RCRA Requirements for Hazardous Waste Management Units

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AEG President, 2019-2020

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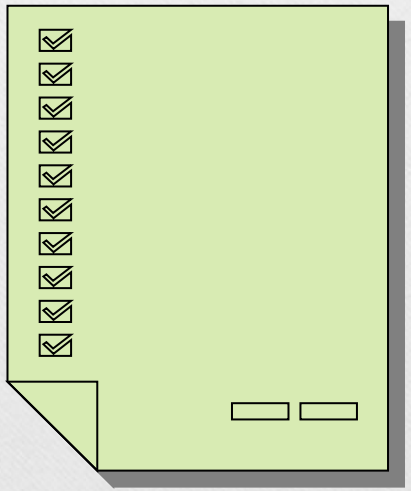
Presentation Outline

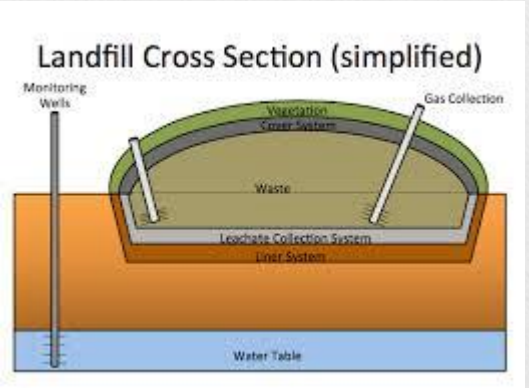
- Resource Conservation and Recovery Act
  - Types of Land-based Units
  - RCRA Requirements that apply
    - Siting, Design, Operation and Closure
- WCS Landfill Design & Construction



- Poll: Are you familiar with RCRA?

Types of Land-based Units

- Surface Impoundments
- Waste Piles (not common)
- Land Treatment Units
- **Landfills**



RCRA Standards that Apply to Land-based Units

- Location Standards
- Design Standards
- Operating Standards
- Closure Standards
- Post Closure Standards

Land Disposal Restrictions Part 268

- Apply to Land based units
  - Surface impoundments
  - Waste Piles
  - Land Treatment Units
  - Landfills

- Waste must be treated to LDR's prior to land disposal

Subpart B – General Facility Standards
264.18 – Location Standards

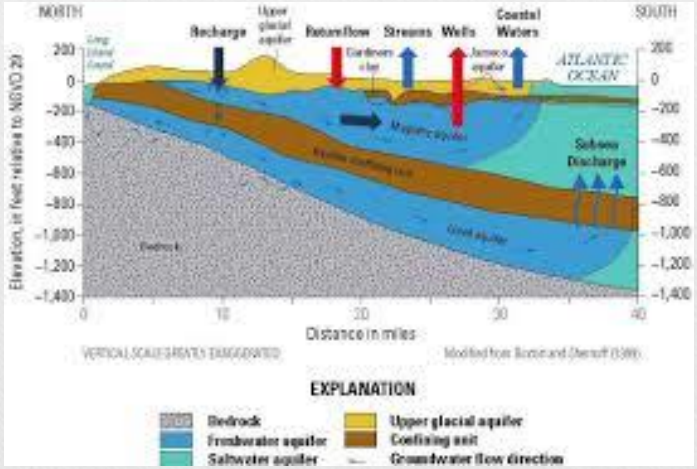
- Seismic considerations
  - must not be located within 200 ft of a fault which has had displacement in Holocene time
- Floodplain
  - May be located in floodplain if designed to prevent washout from a 100-year flood
- Salt Formations (domes, beds, mines and caves)
  - Liquids prohibited

Subchapter G
Location Standards for Hazardous Waste Storage, Processing, or Disposal (cont')

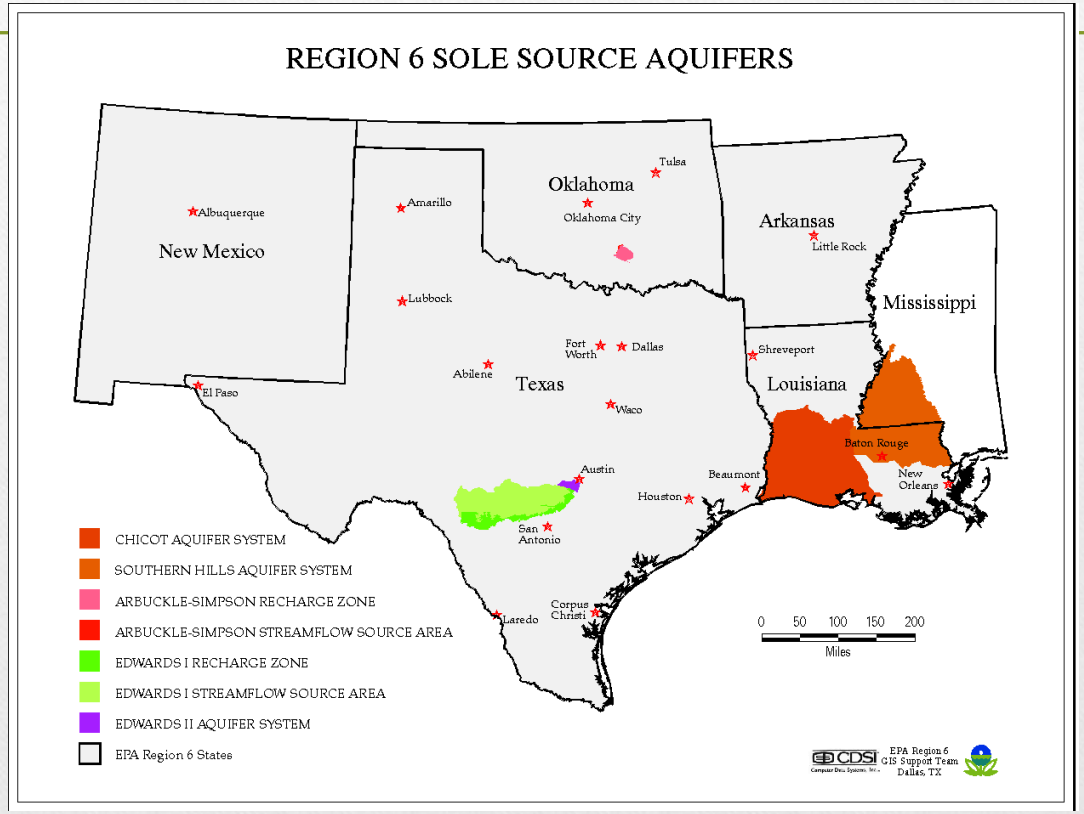
- 335.204 – Unsuitable site characteristics for landfills
  - May not be located in:
    - Wetlands
    - Recharge zone of sole-source aquifer

Sole-source Aquifer

- An aquifer that has been designated by the EPA as the sole or principal source of drinking water for an area.



Sole Source Aquifer



335.204
Unsuitable site characteristics

- A landfill may not be located:
  - in areas where soils within 5 ft of the containment structure have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a k greater than 10-5 cm/sec unless:
    - it is in an area where the average annual evaporation exceeds average annual rainfall by more than 40 in; or
    - the soil unit is not sufficiently thick and laterally continuous to provide a significant pathway for waste migration.

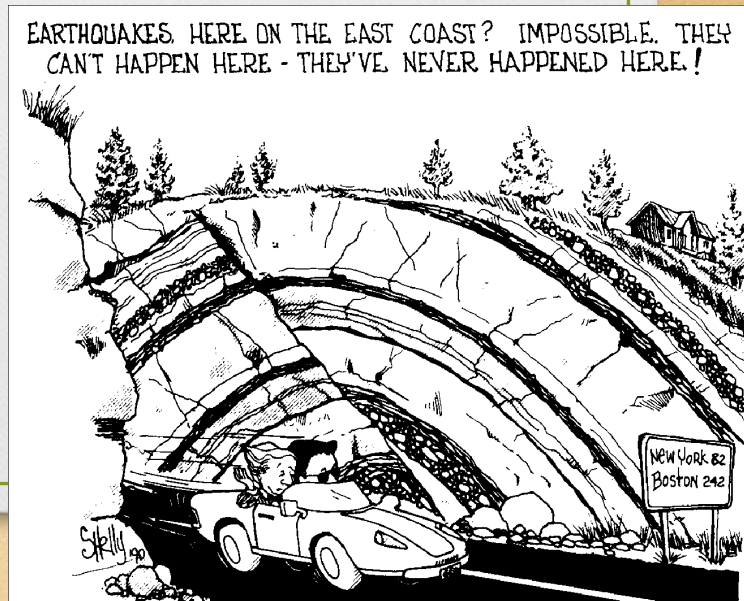
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified for engineering purposes by the Unified Soil Classification System. Grain-size analyses and Atterberg Limits tests often are performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. Graphic symbols are used on boring logs presented in this report. For a more detailed description of the system, see "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" ASTM Designation: 2488-84 and "Standard Test Method for Classification of Soils for Engineering Purposes" ASTM Designation: 2487-85.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW	Well graded sands, gravelly sands
					SP	Poorly graded sands, gravelly sands
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS Limits plot below "A" line & hatched zone on plasticity chart	SILTS OF LOW PLASTICITY (Liquid Limit less than 50)			ML	Inorganic silts, clayey silts of low to medium plasticity
		SILTS OF HIGH PLASTICITY (Liquid Limit 50 or more)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
	CLAYS Limits plot above "A" line & hatched zone on plasticity chart	CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			CL	Inorganic clays of low to medium plasticity, gravelly, sandy, and silty clays
		CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity
	ORGANIC SILTS AND CLAYS	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			OL	Organic silts and clays of low to medium plasticity, sandy organic silts and clays
		ORGANIC SILTS AND CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			OH	Organic silts and clays of high plasticity, sandy organic silts and clays
ORGANIC SOILS		PRIMARILY ORGANIC MATTER (dark in color and organic odor)			PT	Peat

335.204
Unsuitable site characteristics

- A landfill may not be located in areas of active geologic processes unless the design, construction, and operational features of the facility will prevent adverse effects resulting from the geologic processes.



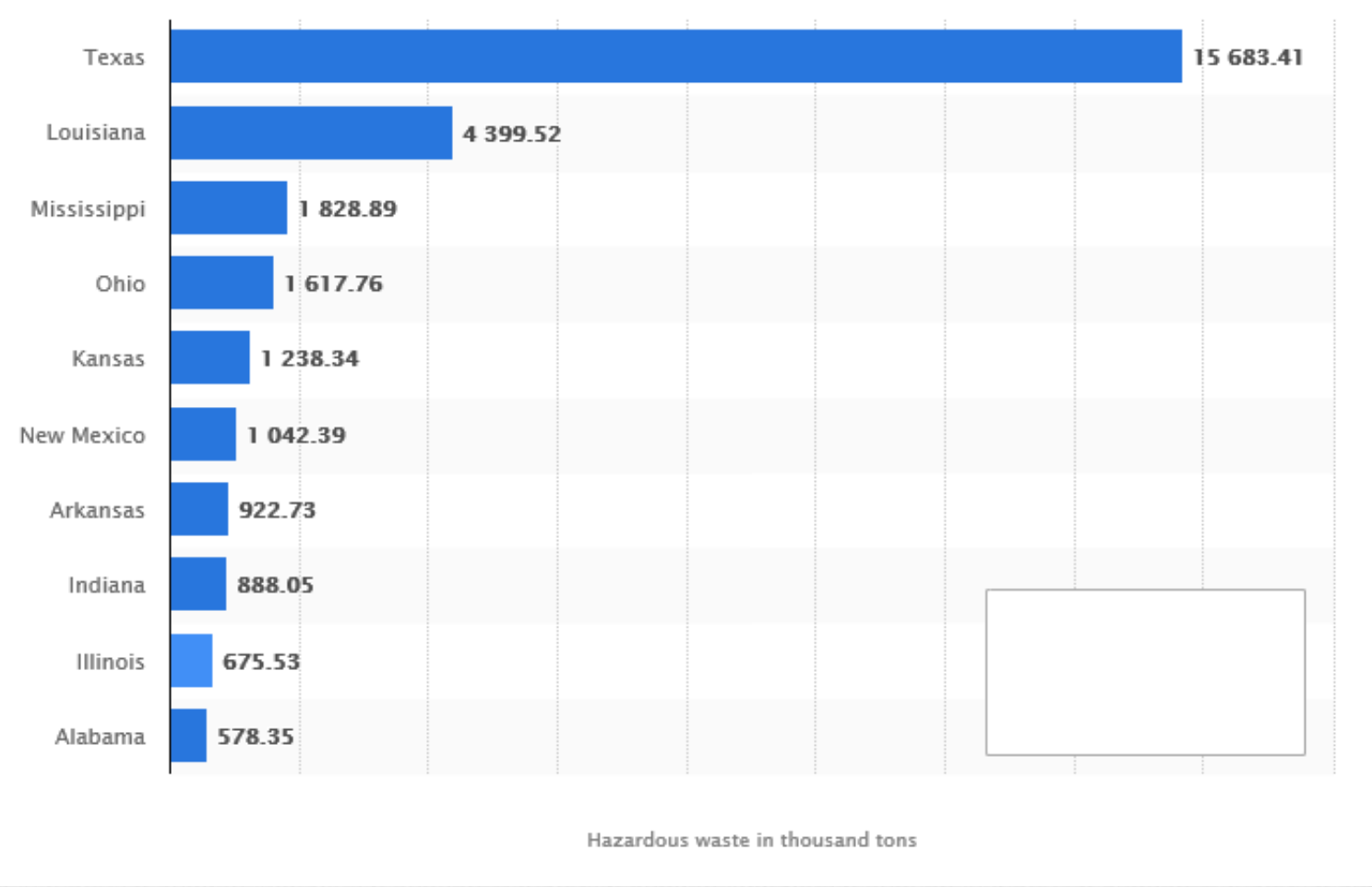
335.204
Unsuitable Site Characteristics

- A landfill may not be located within 1,000 ft of an area subject to active coastal shoreline erosion (if protected by a barrier island.)
- A separation distance from the shoreline to the facility must be at least 5,000 feet (if unprotected by a barrier island.)

Poll

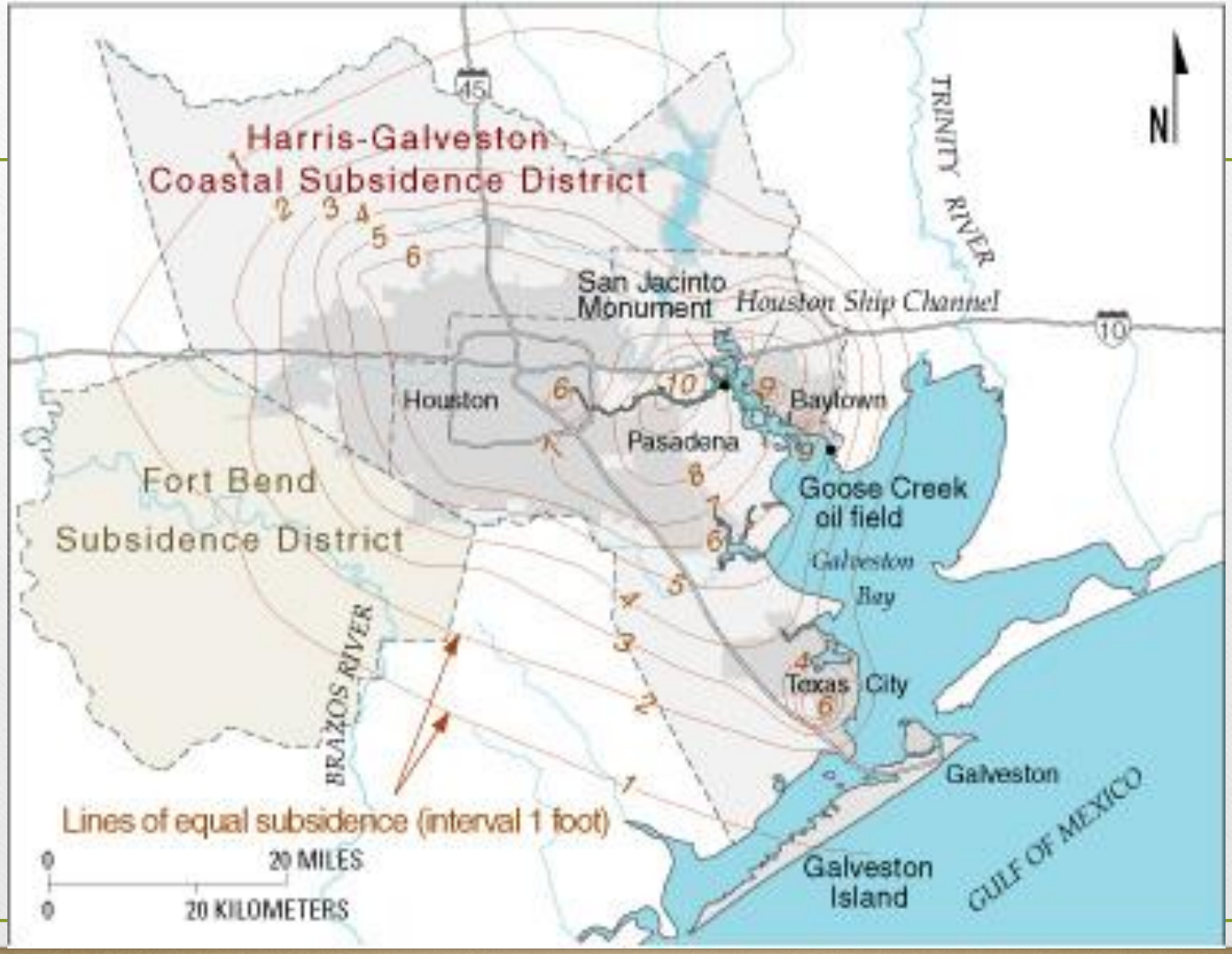
- Which state generates the most hazardous waste?
  - California
  - New York
  - Louisiana
  - Texas

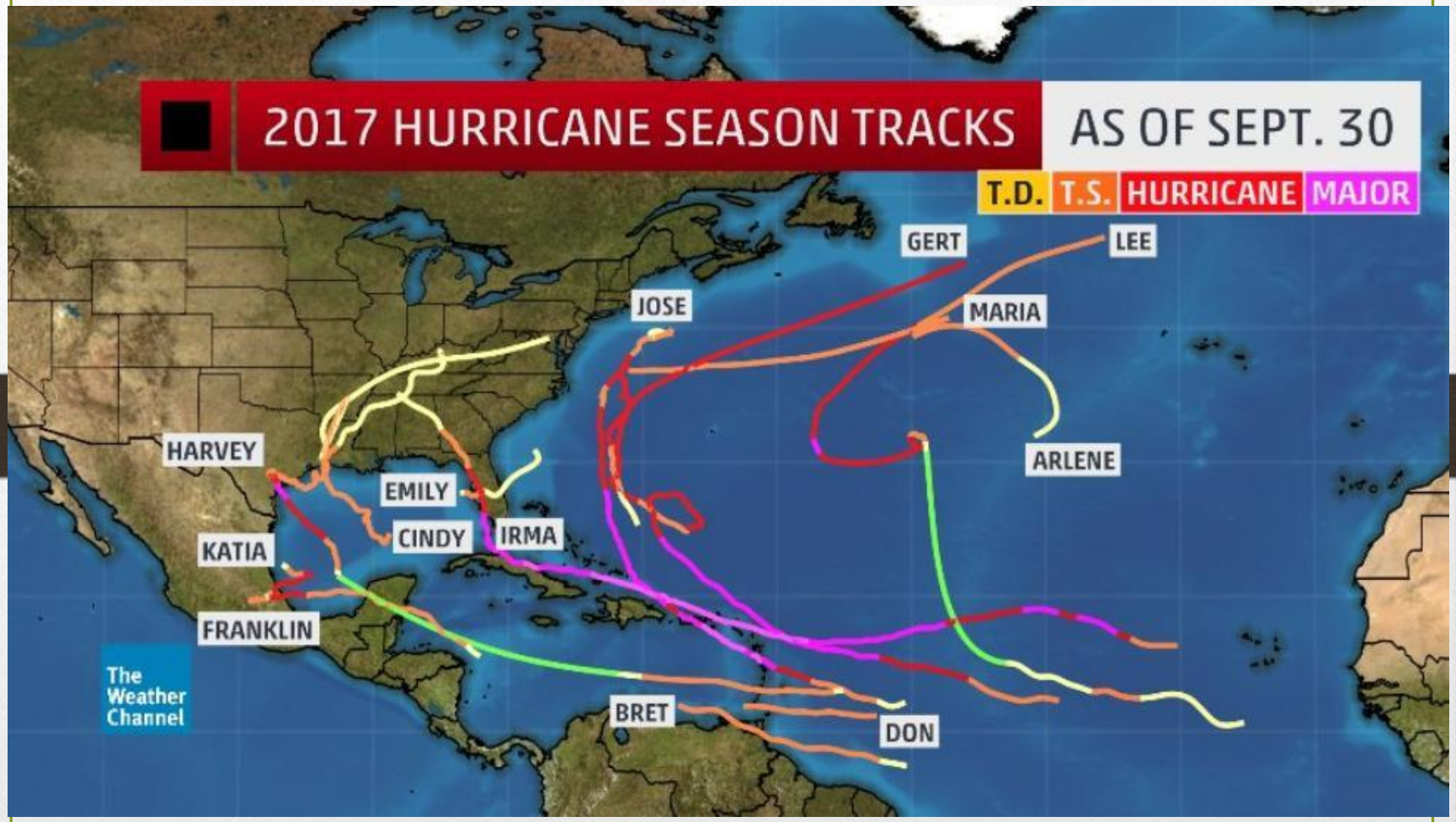
US Hazardous Waste Generation (2011)



Gulf Coast Refineries

Subsidence in Houston-Galveston Area

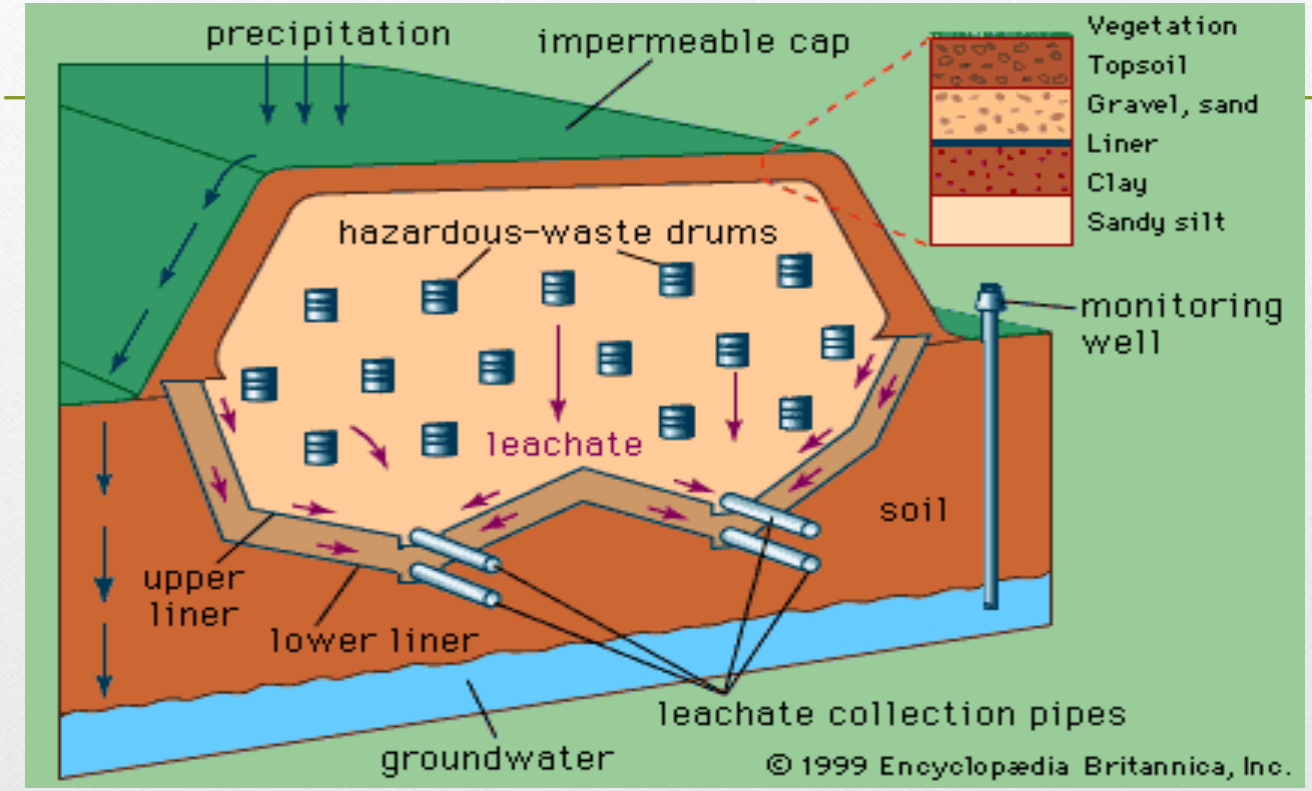



2017 HURRICANE SEASON TRACKS
AS OF SEPT. 30
T.D.
T.S.
HURRICANE
MAJOR
GERT
LEE
JOSE
MARIA
HARVEY
ARLENE
EMILY
CINDY
IRMA
KATIA
FRANKLIN
The Weather Channel
BRET
DON

Subpart N – Landfills and 335.173 – Design and Operating Requirements

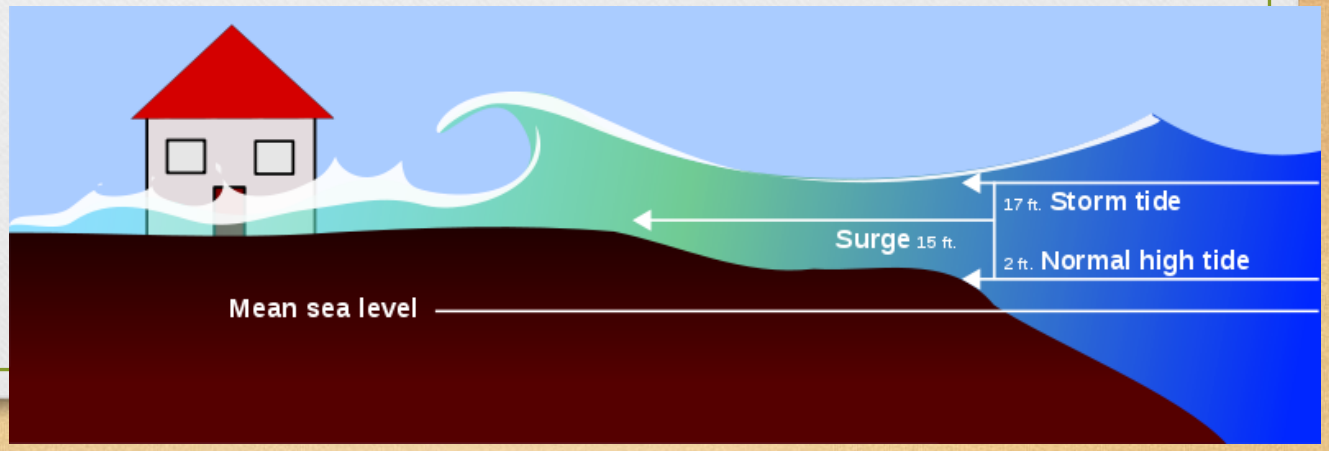
- Cover System
  - Promote long-term minimization of migration of liquids through the landfill
  - Have k less than or equal to the k of the bottom liner system

Landfill Schematic



Landfill Operating Requirements

- Must maintain a run-on control system that prevents run-on from a 25-year storm
- Must maintain a runoff management system that will contain a 24-hour, 25-year event



Closure

Cover system

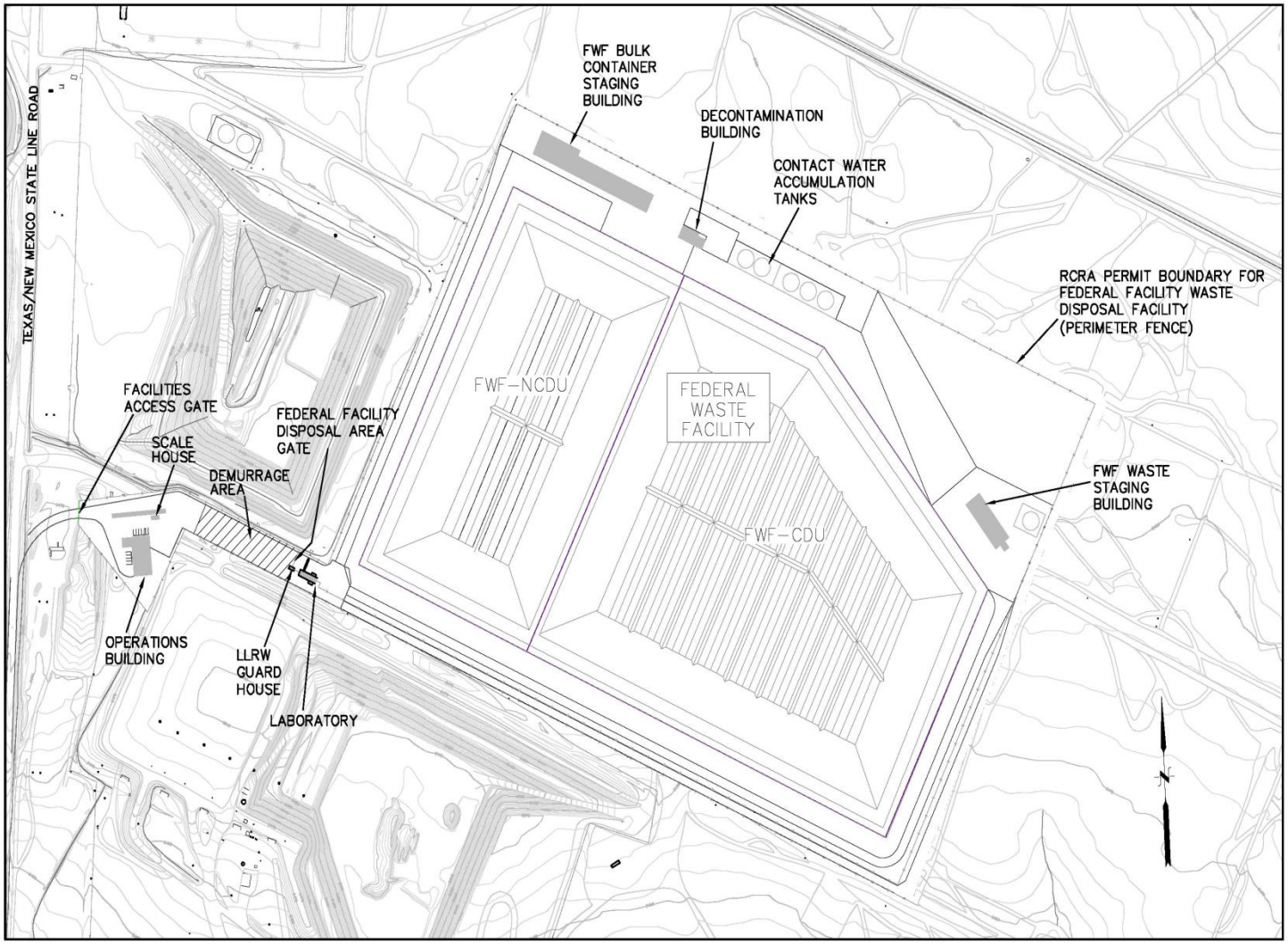
- Provide long term minimization of migration of liquids
- Promote drainage and minimize erosion
- Accommodate settling and subsidence
- K less than k of bottom liner

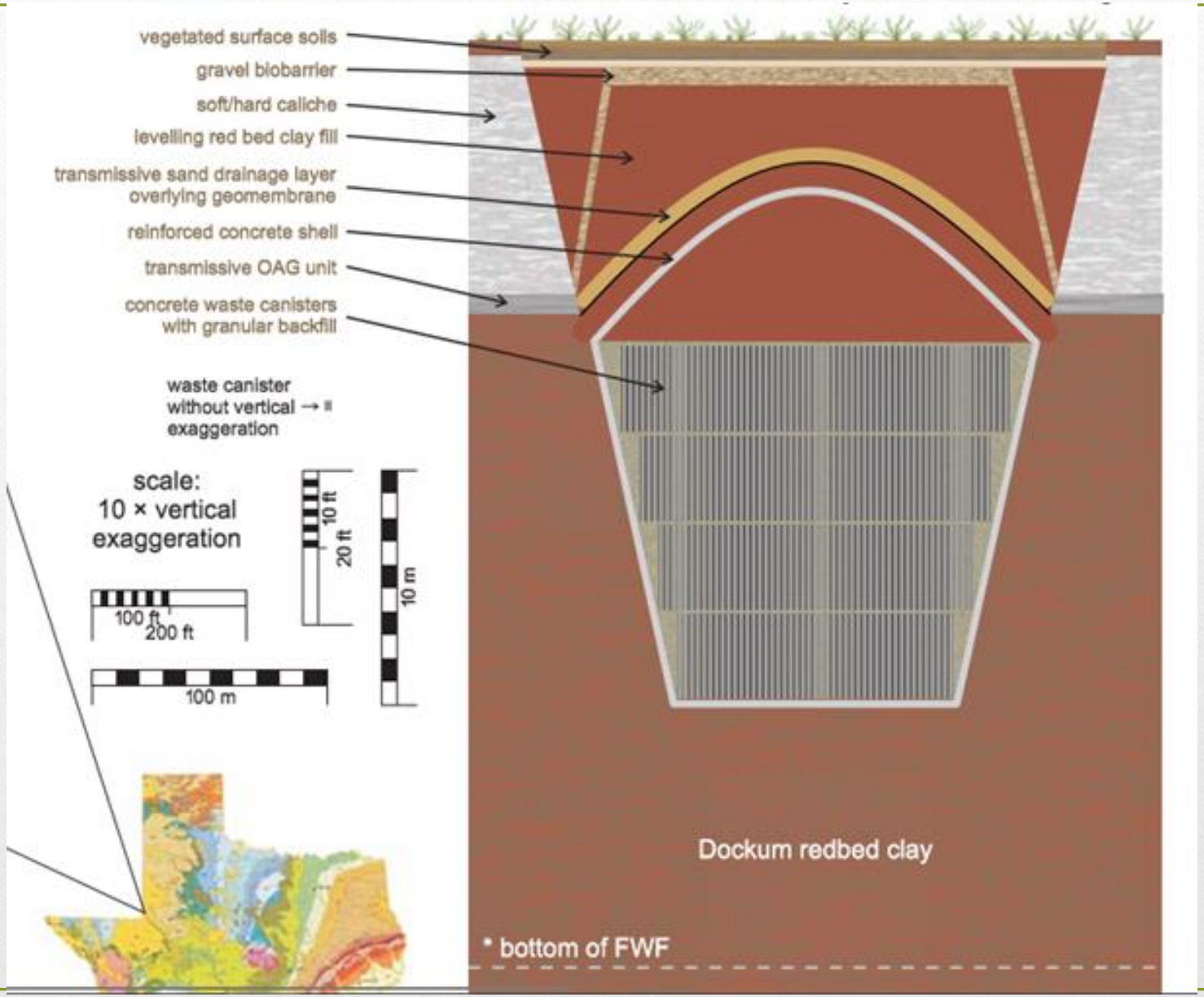
Post-closure care

- Maintain final cover
- Continue to operate the leachate collection and removal system/leak detection system
- Continue GW monitoring
- Prevent run-on and run-off from damaging cover system

Waste Control Specialists


Richland (US Ecology)
Clive
(EnergySolutions)
Andrews (WCS)
Barnwell
(EnergySolutions)


FWF BULK CONTAINER STAGING BUILDING
DECONTAMINATION BUILDING
CONTACT WATER ACCUMULATION TANKS
RCRA PERMIT BOUNDARY FOR FEDERAL FACILITY WASTE DISPOSAL FACILITY (PERIMETER FENCE)
TEXAS/NEW MEXICO STATE LINE ROAD
FACILITIES ACCESS GATE
SCALE HOUSE
DEMURRAGE AREA
FEDERAL FACILITY DISPOSAL AREA GATE
FWF-NCDU
FEDERAL WASTE FACILITY
FWF-CDU
FWF WASTE STAGING BUILDING
OPERATIONS BUILDING
LLRW GUARD HOUSE
LABORATORY


vegetated surface soils
gravel biobarrier
soft/hard caliche
levelling red bed clay fill
transmissive sand drainage layer overlying geomembrane
reinforced concrete shell
transmissive OAG unit
concrete waste canisters with granular backfill
waste canister without vertical exaggeration
scale:
10 × vertical exaggeration
10 ft
20 ft
10 m
100 ft
200 ft
100 m
Dockum redbed clay
* bottom of FWF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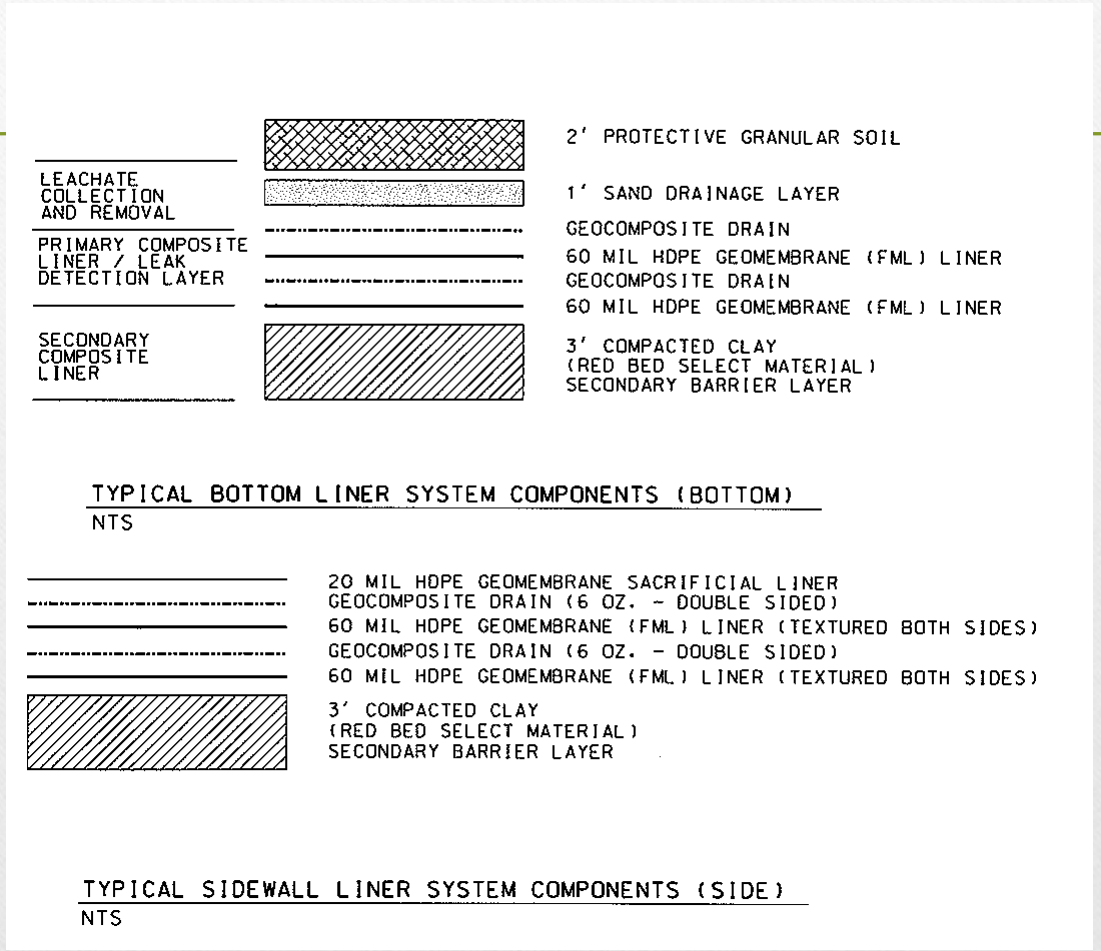
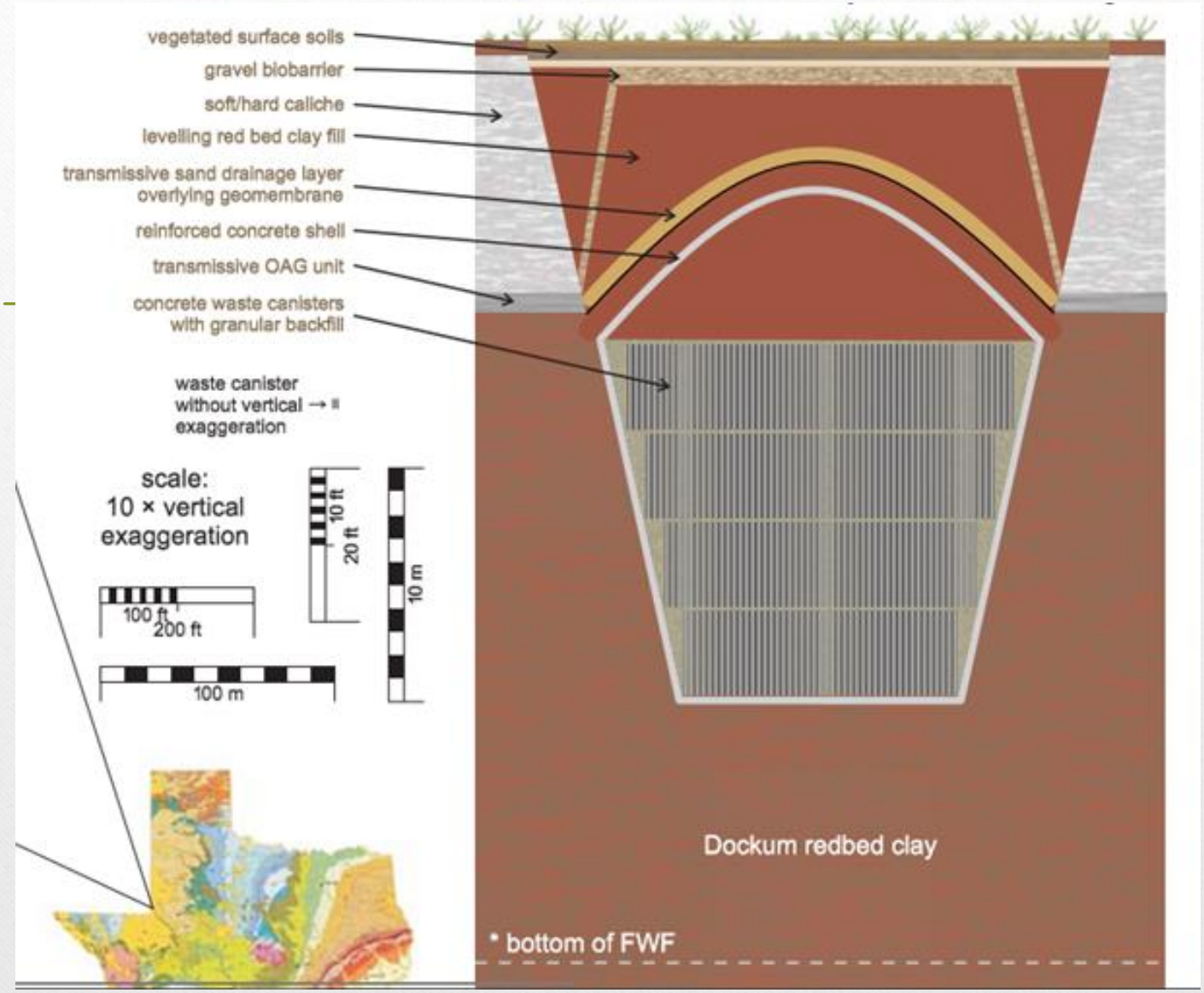
Composite Liner System



Proposed Composite Final Cover System

- 3-ft thick, compacted red bed clay with k of 1 x 10-7 cm/sec or less.
- 60-mil HDPE smooth geomembrane
- Geocomposite drainage layer
- 2 ft of clean native granular material
- Variable thickness of compacted red bed clay
- 3 ft of caliche cobble
- 4 ft evapotranspiration layer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transmissive sand drainage layer overlying geomembrane
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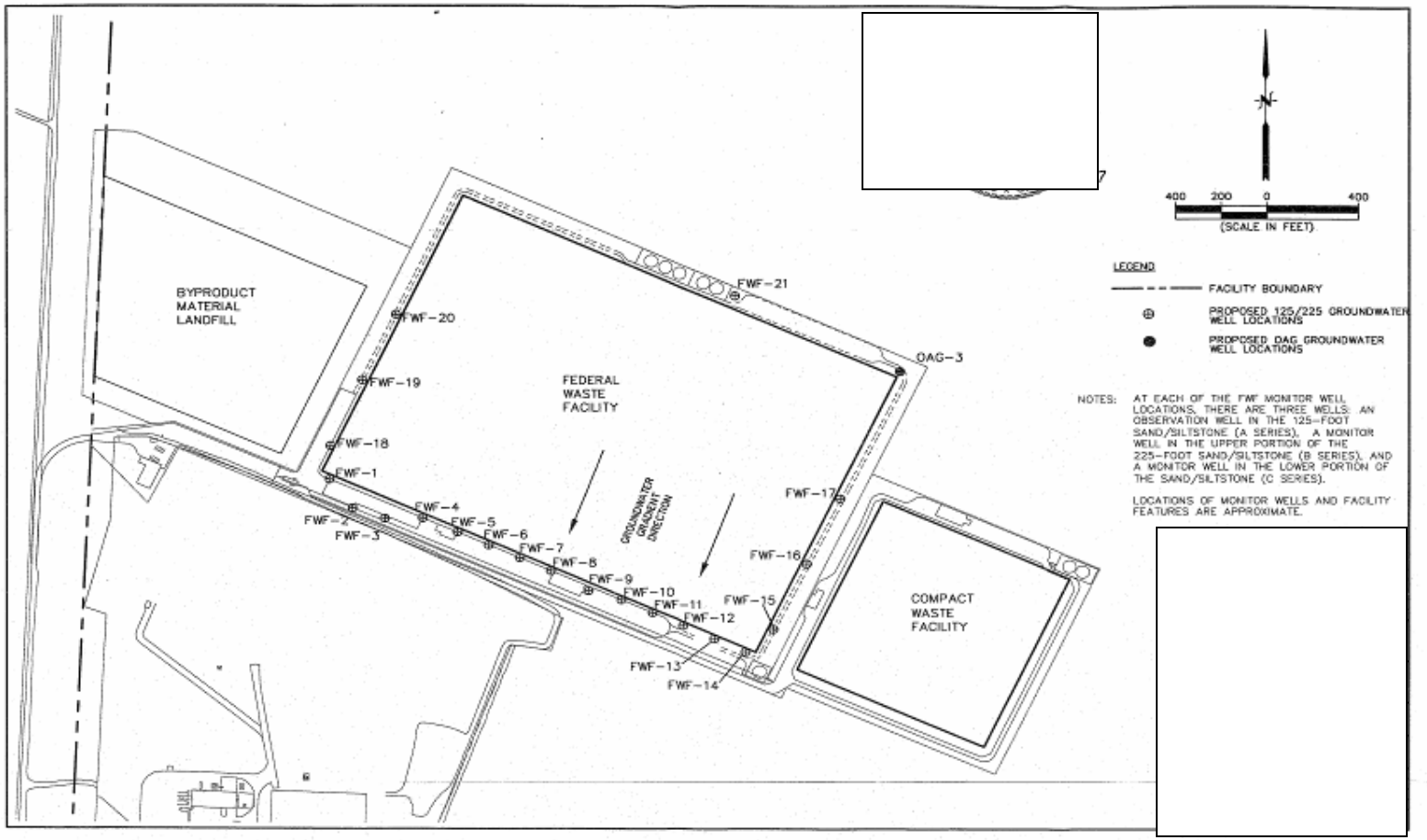
transmissive OAG unit
concrete waste canisters with granular backfill
waste canister without vertical exaggeration
scale:
10 × vertical exaggeration
100 ft
200 ft
10 ft
20 ft
10 m
100 m
Dockum redbed clay
* bottom of FWF

Groundwater Monitoring System



Questions?