FORM
27
Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109

#8494

FOR OGCC USE ONLY

RECEIVED
6/20/2014

OGCC Employee:
☐ Spill ☐ Complaint
☐ Inspection ☐ NOAV
Tracking No:

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☐ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☑ Other (describe): requirement to re-permit facility

OGCC Operator Number: 10119
Name of Operator: Maralex Disposal, LLC
Address: PO Box 338
City: Ignacio State: CO Zip: 81137

Contact Name and Telephone:
Naomi Azulai
No: 970-563-4000
Fax: 970-563-4116

API Number: n/a
County: Mesa
Facility Name: Roan Creek Evaporation Pond
Facility Number: 116525
Well Name: n/a
Well Number: n/a
Location: (QtrQtr, Sec, Twp, Rng, Meridian): NESE Sec 36 T8S R98W Latitude: 39.31 Longitude: -108.27

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): produced water

Site Conditions: Is location within a sensitive area (according to Rule 901e)? ☐ Y ☑ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): non-cropland

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: Uffens loam, 1-8% slopes

Potential receptors (water wells within 1/4 mi, surface waters, etc.): Coon Hollow dry wash. No water wells within 1/4 mile.

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):	Extent of Impact:	How Determined:
☐ Soils	not known	TBD with soil sampling upon plan approval
☐ Vegetation	none	very little vegitation in the area and no events that put any at risk of exposure
☐ Groundwater	none known	will investigate further if sampled soils show signficant exposure
☐ Surface Water	none	there is no surface water within exposure range and no event that would cause risk

REMEDIATION WORKPLAN

Describe initial action taken (if previously provided, refer to that form or document):

Conformed to BLM requirements to recommission the pond including reconfiguring the load-out area to contain spills, secure the facility from unauthorized disposal, revegitate the pond berm, install required signs, and label the storage vessel.

Describe how source is to be removed:

At this point, no impact has been identified and the pit is currently not in use.

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

At this point, no impact has been identified, nor is any anticipated. If it is found that the liner has been compromised and the soil under or adjacent to the pit has been impacted by produced water then the pit liner and leak detection system will be removed so that the underlying soil can be removed by a subcontractor using equipment to excavate and move the affected soil just outside the fence on the west side of the pond where it will be landfarmed according the following parameters and with the approval of the landowner:
6ml plastic sheeting will be secured to the leveled subgrade and surrounding soil berms built 4' high. The compromised soil will be placed a loose depth no greater than 3' as indicated by using a device on the surface of the liner designating depth. The area will be determined by the volume of soil needing treatment. The area is calculated by dividing the volume of soil by 3' deep. The soil will be cultivated monthly with a small tracked backhoe and the facility will be regularly inspected for integrity during routine site visits.

Submit Page 2 with Page 1

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Page 2

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Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

REMEDIATION WORKPLAN (Cont.)

OGCC Employee:

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

There is no known impact to groundwater. If it is concluded that the soil under or near the pond has been unaffected by the water in the pond, then it is reasonable to conclude that the groundwater has not been impacted by the facility. After reviewing the results from the soil analyses, it will be decided if a soil boring will be required to define depth of impact. This will determine if a path to groundwater is probable. In the case that groundwater impact is suspected, a groundwater investigation will follow. The nearest water well is 1 mile NE of the facility and 540' deep.

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

The site will maintain all existing grade contours in order to re-permit the facility for use. In the event that the pit is not re-permitted, the site will be reclaimed in accordance with the 1000-series rules and BLM requirements. This includes removing all equipment from the site, backfilling the pond, compacting, reseeding the area with a weed-free BLM approved mix, and monitoring the site until final approval is given by the COGCC and BLM that no futher action is required.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☑ Y ☐ N If yes, describe:

When the plan proposed in this form is accepted by the COGCC, the following site investigation will be performed in addition to the liner analysis that has already been done and reported in the attached document from TRI. Three descrete soil samples at equal intervals will be collected from under the patched panel on the North side of the pond, one soil sample will be collected from next to the leak detection sump, and one soil sample will be collected from outside the fenced area downgradient of the pond. Each sample will be collected to a depth of 6" and analyzed for Table 910-1 parameters. The liner has been visually inspected by a licensed professional engineer and per the Engineer's recommendation, will not be cleaned (report attached). The Engineer will also review a leak detection test that will be performed by a contractor recommended by the Engineer - as outlined in the attached Engineer's report.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

No impact has been identified. If waste is generated, see first page of this form for description of how soil will be treated on site. Once approved by the COGCC, the soil will be used as fill on site if required at this time. Once the liner is no longer viable, it will be disposed of at a licenced disposal facility according to their requirements.

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: 6/18/2013	Date Site Investigation Completed: tbd	Date Remediation Plan Submitted: _____
Remediation Start Date: _____	Anticipated Completion Date: _____	Actual Completion Date: _____

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Naomi Azulai Signed: _____

Title: Production Technician Date: 6/20/2014

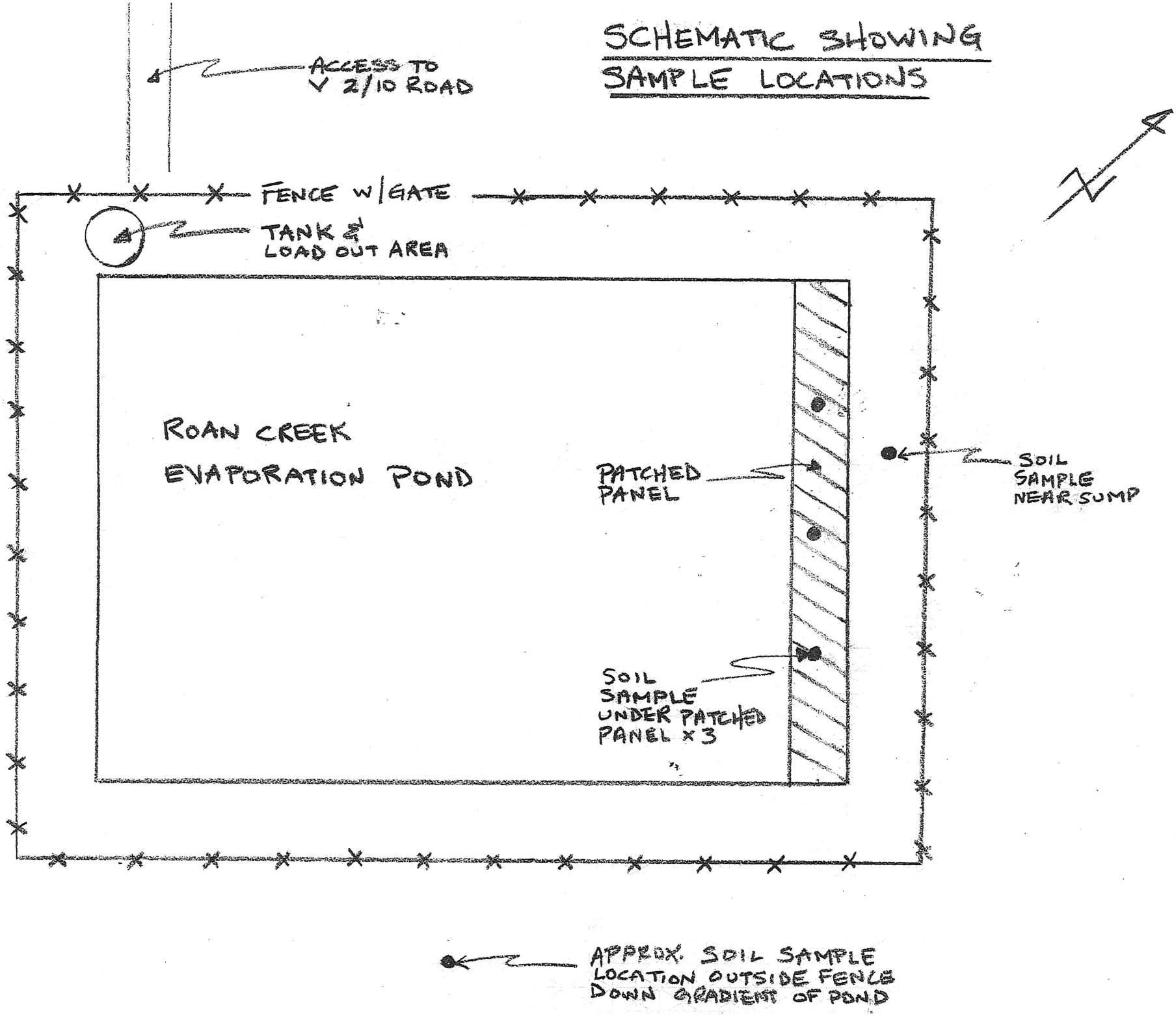
OGCC Approved: Carlos Lujan, Ph.D. Title: Digitally signed by Carlos Lujan, Ph.D. DN: cn=Carlos Lujan, Ph.D., o=COGCC, ou=EPS NW Region, email=carlos.lujan@state.co.us, c=US Date: 2014.06.25 13:49:08 -06'00' Date: _____

See Attached Conditions of Approval (COAs).

Time Schedule of Activities Proposed in Form 27

	Activity	Expected Time	Time Dependency
A	Submittal of Form 27 to COGCC	June 23, 2014	
B	COGCC Approval of Form 27	June 27, 2014	**A** & COGCC
C	Soil Sampling	July 16, 2014	**B** & Availability of ESI to collect soil samples and Liner Repair Company
D	Provide Lab Results of Soil Sample Analysis to COGCC	July 31, 2014	**C**
E	Liner Inspection by Engineer	July 31, 2014	**B** & Availability of Engineer and Crew
F	Provide Engineer's Report on Facility Integrity to COGCC	August 15, 2014	**E**
G	Receive COGCC's Decision to Allow Permitting the Pond	August 30, 2014	**F** & COGCC
F	Follow Up Site Work and Paperwork	TBD	**G**

SCHEMATIC SHOWING SAMPLE LOCATIONS



R. K. FROBEL & ASSOCIATES
Consulting Engineers

Mr. A. M. O'Hare
Maralex Resources, Inc.
P. O. Box 338
Ignacio, CO 81137

June 20, 2014

RE: Technical Memorandum
Site Visit and Primary Geomembrane Liner Inspection
Roan Creek Evaporation Pond, De Beque, CO

At the request of Maralex Resources, Inc., Mr. R. K. Frobel traveled to the Roan Creek Evaporation Pond site on June 18, 2014 for the purpose of inspection of the current condition of the 40 mil HDPE primary geomembrane liner.

The Roan Creek Evaporation Pond is approximately 65,000 sf (1.5 acres) in size and 5 ft in depth and has an under drain leakage collection system composed of 4 in. diameter perforated PVC pipe in gravel trenches. The toe of slope dimensions are 285 ft in length and 175 ft in width. Side slopes are approximately 3H:1V with the top perimeter of the liner fixed in a soil backfill anchor trench. There are no pipe penetrations. The 40 mil HDPE was installed in 1998 and recent index and performance testing completed by TRI Environmental indicated that the liner is still in relatively good condition.

Site Observations and Comments:

- Approximately 90% of the pond bottom is currently covered with wind blown silt and sand as well as a thin layer salt that covers the accumulated silt and sand. The depth of the relatively thin layer ranges from a dusting to approximately 4 or 5 inches at low spots or between liner wrinkles. At the time of this site visit, the soil was wet from recent rains. This accumulation of soil and salt effectively protects the bottom of the pond liner from environmental deterioration due to the effects of UV, wind movement, wrinkling and uplift.

- The 40 mil geomembrane was manufactured by Agru America, Inc. in 1998 and installation was completed in 1998. The geomembrane layout was originally designed so that the 22.5 ft wide rolls (panels) were placed East to West across the pond width. There are a total of 15 panels that are all thermally welded together at overlaps using dual track thermal fusion seams which provide an air channel for QC NDT air testing of seams during installation.

- To facilitate inspection, the individual panels were marked from South to North as panels 1 through 15. Each panel was inspected primarily on the side slopes due to bottom soil and salt accumulation. However, bare areas on the pond bottom were inspected and found to be in excellent condition with good flexibility, no visible damage and no visible polymer degradation.

32156 Castle Court / Suite 211-M240 / Evergreen, CO 80439
Ph 303-679-0285 / Fx 303-679-8955 / geosynthetics@msn.com

- Panels 1 through 14 were inspected primarily on the side slopes. Considering the length of time that the liner has been in place, only minor damage was noted and one bullet hole was observed in Panel No. 1. In particular the patches on the East side Panels 8 and 12 will require removal and replacement with 40 mil HDPE extrusion welded patches.

- Samples were taken by Maralex from Panel No. 4 slope on the West side for testing at TRI Environmental in 2013. The 5 ft x 5 ft slope sample area was patched with new 40 mil HDPE. Of particular note is the fact that the patch was extrusion welded to the old liner with excellent results. Thus any future repairs can be made very effectively with extrusion welding.

- With the exception of Panel No. 15 on the North end of the pond, all exposed sections of the panels were observed to be in very good condition with good flexibility, no cracking at wrinkles, minor surface scratching and only surface oxidation. Thus, the South, East and West Slopes are in good condition.

- The dual track thermal fusion welds connecting all panels were inspected for general appearance, adhesion and cracking. All of the weld areas that were inspected were in excellent condition with no separation at the seam area.

- Panel No.15: This panel is the panel which covers the North end of the pond and which has sustained severe damage due to the extreme south sun exposure, high winds, wrinkling and flexing of the liner at folds. Although repairs with various types of patching materials have been made over damaged areas, this panel must be removed entirely and replaced with a new 22.5 ft wide roll of 40 mil HDPE thermally welded to existing panel 14 and then securely fastened in the perimeter anchor trench.

- Weeds, grass and shrubs were observed to be growing at the perimeter of the pond up to the edge of the HDPE lining system. Additionally, erosion of perimeter soils was noted.

Recommendations Based Site Visit Observations and Review of Available Documents:

1. Remove and Replace the North End Panel No. 15 that has sustained severe damage over time. This will require removing approximately 4 ft of accumulated soils on panel 14, thoroughly cleaning the panel edge and thermal fusion welding a new panel in place.

2. Repair any damaged areas on the side slopes and replace old patches with new extrusion welded 40 mil HDPE patches.

3. With the exception of the North End Panel No. 15, all remaining panels are in good condition and should be placed back in to service once minor repairs are made and

the entire lining system is tested. It should be noted that the TRI Environmental test results on the 40 mil HDPE samples extracted from the liner system show that the HDPE sheet is still in relatively good condition for its age and that with monitoring will give extended service as an evaporation pond liner.

4. It is not recommended to clean the bottom of the pond. Cleaning will damage the intact bottom lining system and the accumulated soils and salt layer effectively protect the liner from damaging effects of wind, uplift, UV and excessive wrinkling when the pond is empty. Additionally, the pond bottom can be tested for holes or damage with the soil accumulation in place.

5. Test the entire 40 mil HDPE lining in place using approved ASTM test methods ASTM D 7002 and/or ASTM D 7007. The testing must be completed by an approved and experienced Electrical Leak Location Survey (ELLS) contractor. The ELLS will locate all minor leak locations which can then be readily repaired prior to placing the pond back into service. An ELLS contractor such as Leak Location Services, Inc. (LLSI) out of San Antonio can be scheduled at any time. Their web site is llsi.com.

6. A hydrostatic or water balance seepage test with a full pond is not recommended due to inaccuracy of method and the fact that actual leak locations that may be present can not be determined.

7. Remove vegetation growth at the perimeter of the pond lining system without damaging the HDPE. Repair excessive erosion areas with infill soils and grading.

8. Once all required repairs are made to the existing 40 mil HDPE geomembrane and the lining system has been final inspected and tested by ELLS, I can provide professional certification that the lining system is fit for use for the Roan Creek Evaporation Pond.

If you have any questions on this report, give me a call at 303-679-0285 or email geosynthetics@msn.com.

Sincerely Yours,

R. K. Frobel

Ronald K. Frobel, MSCE, PE

RONALD K. FROBEL, MSCE, P.E.

CIVIL ENGINEERING
GEOSYNTHETICS
EXPERT WITNESS
FORENSICS

FIRM: R. K. FROBEL & ASSOCIATES
Consulting Civil / Geosynthetics Engineers

TITLE: Principal and Owner

PROFESSIONAL AFFILIATIONS:

American Society for Testing and Materials (ASTM) - Founding member of Committee D 35 on Geosynthetics
Chairman ASTM D35 Subcommittee on Geomembranes 1985-2000
ASTM Award of Merit Recipient/ASTM Fellow - 1992
ASTM D18 Soil and Rock - Special Service Award - 2000
Transportation Research Board (TRB) of The National Academies Appointed Member A2K07 Geosynthetics 2000 - 2003
National Society of Professional Engineers (NSPE) - Member
American Society of Civil Engineers (ASCE) - Member
Colorado Section - ASCE - Member
International Society of Soil Mechanics and Foundation Engineers (ISSMFE) - Member
International Geosynthetics Society (IGS) - Member
North American Geosynthetics Society (NAGS) - Member
International Standards Organization (ISO) - Member TC 221 Team Leader - USA Delegation Geosynthetics 1985 - 2001
European Committee for Standardization (CEN) - USA Observer
EPA Advisory Committee on Geosynthetics (Past Member)
Association of State Dam Safety Officials (ASDSO) – Member
U. S. Committee on Irrigation and Drainage (USCID) - Member
Technical Advisory Committee - Geosynthetics Magazine
Editorial Board - Geotextiles and Geomembranes Journal
Editorial Board - Geotechnical Testing Journal (ASTM)
Co-Chairman International Conference on Geomembranes
Co-Chairman ASTM Symposium on Impermeable Barriers
U.S. Naval Reserve Officer (Inactive)
Registered Professional Engineer – Civil (Colorado)
Mine Safety Health Administration (MSHA) Certified

ACADEMIC BACKGROUND:

University of Arizona: M.S. - Civil Engineering - 1975
University of Arizona: B. S. - Civil Engineering - 1969
Wentworth Institute of Technology: A.S. Architecture – 1966

PROFESSIONAL EXPERIENCE:

R. K. Frobel & Associates - Consulting Engineers
Evergreen, Colorado, Principal and Owner, 1988 - Present

Chemie Linz AG and Polyfelt Ges.m.b.H., Linz, Austria
U. S. Technical Manager Geosynthetics, 1985 - 1988

U.S. Bureau of Reclamation, Engineering and Research Center
Denver, Colorado, Technical Specialist in Construction Materials Research and Application, 1978 - 1985

Water Resources Research Center (WRRC), University of Arizona
Tucson, AZ, Associate Research Engineer, 1975 - 1978

Engineering Experiment Station, University of Arizona
Tucson, AZ, Research Assistant, 1974 - 1975

United States Navy, Commissioned Naval Officer, 1970 - 1973

REPRESENTATIVE EXPERIENCE:

R.K. Frobel & Associates: Civil engineering firm specializing in the fields of geotechnical, geoenvironmental and geosynthetics. Expertise is provided to full service civil/geotechnical engineering firms, federal agencies, municipalities or owners on a direct contract, joint venture or sub-consultant basis. Responsibilities are primarily devoted to specialized technical assistance in design and application for foreign and domestic projects such as the following: Forensics investigations into geotechnical and geosynthetics failures; providing expert report and testimony on failure analysis; providing design and peer review on landfill lining and cover system design, mine waste reclamation, water treatment facilities, hydro-technical canal, dam, reservoir and mining projects, floating reservoir covers; oil and gas waste containment; design of manufacturers technical literature and manuals; development and presentation of technical seminars; new product development and testing; MQA/CQA program design and implementation.

Polyfelt Ges.m.b.H., Linz, Austria and Denver Colorado: As U.S. technical manager, primary responsibilities included technical development for the Polyfelt line of geosynthetics for the U.S. civil engineering market as well as world wide applications.

U.S. Bureau of Reclamation, Denver, Colorado: As technical specialist, responsibilities included directing laboratory research, design and development investigations into geosynthetics and other construction materials for use on large western water projects such as dams, canals, power plants and other civil structures. Included were material research, selection and testing, specification writing, large scale pilot test programs, MQA/CQA program design and supervision of site installations. Prime author or contributor to several USBR technical publications incorporating geosynthetics.

University of Arizona, Tucson, Arizona: As research engineer at the Water Resources Research Center, responsibilities included research, design and development of engineering materials and methods for use in construction of major water projects including potable water reservoirs, canals and distribution systems. Prime author or contributor to several WRRC technical publications.

Northeast Utilities, Hartford, Connecticut: As field engineer for construction at Northeast Utilities, responsibilities included liason for many construction projects including additions to power plants, construction of substations, erection of fuel oil pipe lines and fuel oil storage tanks. Responsibilities also included detailed review, inspection and reporting on numerous construction projects.

U.S. Navy: Commissioned Naval Officer – Nuclear Program

PUBLICATIONS: Over 85 published articles, papers and books.

CONTACT DETAILS:

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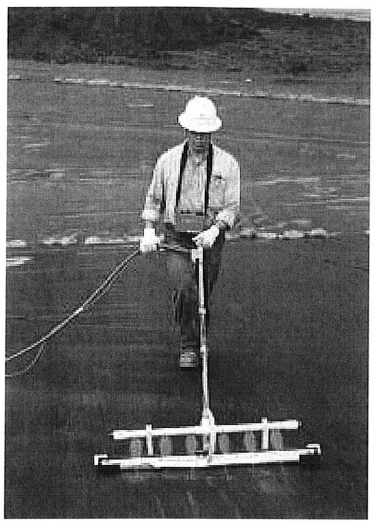
Ph 303-679-0285
M 720-289-0300
Email: geosynthetics@msn.com

Bare Liner Survey



To avoid the logistics of flooding the geomembrane with water, the exposed geomembrane can be tested for leaks using a water puddle test. This test is used on geomembranes that are in direct contact with the supporting sub-grade or a GCL. Procedures for this method are specified in ASTM standard D-7002.

The bare liner test is to detect electrical current flowing through a hole in the geomembrane liner using a small amount of water that is temporarily placed in contact with the liner using a squeegee. One output of an LLSI power supply is connected to earth ground or the GCL and the second output is connected to the scanning sensor through an LLSI electronic leak detection unit. When the water in the leak contacts earth ground or the GCL, a circuit is established and the electrical current will increase. The LLSI electronic leak detector unit converts the increase in the current to an audible tone indicating the presence of a leak.

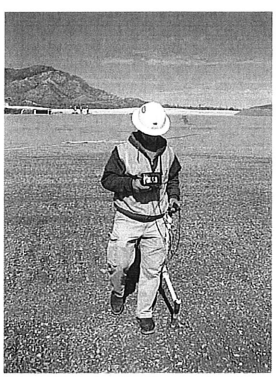
Water Surveys

Geomembrane leak location surveys of surface impoundments and tanks can be conducted with water covering the geomembrane. Surveys are conducted using a probe while wading or standing on the side slopes, or using a sensor that is towed across the impoundment. Procedures for this method are specified in ASTM standard D-7007

Wading Survey Mode

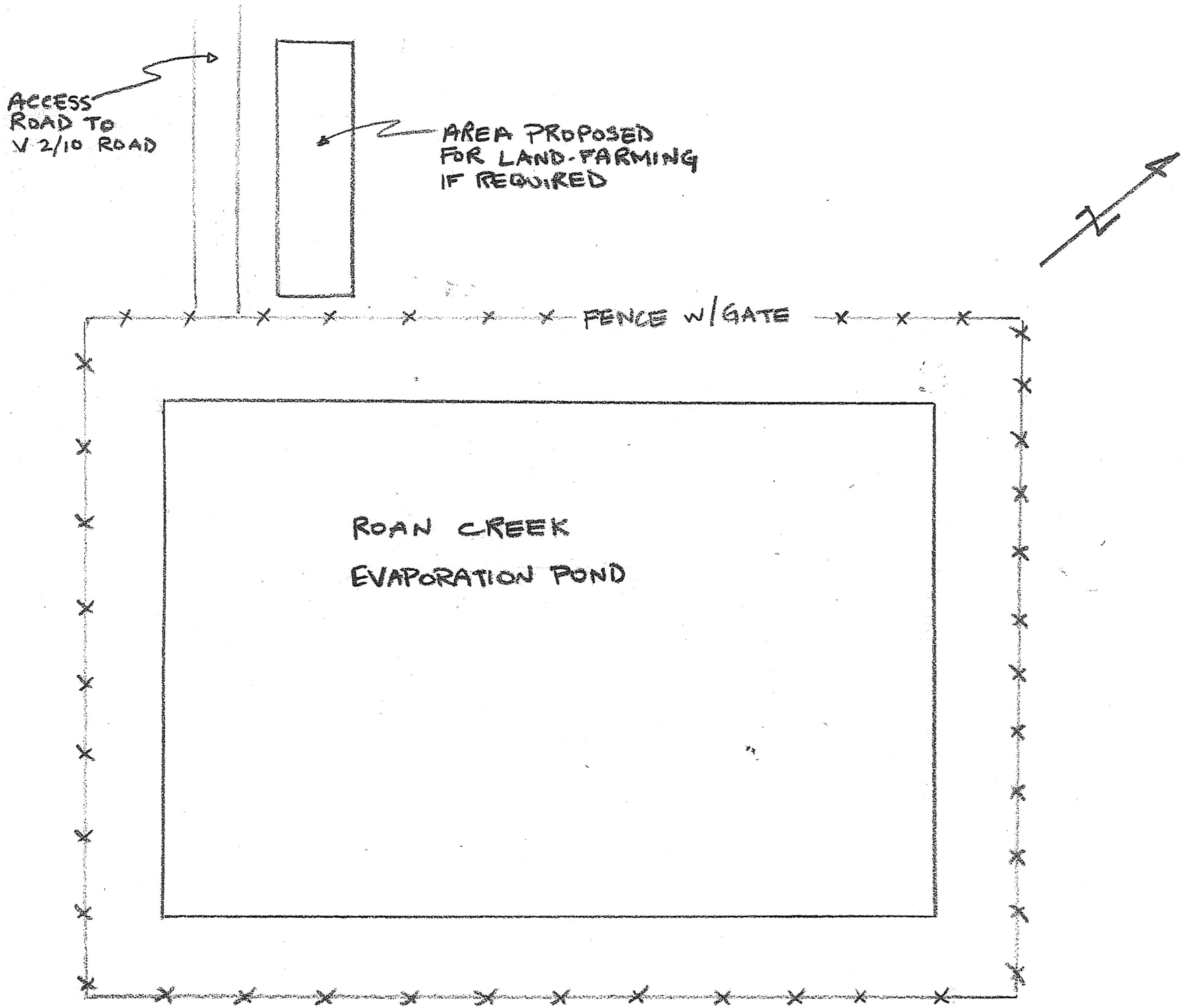
For the wading survey mode the survey personnel wade in the water and systematically scan the submerged liner to locate any leaks. For this method a water depth of between six and 30 inches (150 and 750 mm) is required. Temporary survey lanes are established across the bottom and are scanned with overlapping coverage. The liner field seams that can be located are double-checked. When detected, leaks are located to within one inch (25 mm) or less and immediately marked. The side slopes can be surveyed with deeper water using a long probe that is systematically scanned along the side slopes.

Soil Surveys



Damage caused by heavy machinery while installing earth materials on geomembranes is the most significant cause of damage to geomembranes. A geoelectric leak location survey of the soil-covered geomembrane of a newly constructed landfill is a very cost effective method for finding leaks that occur while placing a protective soil cover over the geomembrane liner. The method has a distinct advantage because the testing is done after the final construction and after the geomembrane liner has been subjected to construction and loading activity. Procedures for this method are specified in ASTM standard D-7007.

Surveys with soil on the liner are conducted by making point-by-point electrical measurements on the soil. The data is recorded in a portable data acquisition logger and then downloaded to a portable computer for processing and data analysis in the field.


ACCESS ROAD TO V 2/10 ROAD
AREA PROPOSED FOR LAND-FARMING IF REQUIRED
N
FENCE W/GATE
ROAN CREEK
EVAPORATION POND