	0	0

3 1.5 0 3 6 9 12 Miles

PRELIMINARY CONCEPT FOR EVALUATION AND PLANNING PURPOSES ONLY

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Progress to Date::
Feasibility + Routing Analyses

01

Review of existing infrastructure

02

Probabilistic analysis of known emitters (volumes and likelihood/timing of participating in centralized CO_2 mgmt. system)

Scope:

- Identification of additional “in-scope” emitters
- Data gathering for all “in-scope” emitters:
  - Likely volumes of CO_2
  - Type & concentration (power gen, cement, etc)
  - Distance emitter’s CO_2 / environmental commitments
  - Established relationship / discussions underway
  - CO_2 sequestration incentives (45Q or other relevant carbon taxation)
  - For new sources, does timeline meet 45Q
  - Data review and probability weighting

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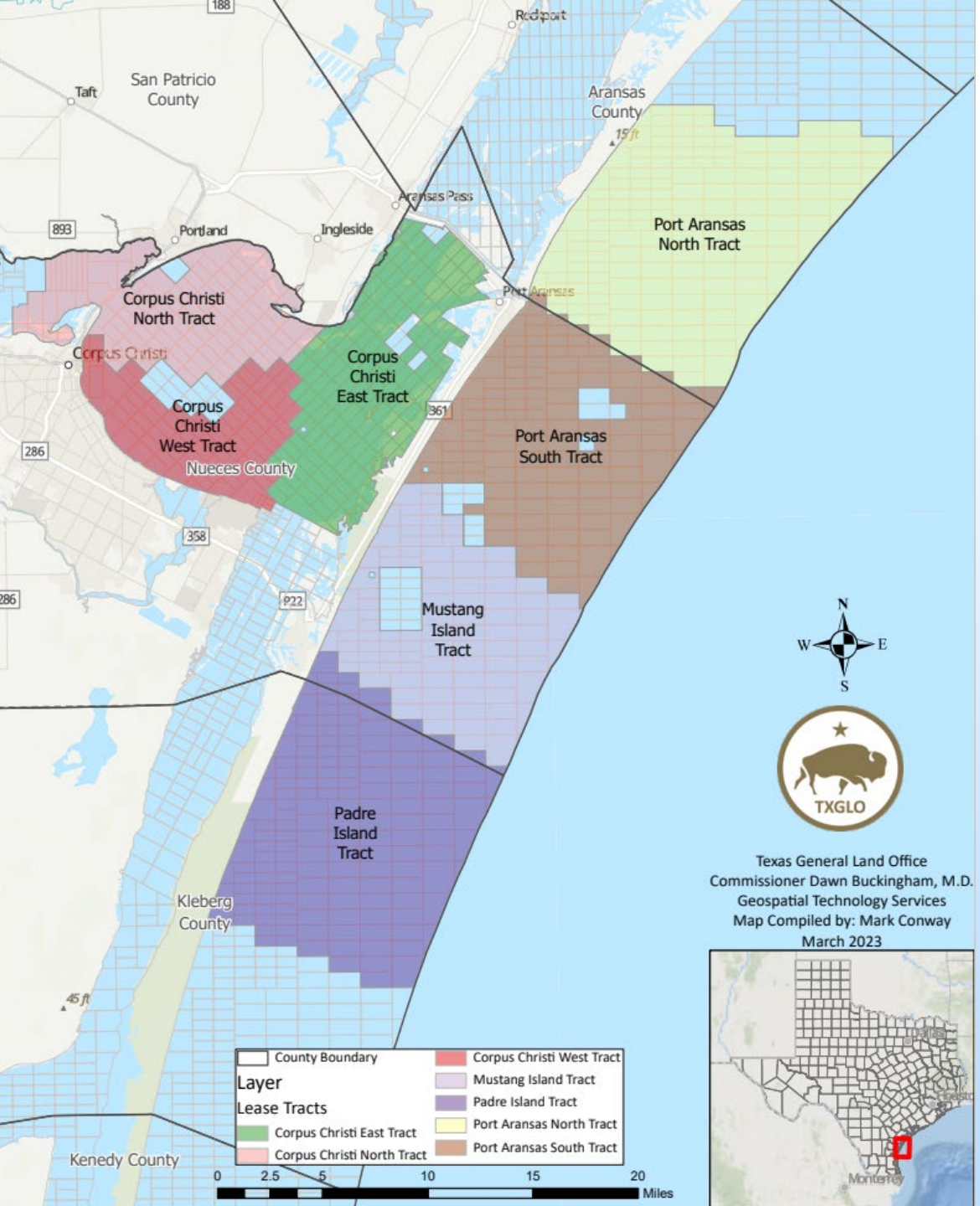

Progress to Date::
State-level Activities

Texas General Land Office - Lease of State Submerged Tracts in Nueces, Aransas, & Kleberg Counties

Published 03.09.23
Closed 06.12.23
2 Leases Awarded

7 defined lease tracts for creation/operation of geologic CO_2 storage repositories

Inshore (bay system) and offshore submerged tracts

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Gulf Coast Carbon Center

Task 3.0: Site Specific Characterization & Assessment of the CO_2 Storage Complex

- Subtask 3.1: Geologic Characterization
- Subtask 3.2: Geophysical Characterization
- Subtask 3.3: Model Data and Reservoir Simulation

Task 4.0: Preliminary Project Risk Assessment with Mitigation & Management Plans

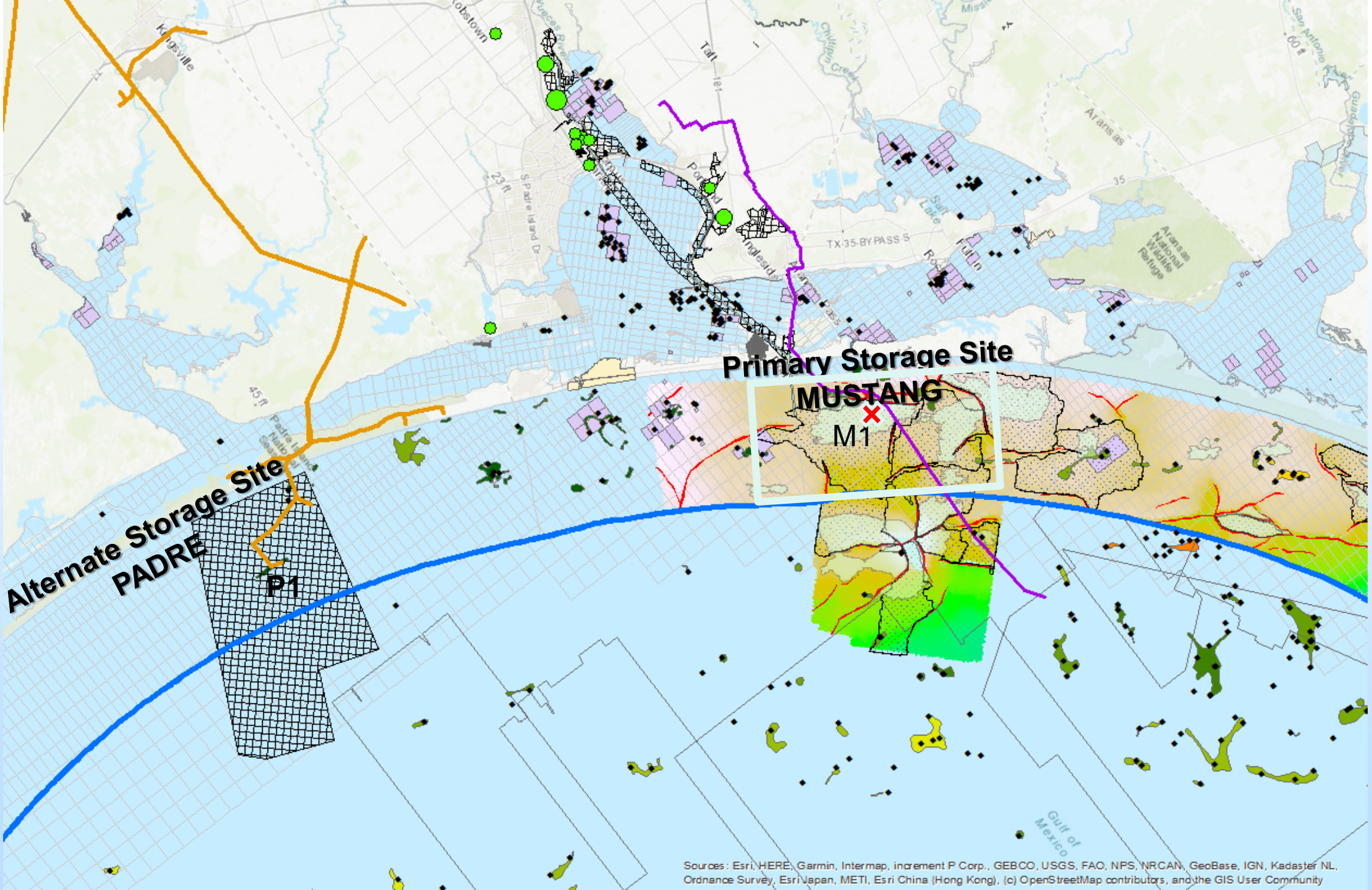
- Subtask 4.1: Non-technical challenges
- Subtask 4.2: Options
- Subtask 4.3: Existing Wells
- Subtask 4.4: Mitigation Plans
- Subtask 4.5: Monitoring
- Subtask 4.6: CO_2 Management Plan

Task 5.0: Plan for Subsequent Detailed Site Characterization & UIC Class VI Permitting

- Subtask 5.1: Storage Complex Geologic and Geophysical Characterization
- Subtask 5.2: Well Plans
- Subtask 5.3: UIC Class VI Permit Planning
- Subtask 5.4: Draft Site Development Plan
- Subtask 5.5: Onshore-Offshore Integration

Task 6.0: Project Technical & Economic Feasibility Assessment

- Subtask 6.1: Technical Feasibility
- Subtask 6.2: Economic Feasibility
- Subtask 6.3: Conceptual-Level Design Study for CO_2 Transport
- Subtask 6.4: Evaluate Options for Ship Transport of CO_2


Primary Storage Site
MUSTANG
M1
Alternate Storage Site
PADRE
P1
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Regional geologic model of the storage complex

- Area: 811 sq. mi.
- Wells:
  - Wells with facies logs 213
  - Wells with porosity log 26
  - Wells with sonic logs 26
  - Wells with density 11

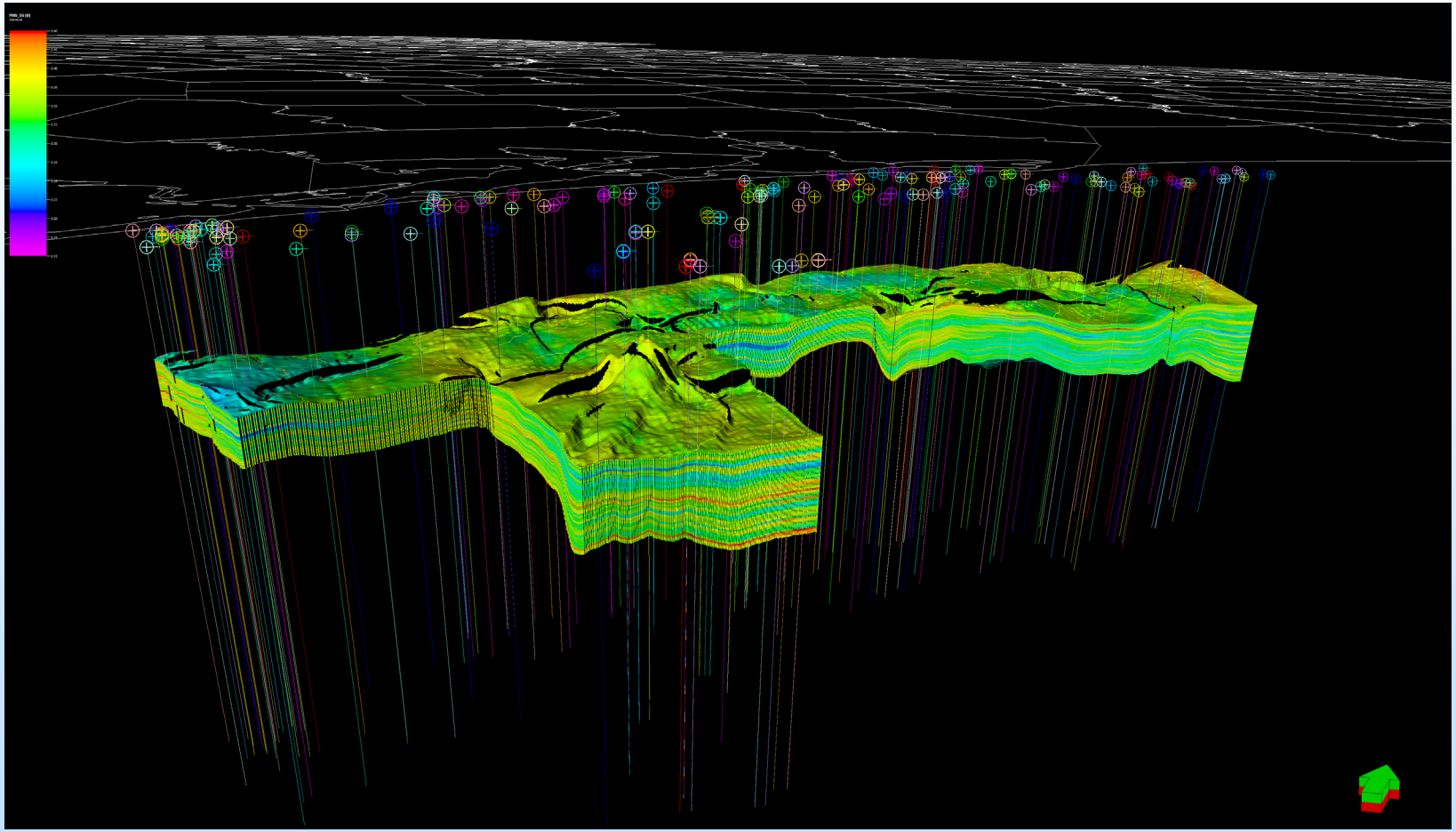
Surfaces:

MFS 9

MFS 10

MFS 12

Number of faults: 171



Synergy Opportunities

- International Offshore CCS Workshop Series
  - Port Arthur September 2024 – Meckel Presentation
- Other projects:
  - DE-FE0002730 – Gulf Coast Decarb Pipeline FEED Study
  - Synergy with GoMCARB, and North Sea projects.

SUMMARY

Opportunity to develop offshore CO_2 storage resources adjacent to the largest energy port in the U.S.

Currently finalizing budget negotiation.

THANK YOU – QUESTIONS?