

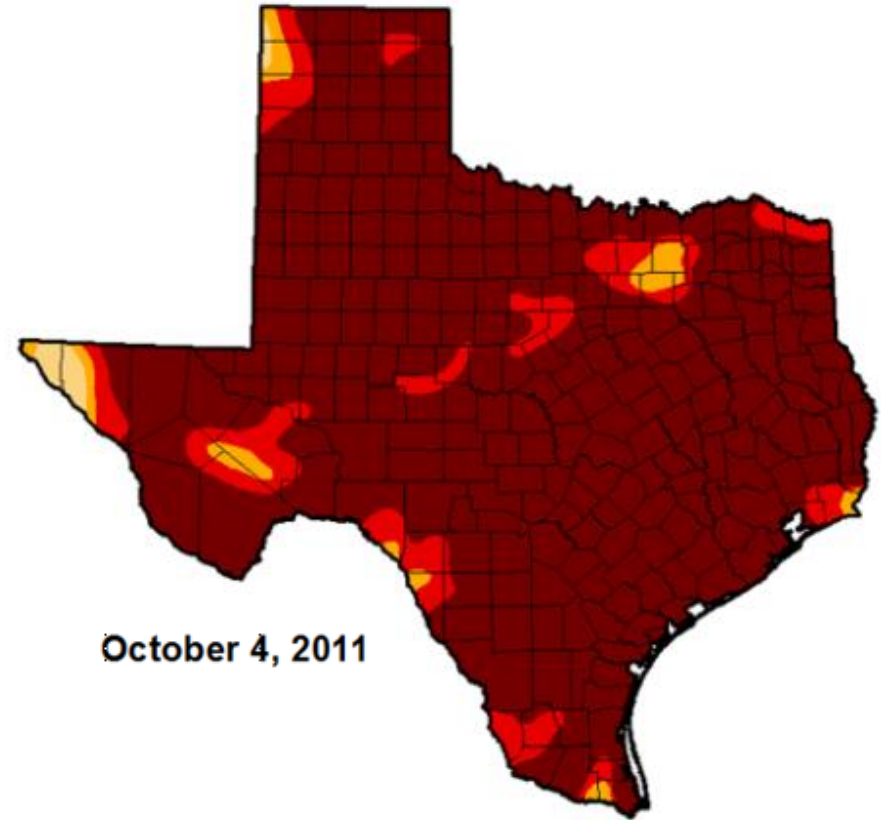


# CITY OF CORPUS CHRISTI

## Seawater Desalination Program

TACWA  
January 27, 2023

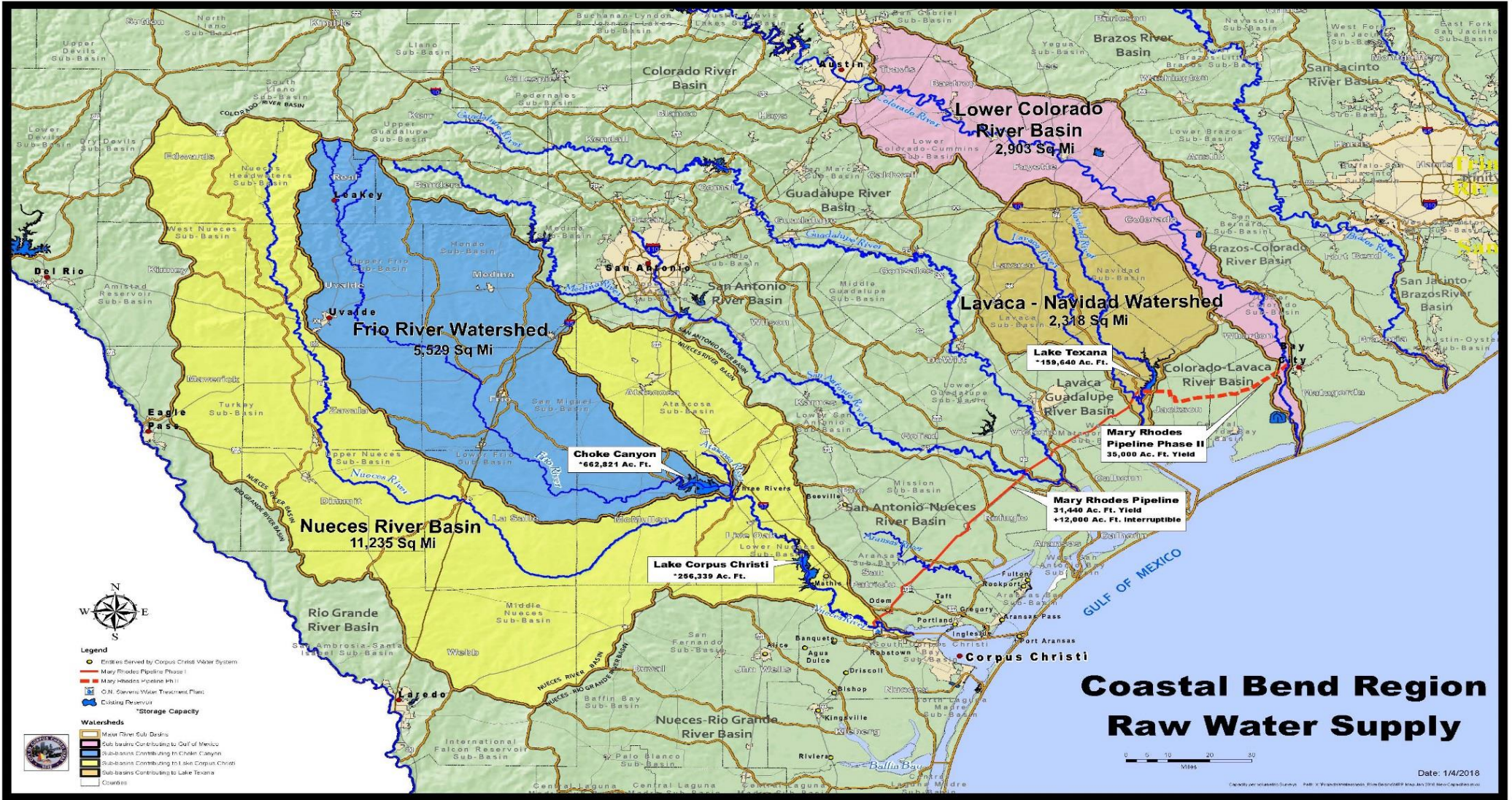
# WATER SUPPLY RELIABILITY



October 4, 2011

*The value of a truly reliable water supply to a local economy cannot be overstated*

# SURFACE WATER SUPPLIES





# PROJECT GENESIS

- 2011 – 2013 drought
- Collaborative effort of City of Corpus Christi and key Stakeholders to examine economic feasibility of seawater desalination
  - Corpus Christi Regional Economic Development Corporation (CCREDC)
  - San Patricio Municipal Water District (SPMWD)
  - Coastal Bend Industries Association (CBIA)

## CBIA (Formerly PICC)

AEP Texas

OxyChem

Chemours

Port of Corpus Christi

Cheniere

Sherwin Alumina

CITGO

Talen Energy

Flint Hills Resources

Valero

Lyondell Basell

voestalpine Texas

# PROJECT OUTLINE: Development Stages

2015-2017 PHASE 1A

## Local Funding

Industrial  
Seawater  
Desalination  
  
Economic  
Feasibility  
  
Go/No-Go

2017-2023 PHASE 1B

## SWIFT #1

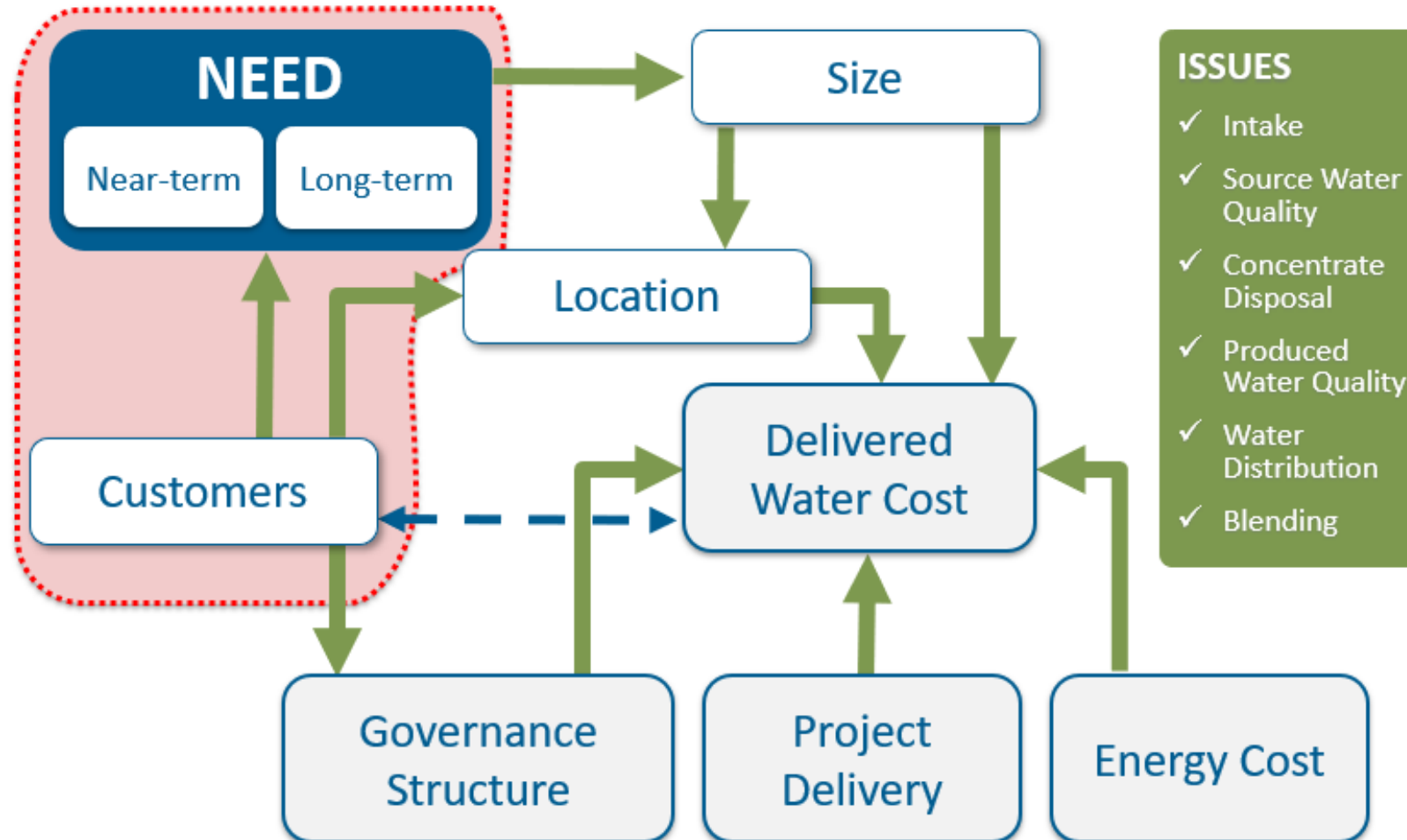
Confirm/Define  
Project  
  
Project Siting  
  
Permitting  
  
Outreach

2023-2028 PHASE 2

## SWIFT #2

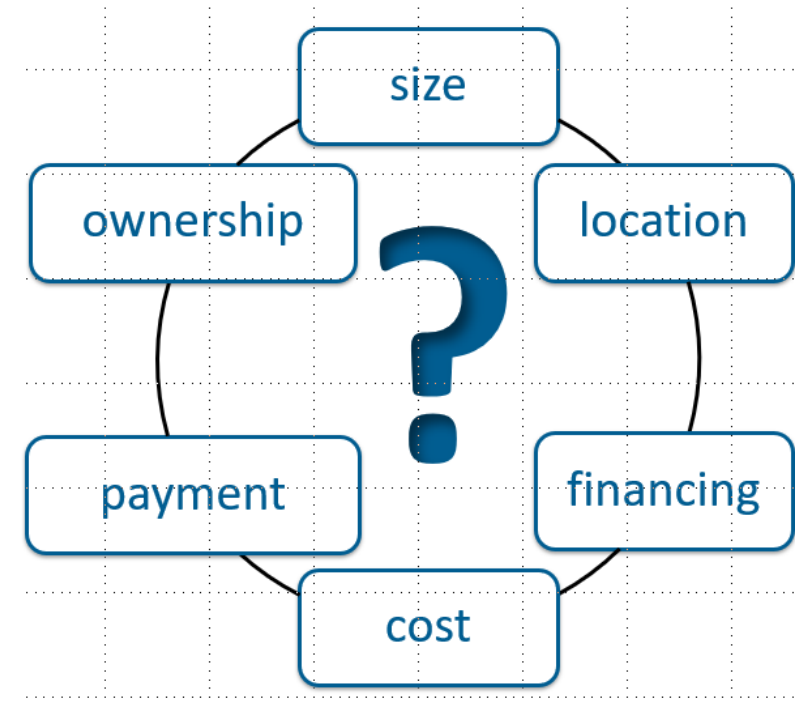
Procurement  
  
Financial  
Closing  
  
Design,  
Construction,  
Commissioning

# CONSIDERATIONS FOR A SEAWATER DESALINATION PROJECT



# PHASE 1-A OBJECTIVES

- Assess economic & technical feasibility of SWD in Corpus Christi
- Define a project that reduces the water supply risk and regional system drought vulnerability

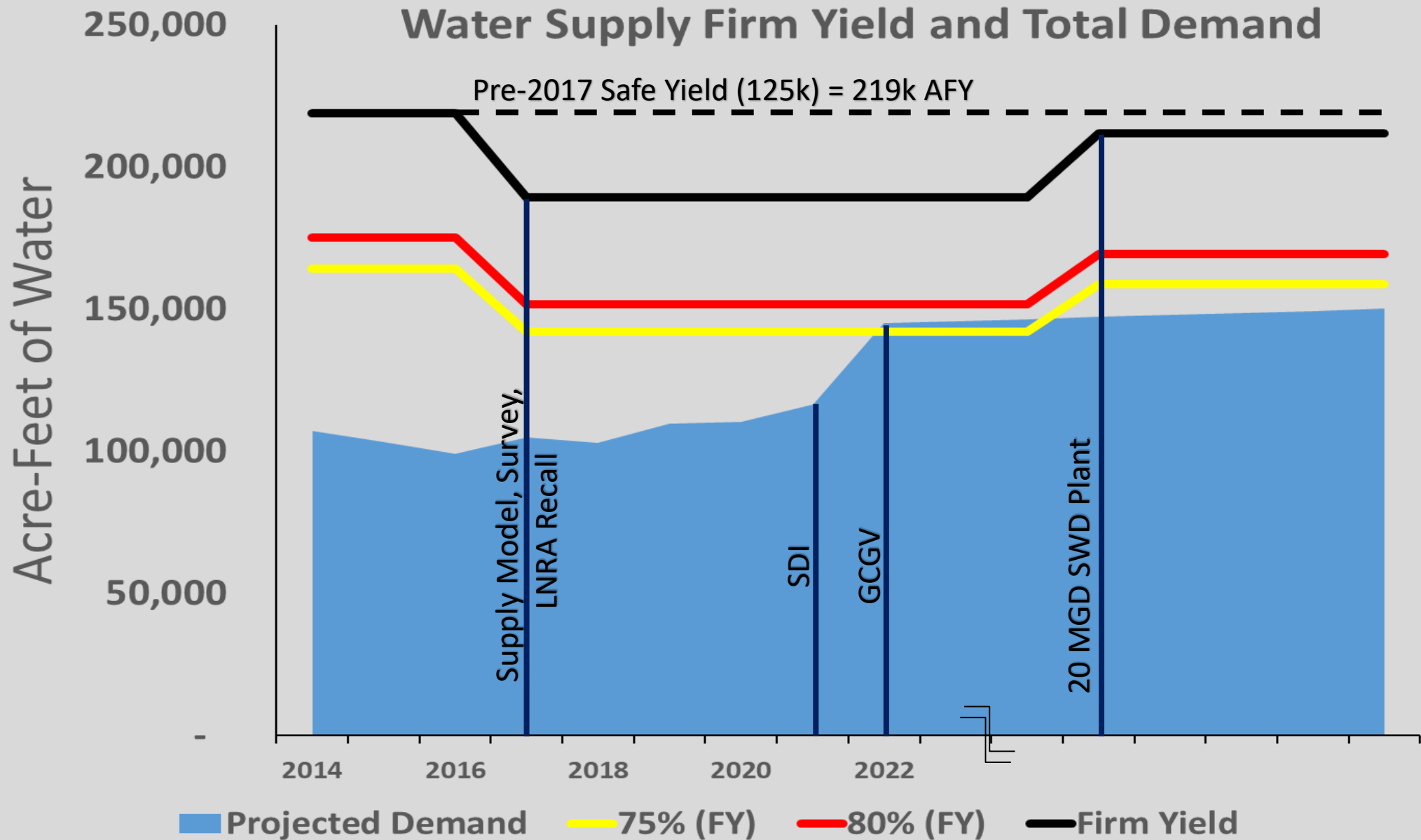
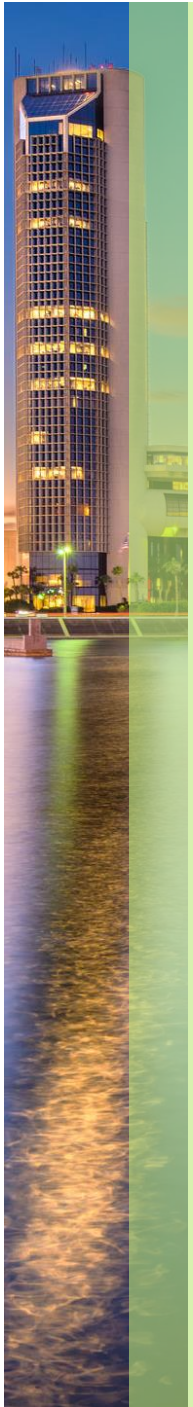




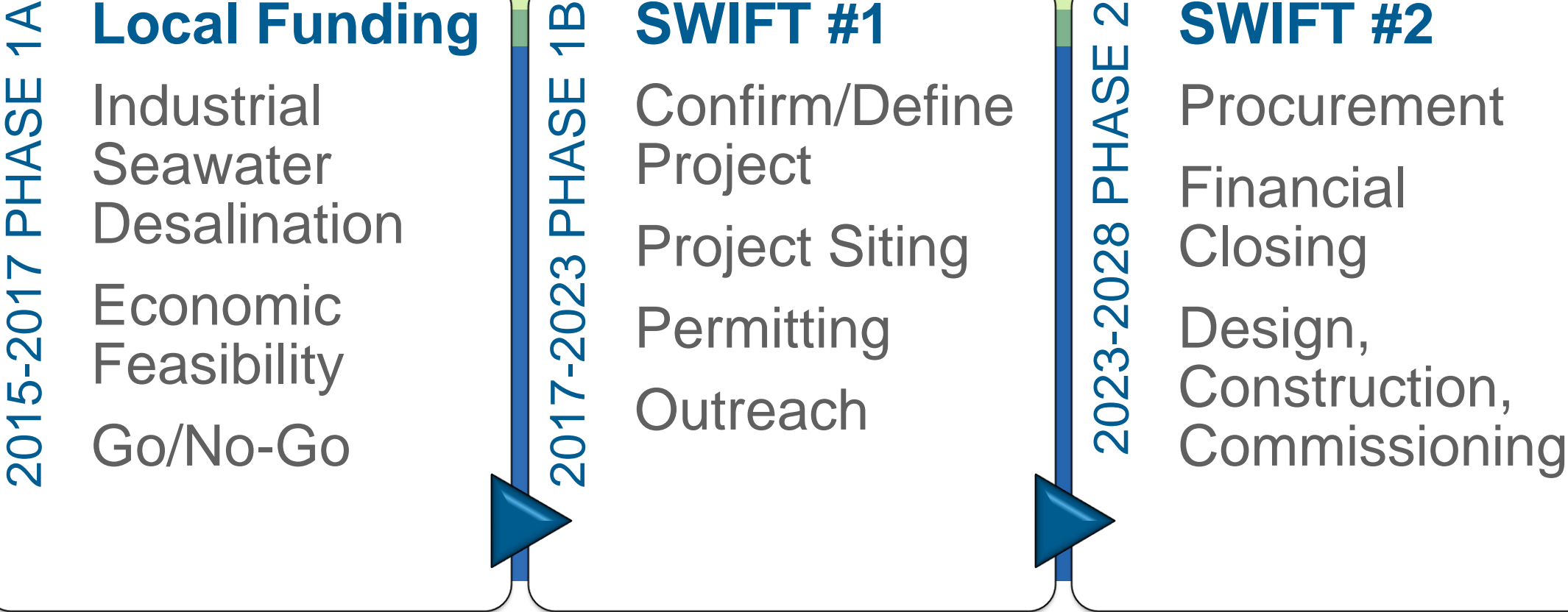
# PHASE 1-A DECISIONS/OUTCOMES

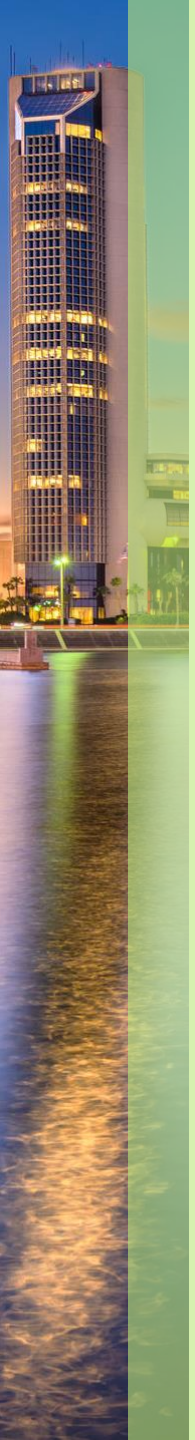
- Preliminary plant siting
- Preferred plant capacities
- Desired water quality
- Preferred water distribution strategy
- Preferred Project ownership
- Project financing (SWIFT 1 & 2)
- Project procurement
- Planning-level cost estimates
- Drought Surcharge Exemption Fee, large volume user participation
- Outreach





# PROJECT OUTLINE: Development Stages



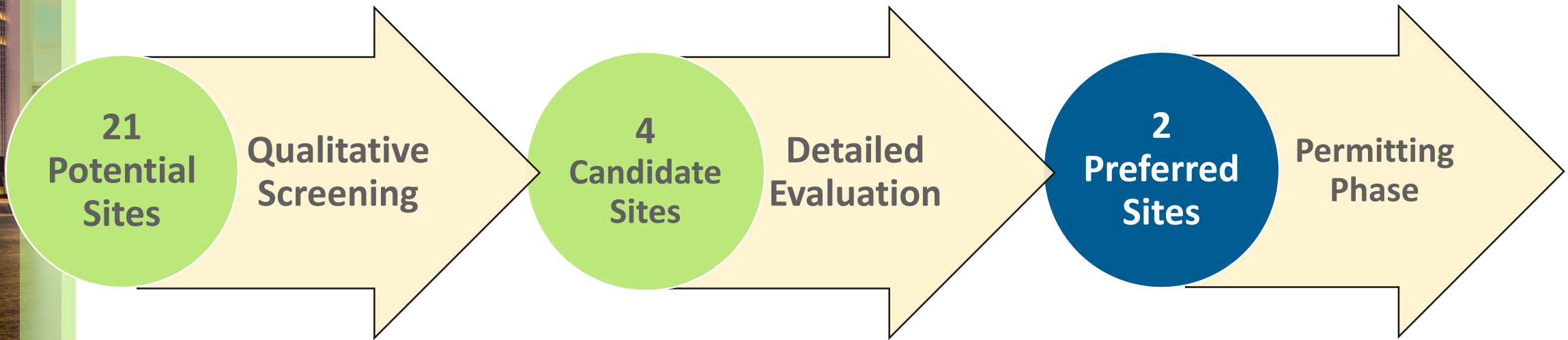


# PHASE I-B OBJECTIVES

Advance Project Planning, Reduce Unknowns, Reduce Risk

- Confirm Desired Project Capacities
- Select sites
- Outreach
- Water quality characterization
- File Owner's permit applications
- Refine detailed cost models
- Achieve readiness to proceed ["Trigger Ready"]

# PHASE 1-B SITING



## Screening Parameters

- Social & Environmental
- Tract
- Water Quality
- Intake
- Discharge
- Product Water Delivery
- Power

## Evaluation Parameters

- Environment
- Cost
- Diffusion Modeling
- Water Quality
- Surveys
- Permitting Considerations



# PROJECTS DEFINED

<b>Average Production Capacities in MGD</b>	
<b>Production Phase</b>	<b>Average Daily Production</b>
<b>Inner Harbor Ship Channel Plant</b>	
Initial Capacity	20
Ultimate Capacity	30
<b>La Quinta Channel Plant</b>	
Initial Capacity	20
Expandable Capacity	30
Ultimate Capacity	40

# PERMITTING

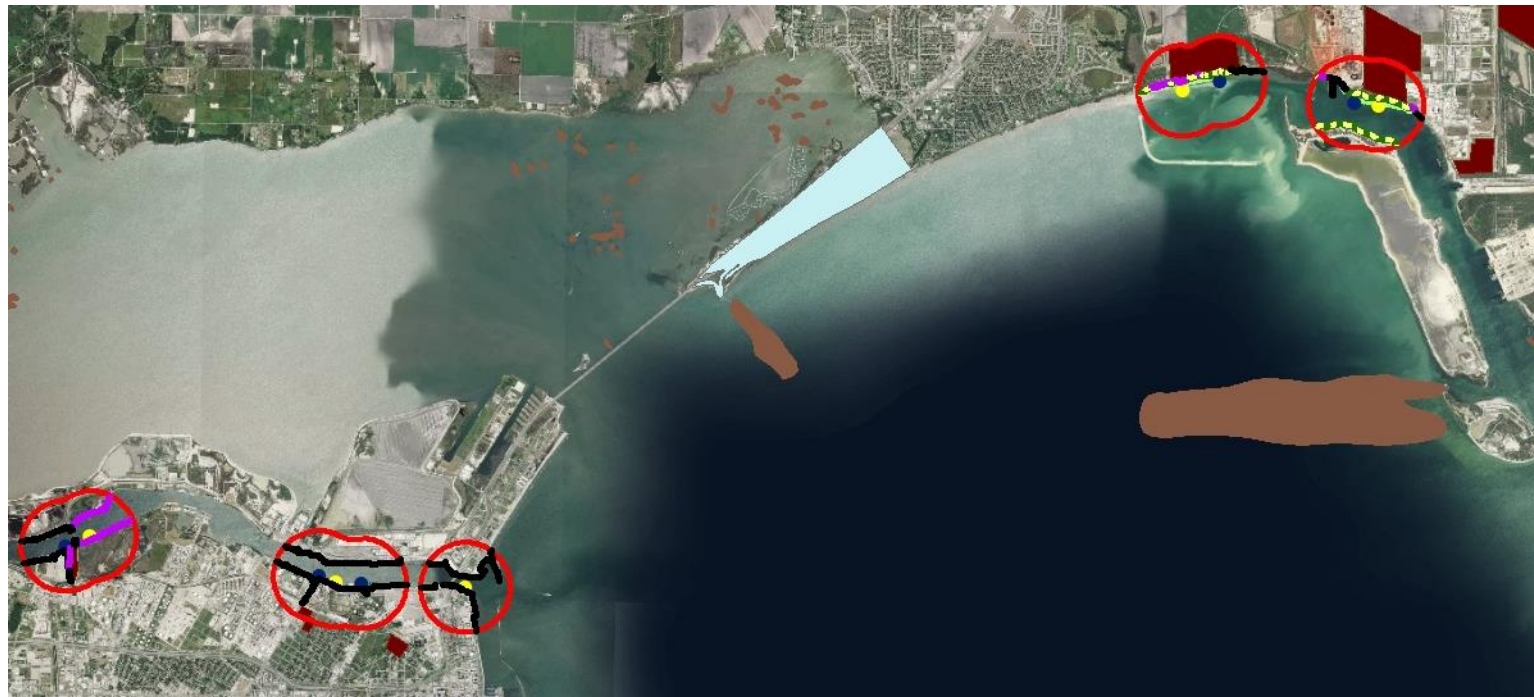
- Texas Commission on Environmental Quality (TCEQ)
  - Water Rights Applications
    - Inner Harbor Granted (2022)
  - TPDES Applications in Technical Review
- US Corps of Engineers (USACE)
  - Defining 10/404 Permitting Requirements



# CONSIDERATIONS FOR A SEAWATER DESALINATION INTAKE

## Mapping Sensitive Species & Ecosystems

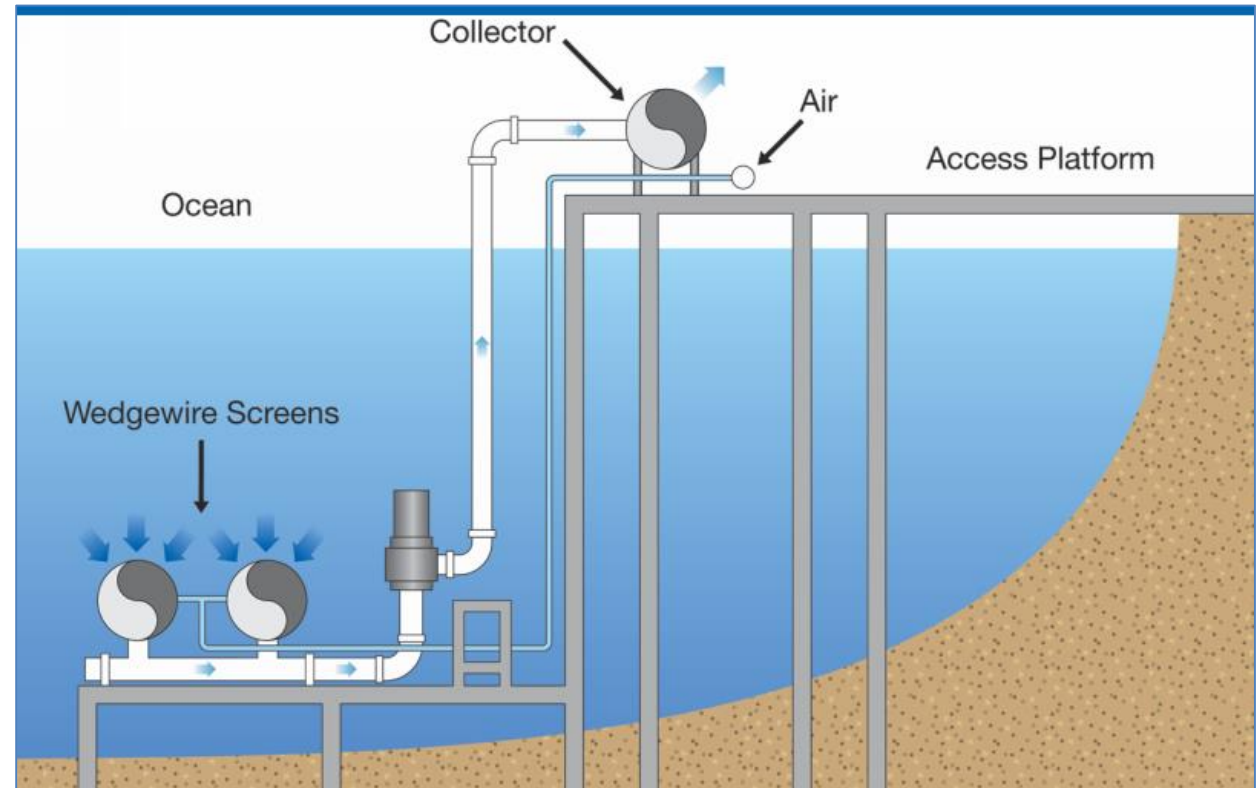
- Ecosystems and Species mapping during the siting phase
- No oyster reefs, no critical habitat for federally listed species within 2,500ft for intake or discharge zones.
- Hardened shorelines can be habitats, too.



# CONSIDERATIONS FOR A SEAWATER DESALINATION INTAKE

## Mitigating Impingement and Entrainment

- Wedge-wire screen narrow openings (2mm to 3mm wide)
- Low inlet velocities (<0.5fps)





# CONSIDERATIONS FOR A SEAWATER DESALINATION INTAKE

## Targeting Sustainability

- Specifically targeting stable water quality with optimal characteristics
- Sufficient depth to reduce impacts from any spills in the water body
- Sufficient depth to mitigate impacts to seagrasses

## Water Quality

- No concerns with heavy metals or other parameters after 1-year of sampling.



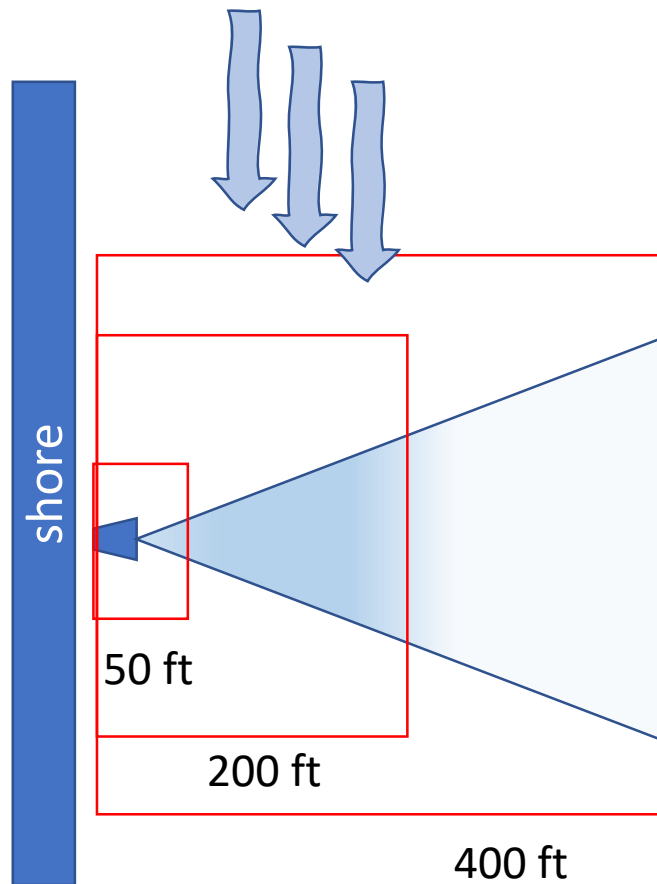
Desalination Plant Intake - Beckton, U.K.

# CONSIDERATIONS FOR A SEAWATER DESALINATION DISCHARGE

- Permitting Requirements
  - White Paper
- Jet Diffusion
- ADCPs & Dispersion Modeling – Near Field and Far Field
- Temperature < 1.5°F above Ambient



# CONCENTRATE MIXING AND DISPERSION – NEAR FIELD



Source: Sustainable Management of Desalination Plant Concentrate;  
Voutchkov N., International Desalination Association World Congress, 2019.

# SALINITY TOLERANCES

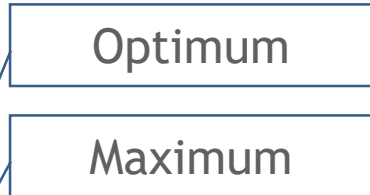
Salinity Tolerance of Select Fish and Crustacean Species in Corpus Christi Bay Area

Common Name	Scientific Name	Optimum Salinity Range (Salinity Maximum) (ppt)		
		Larvae	Juveniles	Adults
American Oyster	<i>Crassostrea virginica</i>	10-35 (39)	10-30 (44)	10-30 (44)
Brown Shrimp	<i>Farfantepenaeus aztecus</i>	24-36 (40-69)	10-20 (45)	24-39 (45)
White Shrimp	<i>Litopenaeus setiferus</i>	0.4-37 (N/A)	2-15 (41)	>27 (40)
Mysid Shrimp	<i>Americamysis bahia</i>	--	--	20-43 (25)*
Blue Crab	<i>Callinectes sapidus</i>	12-36 (43)	2-21 (N/A)	<10-33 (67)
Stone Crab	<i>Menippe sp.</i>	15-25 (27)	<4-34 (40)	>13 (N/A)
Gray Snapper	<i>Lutjanus griseus</i>	0-66 (67)	0-66 (67)	0-48 (67)
Sheepshead	<i>Archosargus probatocephalus</i>	5-25 (45)	0.3-44 (45)	0.3-44 (45)
Spotted Seatrout	<i>Cynoscion nebulosus</i>	20-35 (50)	8-25 (48)	20-25 (45)
Atlantic Croaker	<i>Micropogonias undulatus</i>	15-36 (N/A)	0.5-20 (40)	6-20 (70)
Black Drum	<i>Pogonias cromis</i>	9-34 (36)	9-26 (80)	9-26 (80)
Red Drum	<i>Sciaenops ocellatus</i>	8-36 (50)	20-40 (50)	20-40 (50)
Southern Flounder	<i>Paralichthys lethostigma</i>	10-30 (N/A)	2-37 (60)	20-30 (60)
Inland Silverside	<i>Menidia beryllina</i>	0-30 (2-8)	0-32 (N/A)	0-120 (8-11)

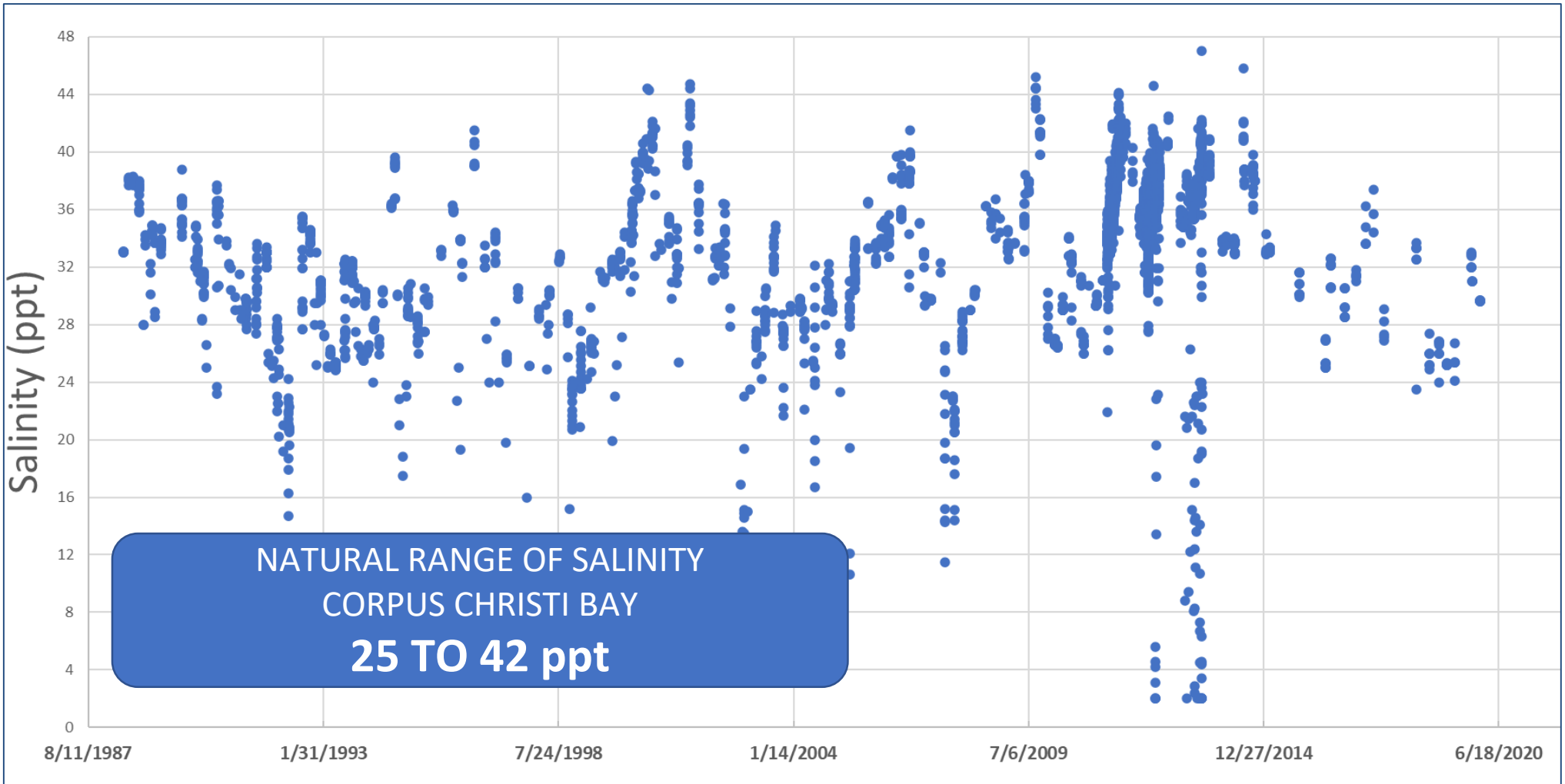
Sources:

Patillo et al. (1997)  
 Baggett et al. (2014)  
 Gulf Marine States Fisheries Commission (2012)  
 Hijuelos et al. (2016)  
 Saoud and Davis (2003)  
 Doerr et al. (2016)

Guillory et al. (2001)  
 Serrano (2008)  
 Odell et al. (2017)  
 EPA (2009)  
 Phillips et al. (2012)



# NATURAL SALINITY VARIATIONS CORPUS CHRISTI BAY



# PROJECT OUTLINE: Development Stages

## Phase 2

2015-2017 PHASE 1A

### Local Funding

Industrial  
Seawater  
Desalination

Economic  
Feasibility

Go/No-Go



2017-2021 PHASE 1B

### SWIFT #1

Confirm/Define  
Project

Project Siting

Permitting

Outreach



2021-2026 PHASE 2

### SWIFT #2

Procurement

Financial  
Closing

Design,  
Construction,  
Commissioning



# PHASE 2 MILESTONES

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- Land Acquisition
  - AEP Preliminary Engineering
  - Continued Outreach
  - Receive Owner's Permits (TCEQ & USACE)
  - Power Infrastructure Improvements
  - Prequalification of Contractors (RFQ)
  - Procurement (RFP)
  - Financial Close
  - Design / Construction / Commissioning
-

# OUTREACH

- Desal Mayor-to-Mayor Meetings
  - Port Aransas
  - Portland
  - Rockport
  - Gregory
  - Fulton
  - Aransas Pass
- Legislative Delegation
- Council Updates
- Business Groups
- Proactive Outreach to Environmental Stakeholders
- Town Halls, Public Meetings



The screenshot shows the website for the City of Corpus Christi Seawater Desalination. The header includes the city logo and navigation links: Home, Documents, FAQs, Learn, and Contact. The main banner features the text "Stage 1 Drought Response" and "Mild Water Shortage Watch in effect." Below this is a search bar with the text "Find my watering day & more". The main content area displays a large image of the city skyline with the word "POTENTIAL" overlaid in large blue letters. A play button icon is visible in the center of the image.





# CITY OF CORPUS CHRISTI

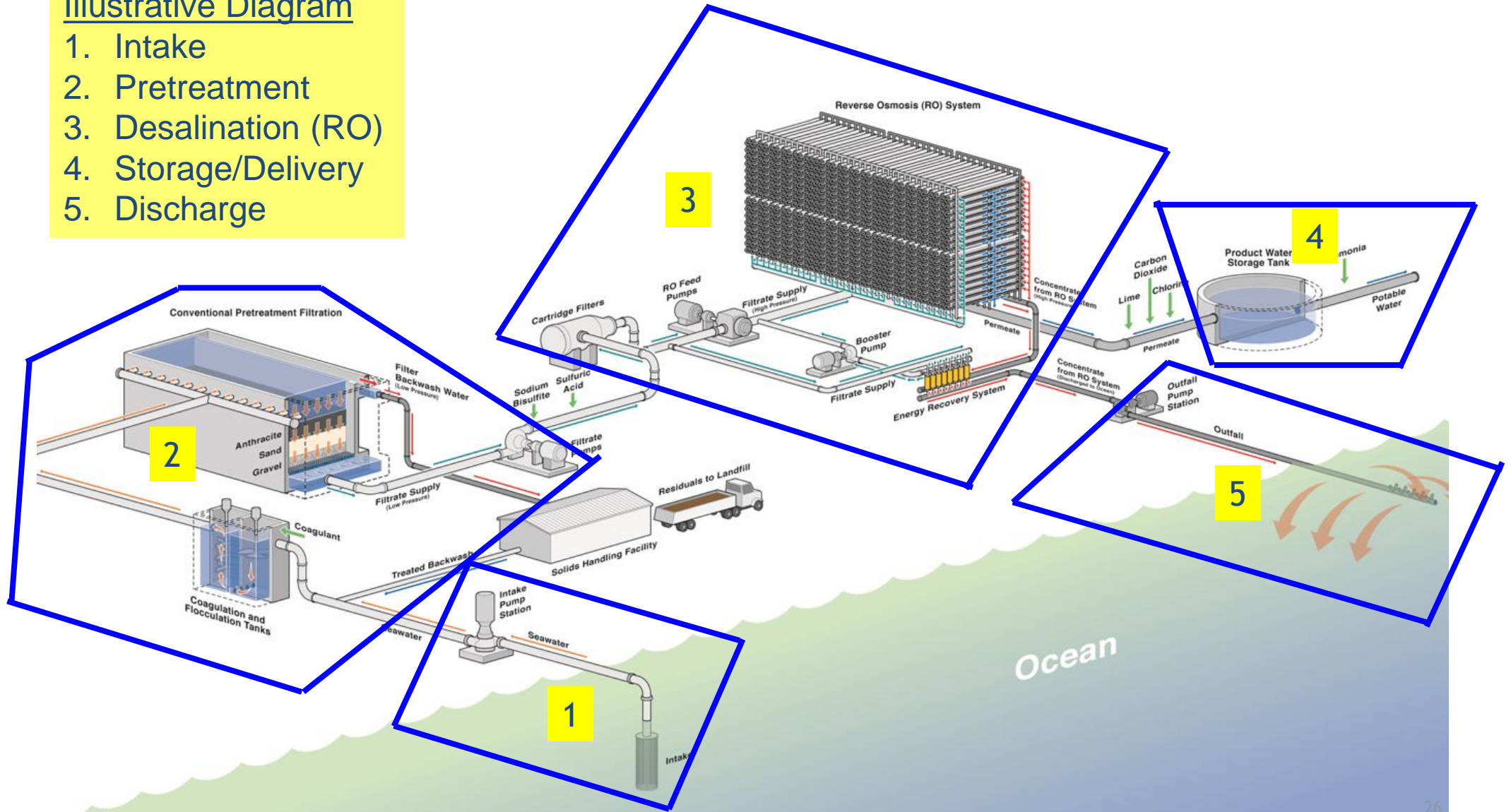
Seawater Desalination

[desal.cctexas.com](http://desal.cctexas.com)

# 20MGD Desalination Plant Expandable to 30MGD

## Illustrative Diagram

1. Intake
2. Pretreatment
3. Desalination (RO)
4. Storage/Delivery
5. Discharge

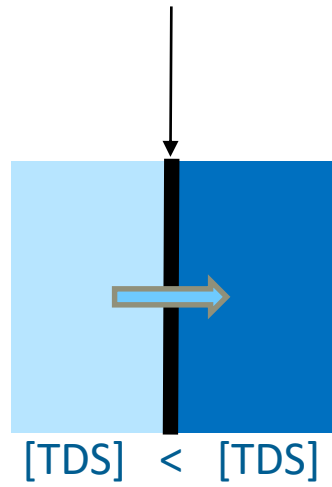


# REVERSE OSMOSIS DESALINATION



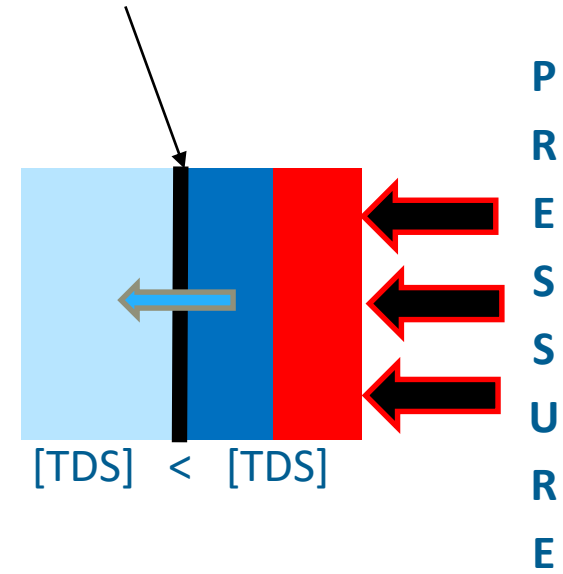
## OSMOSIS

Semi-permeable Membrane



## REVERSE OSMOSIS

Semi-permeable Membrane





# CORPUS CHRISTI BAY VOLUME

## 282,000,000,000 Gallons (865,513 ac-ft)

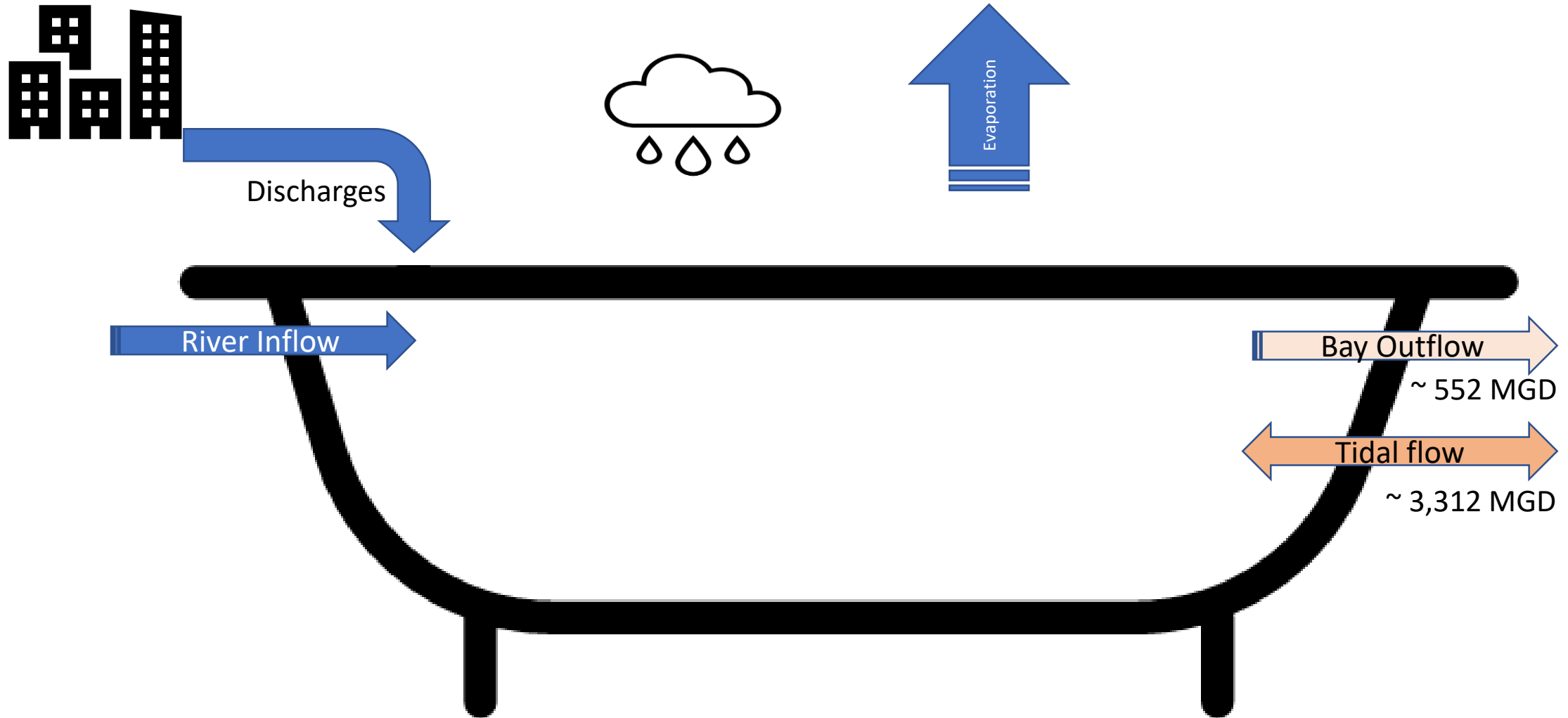
- Inflows

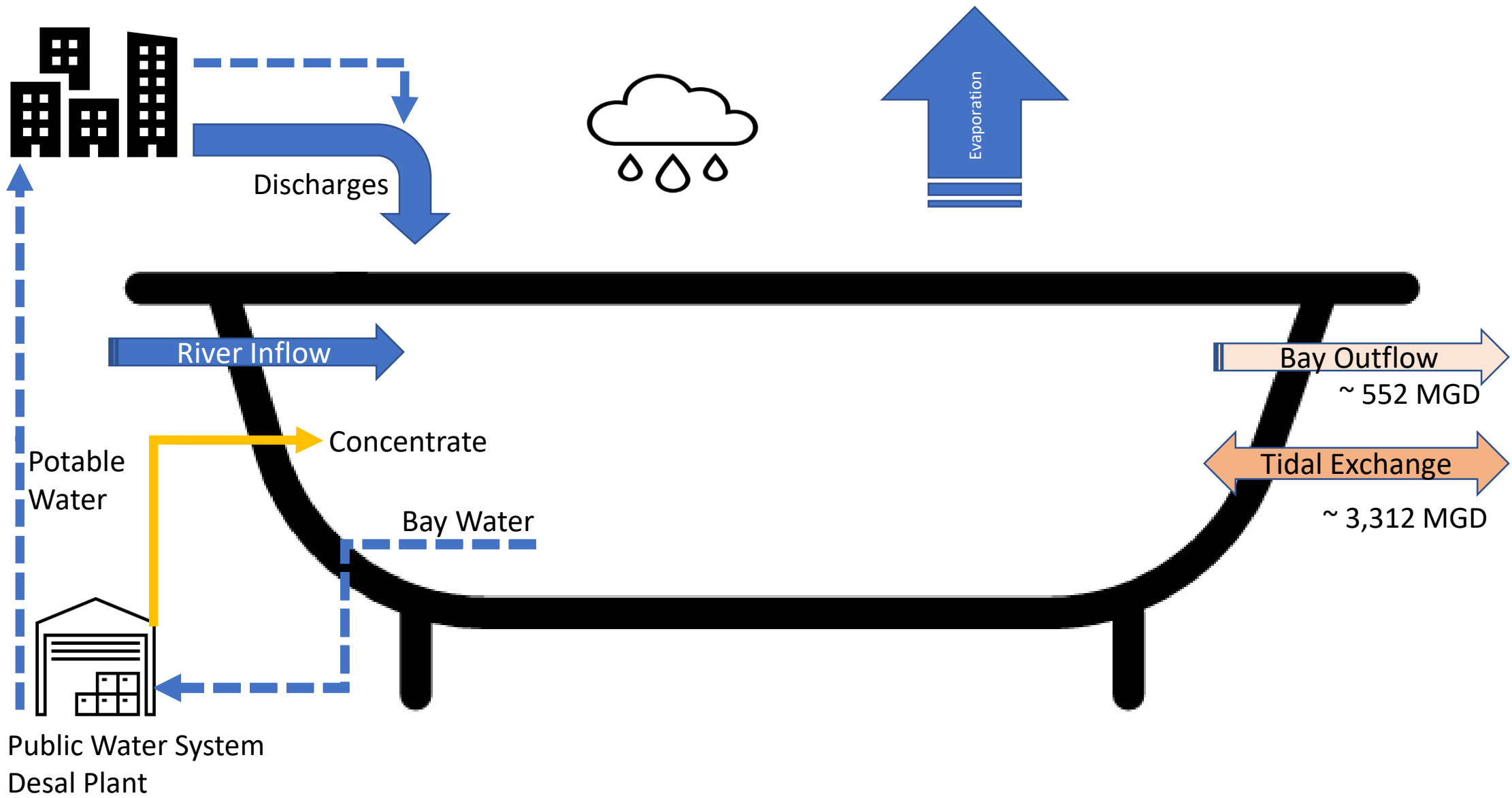
- Rain & Runoff
- River water
- Tidal water
- Municipal/Industrial Discharges

- Outflows

- Evaporation
- Outflow to ocean
- Tidal water

# CORPUS CHRISTI BAY DYNAMICS







# PROCUREMENT

State law requires “Best Value” determination

Public-Private Partnership (P3)

Design-Build (Fixed Price)

Progressive Design-Build

Design-Bid-Build

Operations may be part of the procurement contract, or not.





# PROJECT COSTS

**Inner Harbor Plant**

**20 MGD Expandable to 30 MGD**

**Capital Cost (\$222M)**

Construction = \$164M

Non-Construction = \$26M

Contingencies = \$32M

**Operations & Maintenance Costs**

\$16M annually (includes treatment to potable)



# PROJECT FINANCING

**Water Supply Development Funds - \$0.05/kgal (\$1.6M/year)**

**Large Volume Users' Drought Surcharge Exemption Fee - \$0.25/kgal  
(~\$3M to \$5M / year)**

**TWDB State Water Implementation Fund for Texas (SWIFT)**

- Subsidized State Loan – Interest @ < 2%
- 30 Year Term



# COST OF TREATED WATER

**\$3.50 to \$4.00 per thousand gallons**

- Includes substantial contingency estimates
- Work continues to refine the cost estimates and will continue through establishment of a contract for design and construction with a private contractor.
- This is a supplemental supply, so only a portion of the regional water supply will be developed at this rate.

# COST OF TREATED WATER

