

# Groundwater Monitoring for Closed Landfills and Surface Impoundments

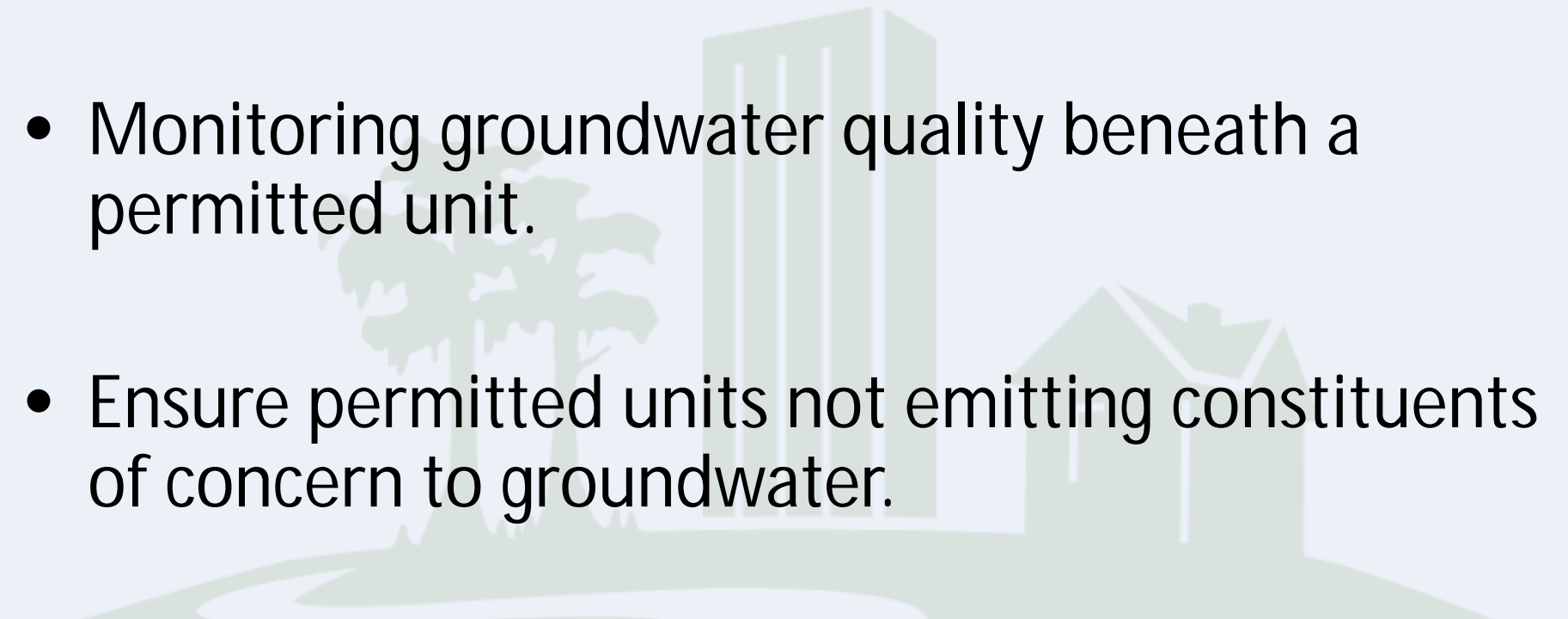
The background of the slide features a stylized, light green illustration of a landscape. It includes a palm tree on the left, a tall rectangular building in the center, and a house on the right. A winding path or road is visible in the foreground.

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# OUTLINE

- Sites that require groundwater monitoring
- What triggers need for monitoring?
- Groundwater monitoring plan
  - Locations
  - Depths
  - Frequency,
  - Parameters
- Drilling and Completions for Wells
- Measurements for wells
- Statistics
- Report Contents
- Well Redevelopment
- Post-Closure Requirements

# What is Groundwater Monitoring?

- Collecting and analyzing groundwater samples from wells installed into the subsurface beneath a facility.
  - Monitoring groundwater quality beneath a permitted unit.
  - Ensure permitted units not emitting constituents of concern to groundwater.
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# How is Groundwater Monitoring Managed?

- The Sampling and Analysis Plan (SAP) in the SW or HW Permit.
- SAP contains all requirements of regulations for monitoring.



# When Units Require Monitoring?

- Solid Waste
  - Type I
  - Type II Facility
  - Surface Impoundments, Landfills, Landfarms
- Hazardous Waste
  - Surface Impoundments
  - Land Treatment Units
  - Landfills
  - Waste Piles

# When does Monitoring Occur?

- For the entire operational life of the facility.
- For a post-closure period of 30 years.
- Post-Closure Period may be shortened or lengthened by Administrative Authority.

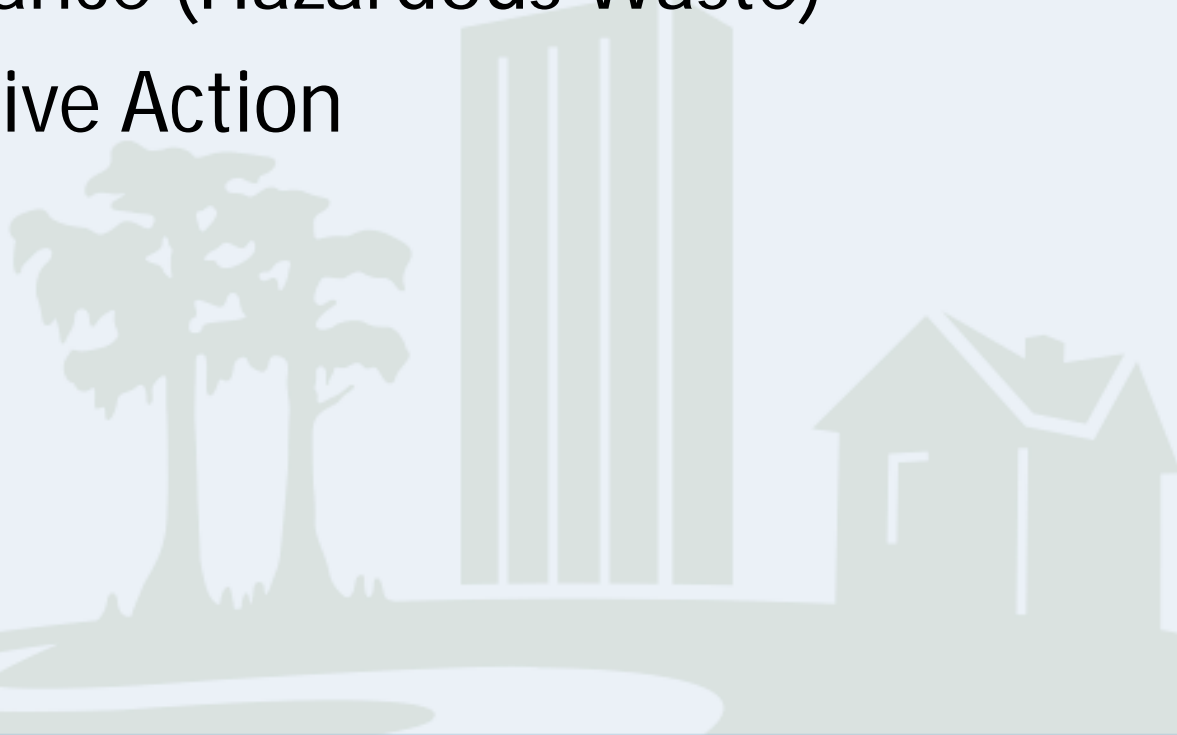


# Units and Facilities Monitored

- Landfills
  - Landfarms
  - Surface Impoundments
  - Waste Piles
  - Industrial and Municipal Facilities
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# Monitoring Programs

- Detection
- Assessment (Solid Waste)
- Compliance (Hazardous Waste)
- Corrective Action





# Monitoring Wells

- Sufficient number of wells installed at appropriate depth(s) to yield groundwater samples from uppermost aquifer.
- Minimum three wells (1 up gradient and 2 down gradient).
- Installed in at least uppermost permeable zone. May have wells installed in second zone.

# Well Installation Handbook

- LDNR/LDEQ Guidance Manual for Environmental Boreholes and Monitoring Systems
- Replaced the LDOTD/LDEQ “Green Book”
- Guide for drilling, installing, and plugging and abandoning wells

# Groundwater Monitoring Plan

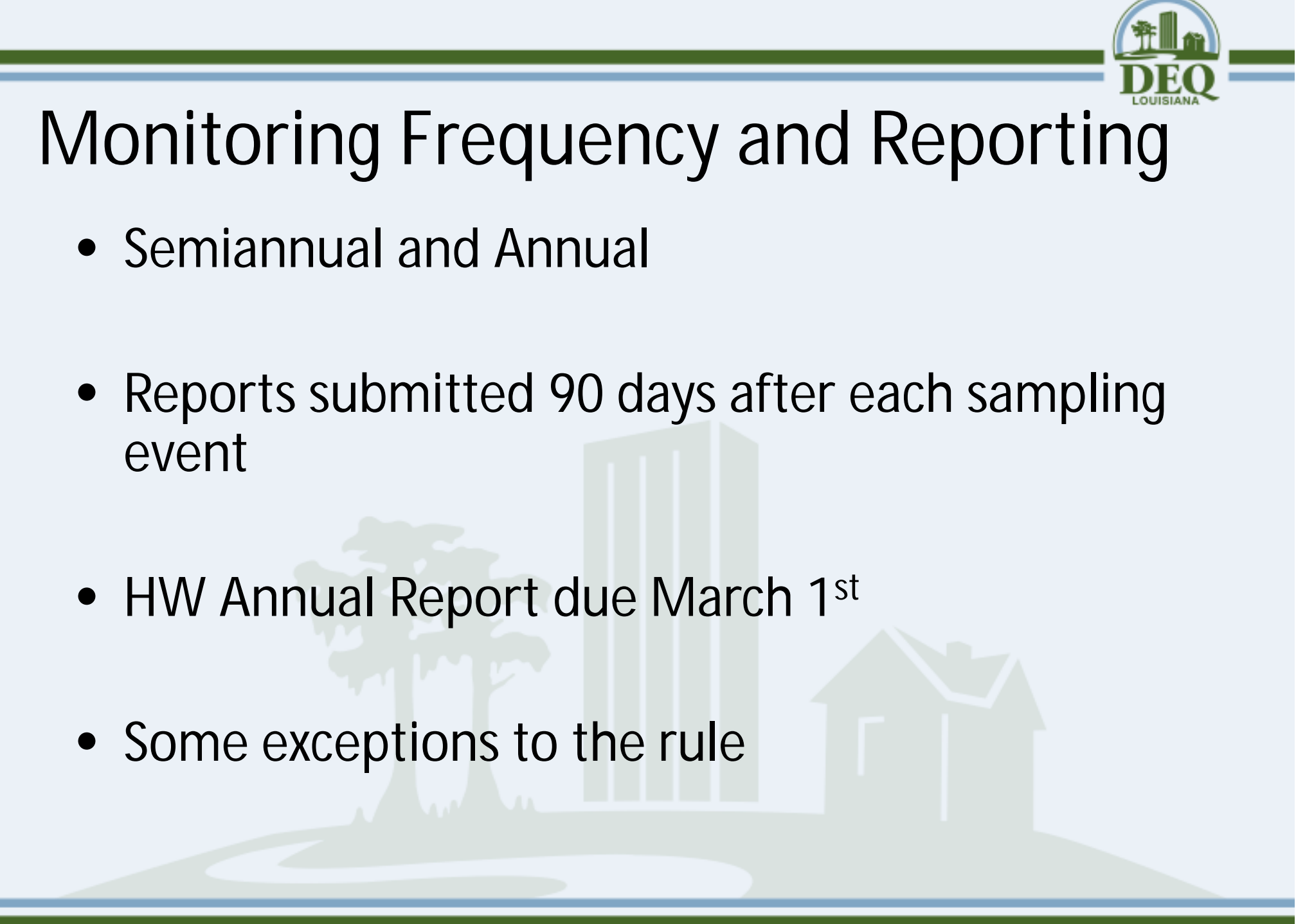
- Groundwater Sampling and Analysis Plan
- Contains sampling methods, sampling parameters, groundwater wells, QA/QC procedures, statistical information/GWPS, reporting information
- This is the guide for sampling event and used for review of groundwater reports

# Monitoring Parameters

- Parameters to be monitored during events.
- Parameters to be based on waste characterization and facility operations
- Semiannual and Annual Events



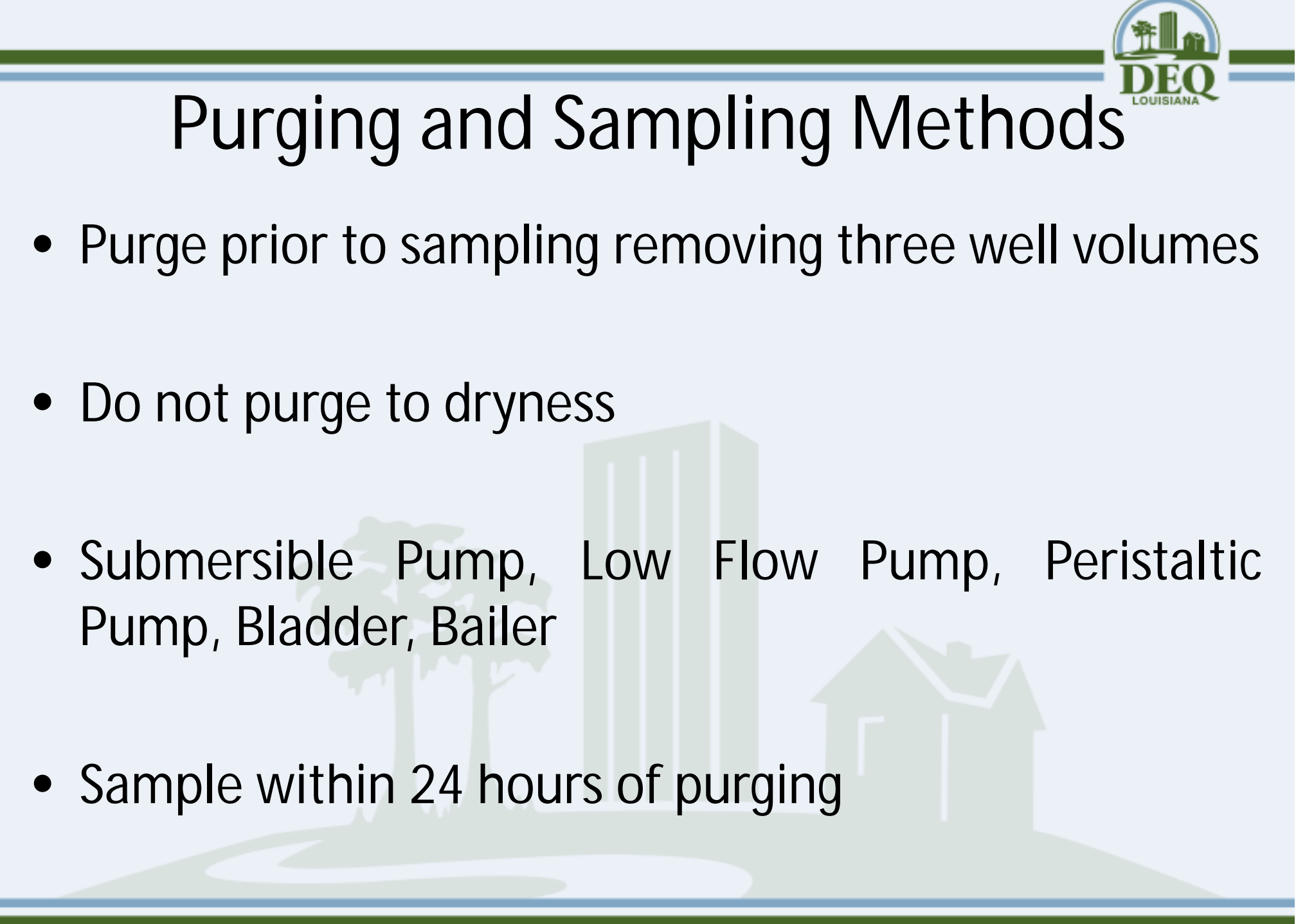
# Monitoring Frequency and Reporting

- Semiannual and Annual
  - Reports submitted 90 days after each sampling event
  - HW Annual Report due March 1<sup>st</sup>
  - Some exceptions to the rule
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# Well and Water Depths

- Measure well depths at each sampling event
- Determine if well screens blocked and need to be redeveloped
- Measure well depths prior to purging at each event
- Used to develop potentiometric maps

# Purging and Sampling Methods

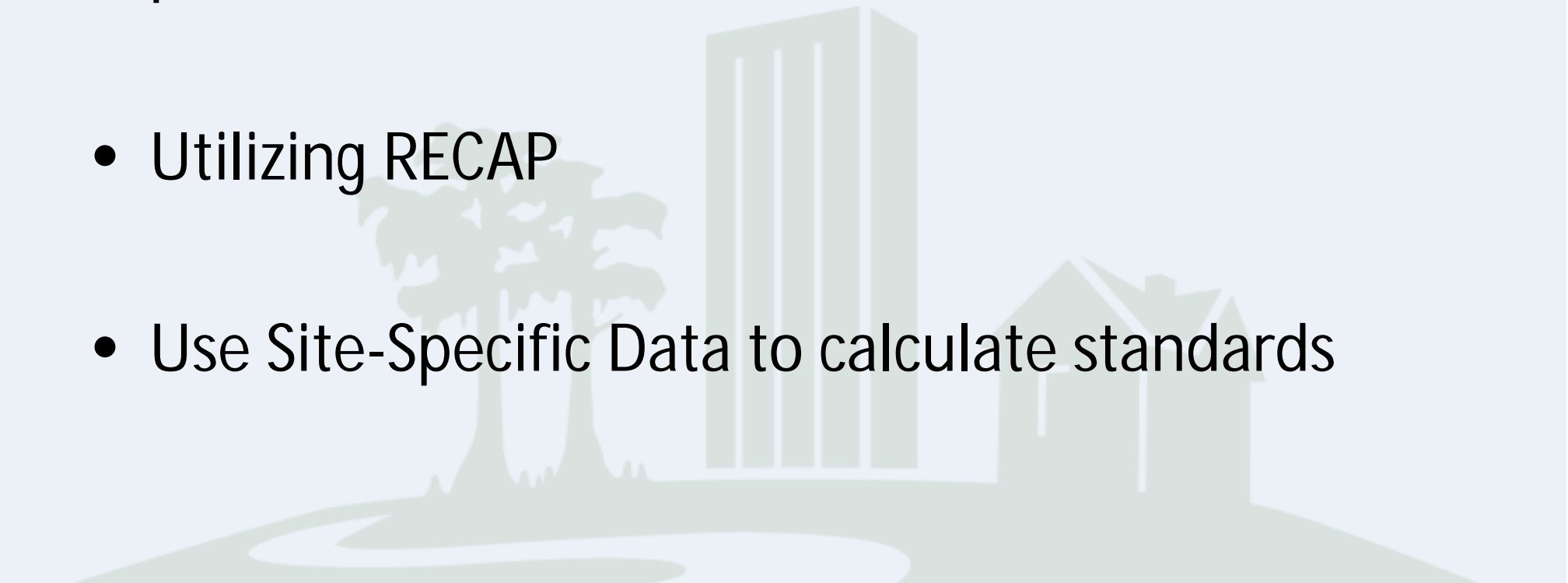
- Purge prior to sampling removing three well volumes
  - Do not purge to dryness
  - Submersible Pump, Low Flow Pump, Peristaltic Pump, Bladder, Bailer
  - Sample within 24 hours of purging
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# Statistical Analyses

- Statistical analyses required during detection monitoring
- Interwell vs Intrawell
- Prediction, Tolerance, Control Chart Methods
- Statistically Significant Increases (SSIs)



# GWPS


- Calculated standard used in Assessment to ensure constituents in Groundwater are protective of human health and the environment
  - Utilizing RECAP
  - Use Site-Specific Data to calculate standards
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# Laboratory Report and Summary Tables

- Create Summary Tables for Well Construction Information including Measured Well Depths
- Summary Table for Laboratory Results
- Laboratory Report



# Monitoring Reports

- Geology and Groundwater Requirements listed in permit
  - Short site summary
  - Summary of sampling event
  - SSIs or exceedances and path forward
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# Well Redevelopment

- Wells need to be redeveloped over time.
- Initial development is when well is installed.
- As well screen become silted in, well should be redeveloped to removed sediment from well screen



# Maintenance and Inspections

- Inspections shall occur at a maximum of at least every 6 months.
- Monitoring wells shall be locked, maintained, bollards upright, casing and pad in good condition.
- Grass should be maintained around the wells.
- No chemicals for grass treatment or pest treatment should be utilized.
- The LDEQ will also inspect the monitoring wells on a yearly basis.

# Differences for Monitoring between Operating and Post-Closure Period

- Facility designs program in Operating Period
- Monitoring continues until end of post-closure period.



# Contact Information

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