


The Best Practices in CQA
 Specific to Avoiding the Formation of Leaks
 Geo2021 Short Course: Designing for a Zero-Leak Containment Facility

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So, What is CQA?

*“A planned system of activities that provides the owner and permitting agency assurance that the facility was constructed as specified in the design.”
 (EPA, 1986)*

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So, What is CQA?


- Refers to measures taken by the CQA team to assess/document that the installer or contractor is in compliance with the plans and specifications
- Includes inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document quality of the constructed facility

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Difference between CQC and CQA?

Construction Quality Control (CQC) is performed by the contractor or installer to ensure adequate confidence that the products/performance meet the contractual requirements




CQA is performed by the owner's representative, designed to provide adequate confidence that the products/performance meet the contractual requirements

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So, What is Routine CQA?


- Routine CQA begins at the pre-construction meeting and ends with cell approval.
- Routine CQA includes measurable tasks such as:
 - Sampling
 - Field Testing
 - Documentation
 - *These are based on Quantity and Frequency*
- Routine CQA includes non-measurable tasks such as:
 - Observation
 - Communication



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So, What is Routine CQA?




Routine CQA often becomes a spectator sport with limited involvement!

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Taking CQA beyond the routine:

- Constructability Review
- Comprehensive CQA
- Post Construction Monitoring

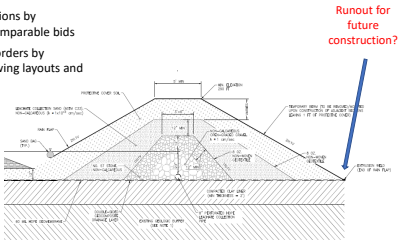


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Constructability Review

- Do construction drawings meet permit conditions?
- Cost savings to client
 - Reduces assumptions by contractors for comparable bids
 - Reduces change orders by proactively reviewing layouts and techniques

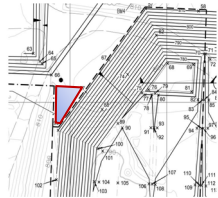


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Constructability Review

- Practical Construction Techniques and Considerations:
 - Can it be constructed as designed?
 - Can CQA adequately monitor the work?
 - Will the design work with owner operations?



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Constructability Review



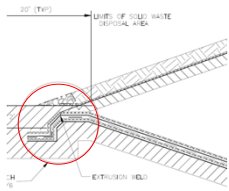
The devil is in the details

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Constructability Review

- Review of Details
 - Tie-in to existing materials
 - Termination at construction limits (anchor trenches)
 - Stormwater plans for during/post construction
 - Sump cross sections
 - Intercell berms
- Every detail has a purpose





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Constructability Review

- Assist with the Selection of Materials
 - Geosynthetics (slope stability, interface friction)
- Review shop drawings
 - Pipe type, diameter, and perforation pattern

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Constructability Review

- Are there better options?



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Constructability Review

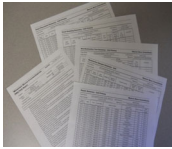
- Are there better options?




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Comprehensive CQA



CQA should be thought of as an "Attitude."




Documentation and testing are necessary but cannot be the only focus.

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Comprehensive CQA

- Pre-Project Coordination
 - Geosynthetics
 - Material Quantities
 - MQC / Conformance Testing
 - Borrow Soil Analysis
 - Material Quantities
 - Prequalification testing
- Construction Schedule



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Comprehensive CQA

- Communications
 - Client
 - Regulatory Notification
 - Assist in coordination between earthwork contractor and geosynthetic installer
 - Surveyor




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Comprehensive CQA

- CQA must be present, be involved
 - What are the contractors doing
 - What are the contractors doing next
 - Heads up – head on a swivel
 - Anticipate problems – LOOK AHEAD



*Be the part of the solution...
Not part of the problem!*

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Comprehensive CQA

- Coordination and planning prevent issues




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Comprehensive CQA

- Coordination and planning prevent issues




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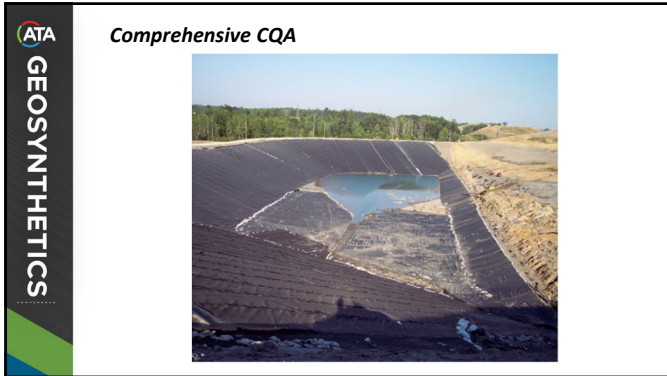
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Comprehensive CQA

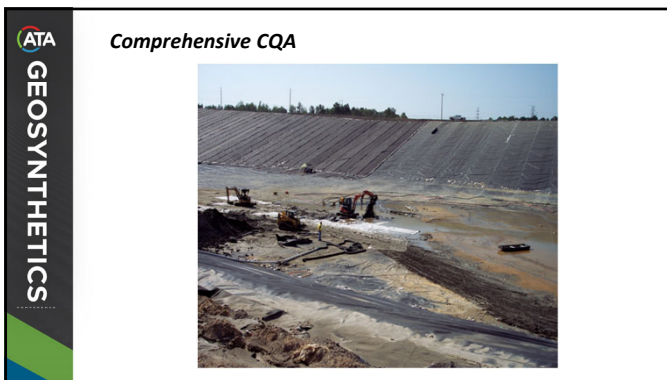
- Lack of coordination and planning can cost time, money, and an impact to the final quality



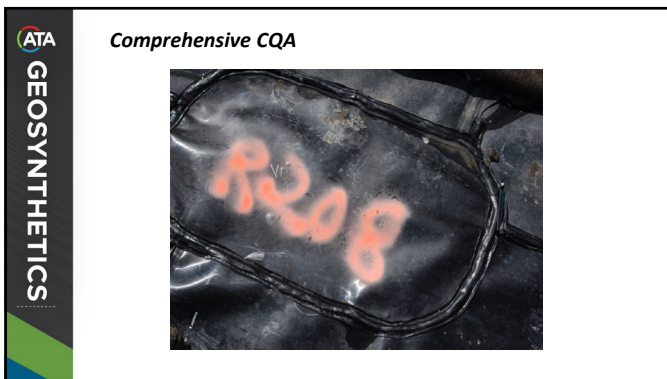
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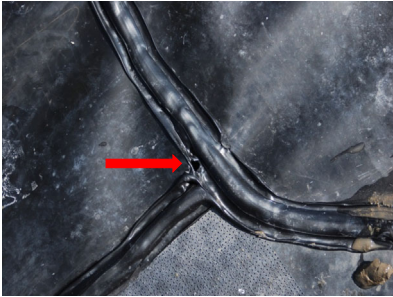
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Comprehensive CQA



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Comprehensive CQA

- The right personnel and the right training




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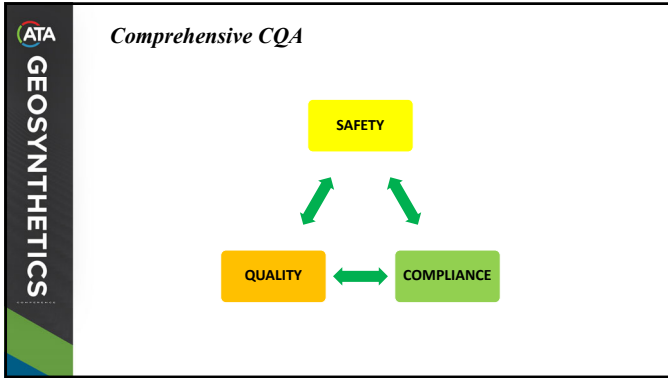
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Comprehensive CQA

- Leak Location Survey (LLS)
 - Majority of leaks in geomembrane result from construction damage.
 - Tests the function of the geomembrane as the final component to construction.



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Comprehensive CQA

- Compliance

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      COMPLIANCE --> PERMIT["PERMIT  
CQA PLAN  
CONSTRUCTION  
DRAWINGS"]
      COMPLIANCE --> STATE["STATE REGULATORY  
REQUIREMENTS"]
      COMPLIANCE --> SOP["3RD PARTY  
SOP"]
  
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Post Construction Monitoring

- Maintain post construction integrity prior to waste being placed.



- Have the temporary intercell berms been constructed to design?
- Are the berms protected from the wind and other elements?

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Post Construction Monitoring

- What temporary stormwater measures have been put in place?
- How is the sump protected from clogging with silt or other objects?



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Post Construction Monitoring



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Post Construction Monitoring

- Should CQA stop when waste placement starts?



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Post Construction Monitoring



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Conclusion



The combination of a constructability review, a comprehensive CQA program, and post construction monitoring is a total effort aimed at reducing leaks.

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Questions?

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