



TerrAqua Resource Management

Today's Presenters
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TerrAqua Resource Management is a wholly-owned subsidiary of Larson Design Group (LDG). LDG's headquarters is in Williamsport, PA. The firm has offices in Corning, NY, Bloomsburg, Selinsgrove, Bethel, and Ephrata, PA. LDG is a 200 person employee-owned architectural, engineering, and surveying firm.

September 1, 2009

LDG Larson Design Group® Core Values



CLIENTS are the basis of our enterprise. We know that the first step in client-centered design is to listen carefully so we can understand fully. Our quality relationships offer value to all parties.

Core Services Supporting Gas Exploration/Production Firms

- **SURVEY/SITE/CIVIL/ARCHITECTURAL**
- **WELL PAD DESIGN/PERMITTING**
- **WETLAND DELINEATION**
- **PENNDOT HIGHWAY OCCUPANCY PERMITS**
- **WATER MANAGEMENT PLANS**
- **CULTURAL RESOURCES ENVIRONMENTAL CLEARANCES**
 - PHMC
 - PNDI
 - DCNR
 - PA Fish & Boat Commission
 - US Fish & Wildlife
 - PA Game Commission
- **ESGCP-1**
- **LAND DEVELOPMENT PLANS**
 - Compressor Stations
 - Field Offices
 - Zoning
- **EROSION & SEDIMENTATION CONTROL PLANS**
- **IMPOUNDMENT DESIGN/PERMITTING**
- **WATER WITHDRAW/STORAGE**
- **STREAM CROSSING**
- **STRUCTURAL DESIGNS**

Water Management Tools

- - Surface Water Consumptive Use
 - SRBC/DRBC/DEP
 - PBR Existing Municipal Water Authorities
 - Disposal
 - Existing POTWs
 - Dedicated Facilities
 - Transload/Transport Out of State
 - Large Volumes Accumulating
 - Demand Straining Available Capacity
- - Load Consolidation (Transfer Stations)
 - Blending Operations
 - No Treatment
 - With Treatment
 - Compatible Chemistry
- - Recycle/Reuse
 - Disposal Wells
 - Brine Concentration
 - New Facilities Dedicated to Industry
- - TARM
 - 1st Generation
 - 2nd Generation

TARM = Support of Well Development and Operations

- **FLOW BACK (QUANTITY/QUALITY/STAGES/DURATION)**

- Southwest
- Northcentral
- Northeast

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- Lease Position/Drilling Pad Location
- Horizontal/Vertical Wells
(60 Days – Spud to Completion)
- Frac Flow Back Storage Volumes

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- Fresh Water Portfolio
- Recycle/Reuse
 - Fresh Water Impoundments (5-10 MG)
 - Dirty Frac (0.5-1 MG)
 - Clean Frac (1-3 MG)
 - Off Specification (0.1-0.2 MG)

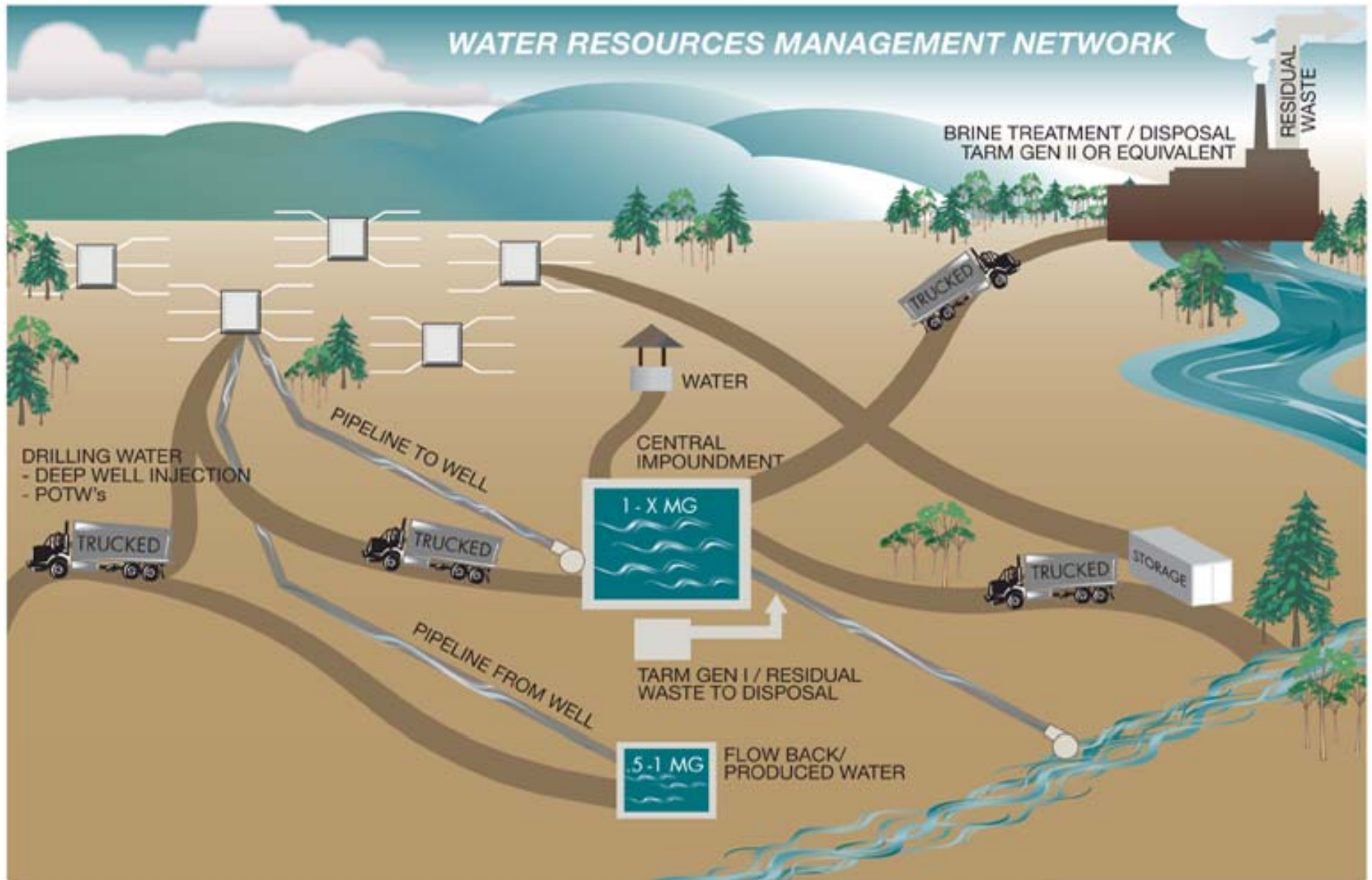
- **Known/Managed Water Quality**

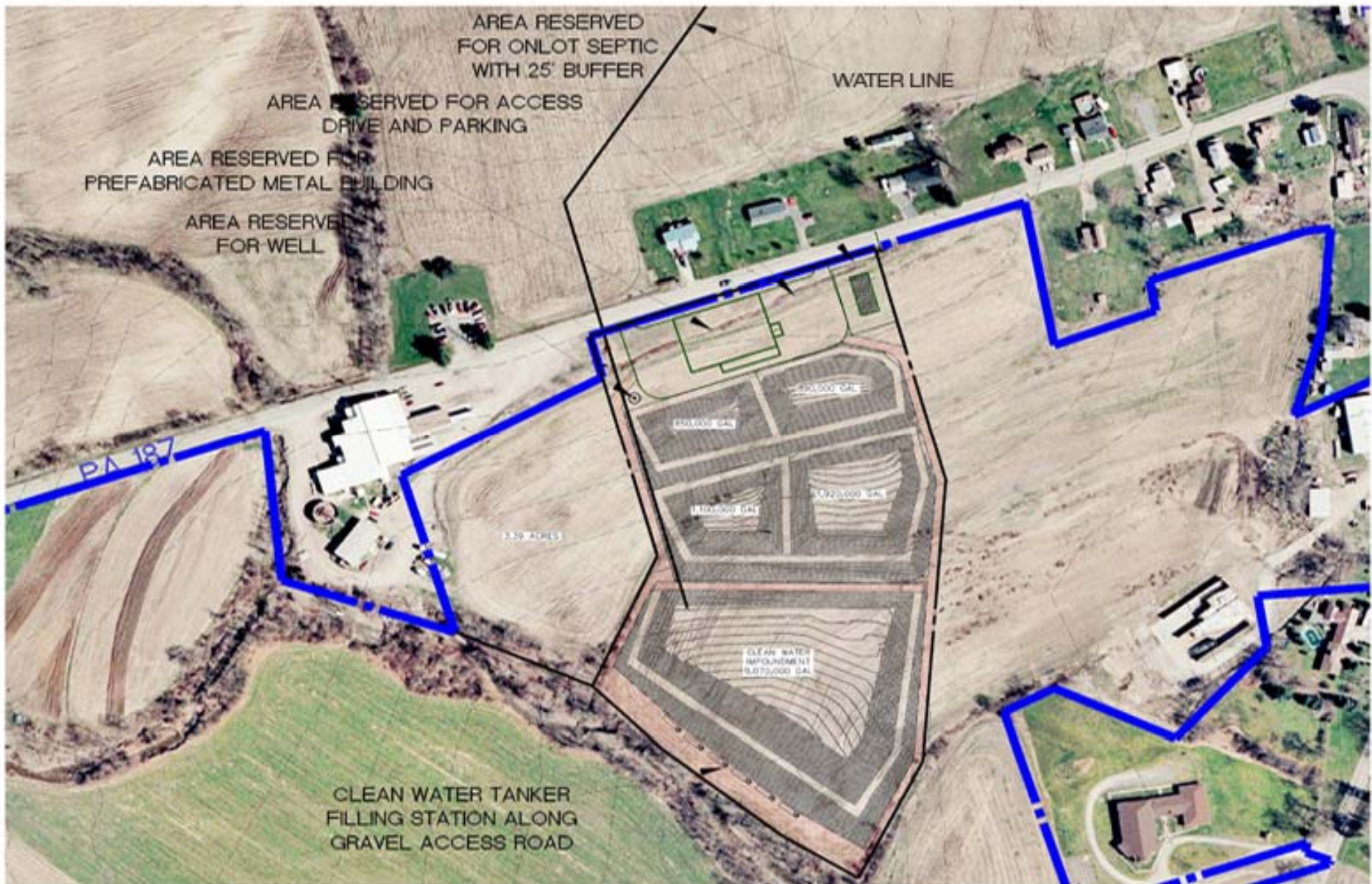
- FR Loop Testing by 3rd Party;
Credible Well Service Company;
Same Day Report With
Recommendation
- Scale Forming Potential
(Barium, Sr, Sulfate, Iron)
- Biocide
- Cationic/Anionic/Nonionic

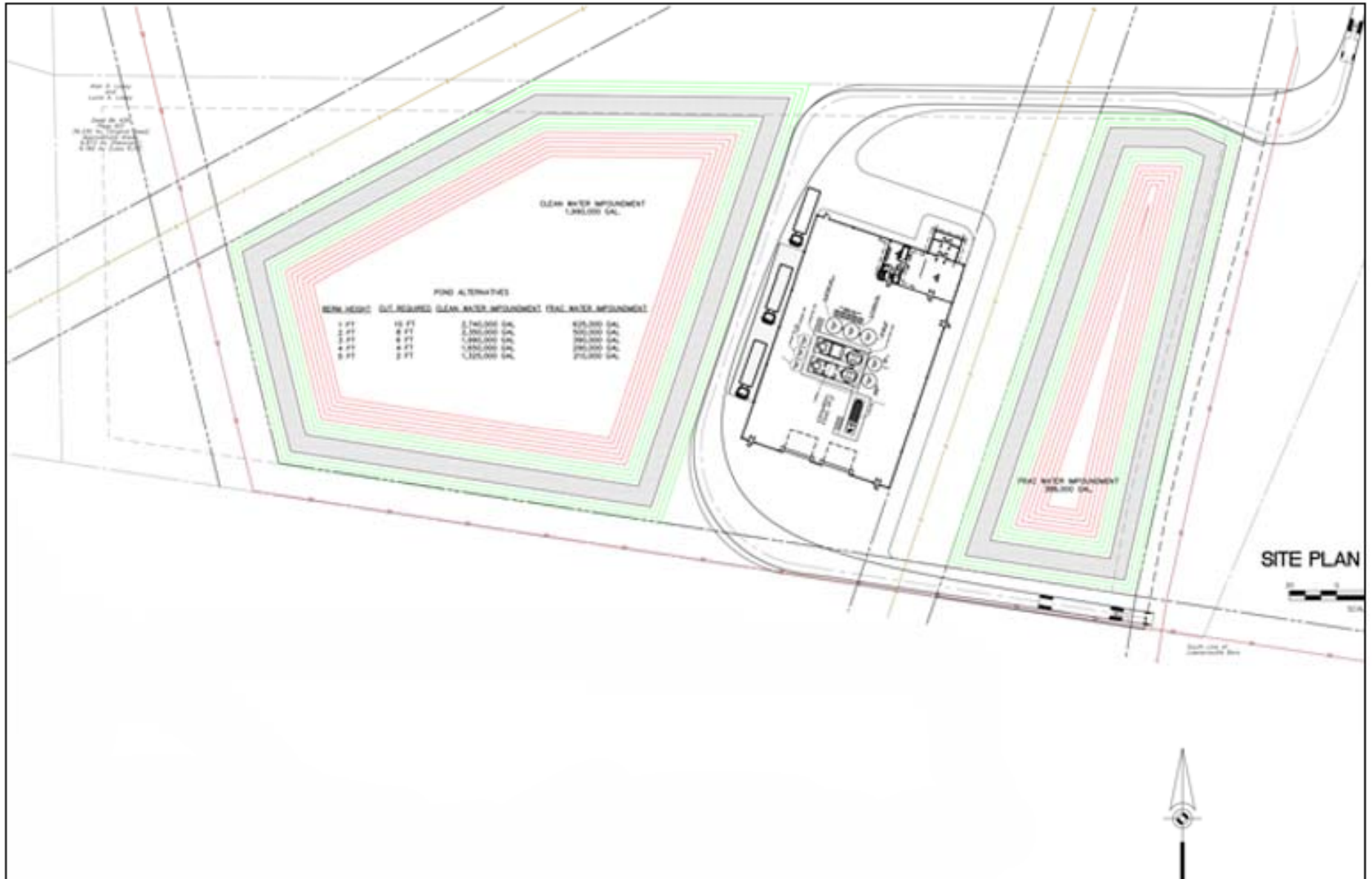
- **Need for Ultimate Disposal Portfolio**

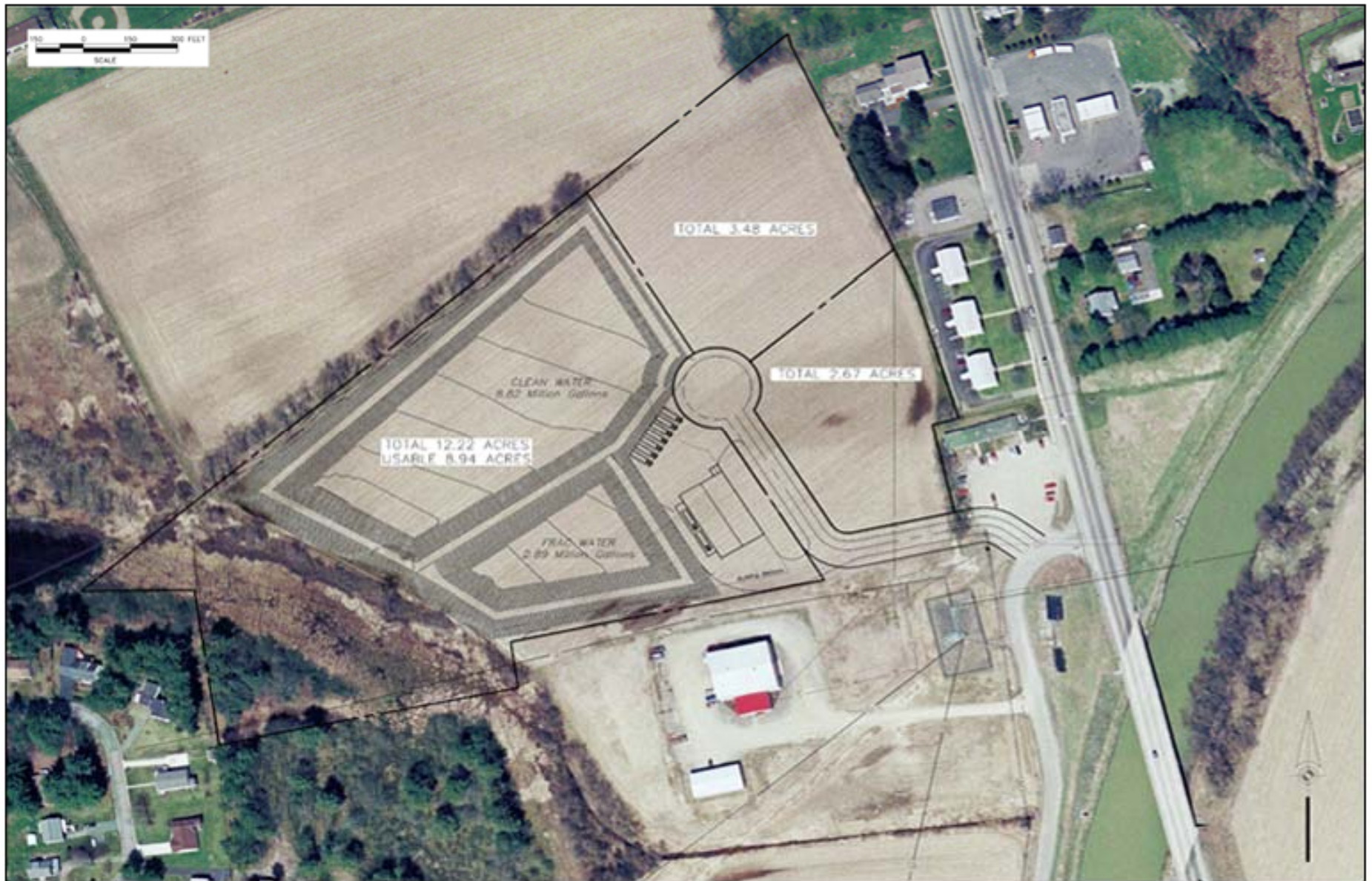
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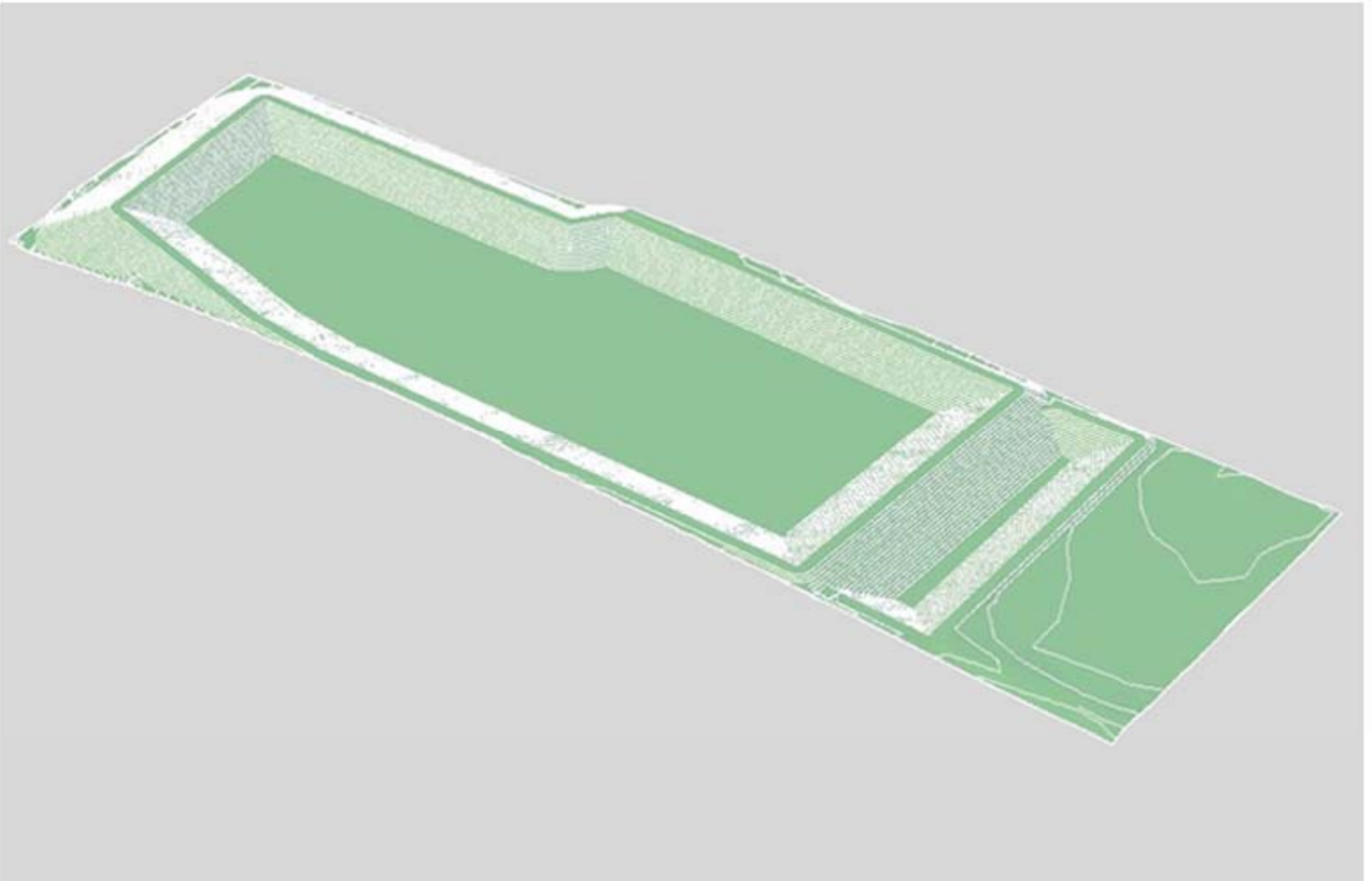
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TARM SOLUTIONS

REGULATORY ENVIRONMENT

- Evolution of PA DEP oversight and permitting of gas industry.
 - Oil and Gas
 - Water Management
 - Waste Management
- Former common practices are now prohibited or under review.
- Several water management attempts by operators/service companies have been classified as non-compliant, and have stopped.
- Blending operations, load consolidation, mobile treatment units at the well pad.
- Flowback and produced water = residual waste?
- DEP has been consistent relative to design, permitting, operating requirements for a centralized waste treatment facility with a beneficial use application – recycle/reuse of the water.
- Recycled water would be included as a source within the water plan.
- Notice of violations result in significant disruption of drilling program.

TARM SOLUTIONS

TARM APPROACH = HIGH COMPLIANCE

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TARM GENERATION II

PERMITTING STATUS

- 1st new point source discharge applicant to receive WQM Part 1 draft permit limits.
- As a result of comments received during public comment period, DEP scheduled and conducted a public meeting.
- A formal public hearing will be conducted.
 - August hearing cancelled due to power outage.
 - Rescheduled for September 30, 2009 7 p.m.
- DEP has targeted 30 days to issue comment/response document.
- At this point, DEP could issue/deny/amend the WQM Part 1 permit.
- TARM will finalize the process equipment design and specifications and submit the WQM Part II Permit estimated to require 30 - 45 days.
- Expectation is DEP will require 4 – 6 months to review the application and issue the Part II construction permit.
- Process equipment lead time and construction is expected to require 40 weeks.
- Take away message: Additional traditional disposal capacity for gas industry will not be available within PA until 1st QTR 2011.

QUESTIONS / ANSWERS

Additional Information is Available Online at:
www.larsondesigngroup.com/tarm

This webpage is password protected!

**Username and password are available to attendees in exchange for
business cards as you exit the room.**

Thank you for attending!

