Liner Integrity Survey
Electrical Leak Location

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Presented by:
Tammy Perkins
Weaver Consultants Group
What is a Liner Integrity Survey? or Leak Location Survey?
Liner integrity / Leak location survey is a means used for locating leak paths (holes) in installed geomembranes through the use of electrical methods.
When would this survey be performed?

- Immediately after construction before being placed into service (Integrity Survey)

- After being placed into service and an issue has surfaced. (Leak Location)
The function of a geomembrane at a WWTP is to prevent liquid flow into the environment.
Geomembrane Hole Statistics
(Nosko, 1996)

- 73% of damage occurs during cover soil placement
- 24% occurs during geomembrane installation,
- 2% occurs during post construction
Cover soil placement damage
Wastewater leakage through the geomembrane creates a microbiological reaction creating gas followed by the common whale.
History

This is a time-tested technology

• Early 80’s development started (USEPA)
• Mid 80’s first commercial surveys on soil and water covered geomembranes
• Mid 90’s first exposed geomembrane surveys
• Early 2000 first ASTM method published
• Technology continues to emerge and its use is more common
DIAGRAM OF THE ELECTRICAL LEAK LOCATION METHOD FOR SURVEY WITH SOIL COVERING THE GEOMEMBRANE
CHARACTERISTIC LEAK SIGNAL
SIGNAL OVER AND BESIDE LEAK
MAPPED VOLTAGE READINGS

Dipole measurements taken at one-meter intervals
Leak Location Methods

D6747-04 Standard Guide for Selection of Techniques for Electrical detection of potential Leak Paths in Geomembranes

– Water Puddle System
– Water Lance System
– Di-Pole System
– Conductive Geomembrane Spark Test
– Arc Testing System
Water Puddle Method
(exposed geomembranes)

D7002-10 Standard Practice for Leak location on Exposed Geomembrane using Water Puddle System
Water Lance Method
(exposed geomembranes)

D7703-11 Standard Practice for leak Location on Exposed Geomembranes Using the Water Lance System
Water Covered Method
(Di-pole)

D7007-09 Standard Practice for Electrical methods for Locating Leaks in Geomembrane Covered with Water or Earth Material (Di-pole)
Soil Covered Method
(di-pole)

D7007-09 Standard Practice for Electrical methods for Locating Leaks in Geomembrane Covered with Water or Earth Material (Di-pole)
Spark Test

D7240-11 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)
Arc Test

D7953-14 Standard Practice for Leak Location on Exposed Geomembranes Using the Arc Testing Method
Holes found utilizing this technology
Boundary Conditions

• A conductive medium above the geomembrane;
• A conductive medium through the holes;
• A conductive medium directly under the geomembrane;
• No contact between the medium above and below the geomembrane other than the holes being sought.
Limitations

- Dry soils/frozen soils
- Type of boundary soils
- Multiple geosynthetic layers
- Wrinkles / Waves
- Other electrical interference
Edmore WWTP Lagoon Liner Integrity Survey Project
Storage Lagoon #3
5.8 acres

Storage Lagoon #2
5.2 acres

Primary Lagoon #1
1 acre
Edmore WWTP
Lagoon Project

Lagoon Cross-Section (from bottom up)
• Prepared subgrade
• Geosynthetic Clay Liner
• 40-mil PVC geomembrane
• 12-inch thick protective cover layer (sand)
• Erosion control ballast on sideslopes
Edmore Lagoon #3
Edmore Lagoon #3
Edmore Lagoon #3
Edmore Lagoon #1
Edmore Lagoon #1
Edmore Lagoon #2
Edmore Lagoon #2
Conclusions

- Liner integrity survey immediately after construction is the best means for a comprehensive evaluation of the complete installation.
- Leak location survey after an operational issue has been identified is the quickest and most economical means to find a hole.
Questions?

Jeff Blum
jblum@wcgrp.com
616-458-8052