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November 30, 2011

Gunnison Energy Corporation  
1801 Broadway, Suite 1200  
Denver, Colorado 80202  
Attn: Brad Robinson

Re: Hotchkiss Water Storage Facility

Dear Brad:

As requested by the Colorado Oil and Gas Conservation Commission, I have reviewed the liner inspection report prepared by our on-site Construction Manager, Tim Maher, and the supporting quality assurance and quality control documents for the upper water storage facility at Hotchkiss Ranch.

The report and supporting documentation indicate that both the primary and secondary liners were installed per our specifications by Simbeck and Associates and passed both the field and laboratory testing requirements which were analyzed by TRI/Environmental, Inc.

I accept the work on the upper storage facility's liners based on the documentation provided.

Please don't hesitate to call me with any questions or concerns.

Very truly yours,

Weston Solutions, Inc.

A handwritten signature in black ink, appearing to read "S. Stachnik, P.E.", written in a cursive style.

Simon Stachnik  
Project Engineer

cc: File



WESTON SOLUTIONS, INC.

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Hotchkiss Water Storage Facility  
Evacuation Contingency Plan

Prepared for  
Gunnison Energy Corporation

Prepared by  
Weston Solutions, Inc.  
1435 Garrison Street  
Lakewood, CO 80215

November 30, 2011

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# Evacuation Contingency Plan

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## **Hydrostatic Test Water Source**

A hydrostatic test will be performed on both pits at the Hotchkiss Water Storage Facility (HWSF) near Paonia, Colorado on the Hotchkiss Ranch lease. Currently, construction of 6-inch steel piping to connect the HWSF to an existing Gunnison Energy Corporation (GEC) produced water gathering system is underway. For the hydrostatic integrity test, water will be pumped into the pits through the new piping. The water to be used for the test will come predominately from an allocation from the West Branch of Muddy Creek. This water will be comingled with coal bed methane (CBM) produced water. The CBM water is free of hydrocarbons (it will meet drinking water standards) with a TDS ranging from 3,000 to 5,000 mg/L. Analytical data for the Muddy Creek water is unavailable so determining the TDS of the comingled water is not possible. The upper pit will be filled to an average depth of 8 feet, which will require 92,967 bbls of water. This plan outlines the contingencies for addressing a total failure of the liner system during testing.

For the hydrostatic test, filling the pit from the 6-inch steel pipe will take 8 to 10 days. Initially the leak detection sump will be evacuated of moisture that accumulated from precipitation during construction using the leak detection sump pump. This moisture will be pumped directly into the pit. During the filling process the leak detection sump will be closely monitored to insure there is not a significant leak. The leak detection sump pump will remain in place throughout the test. During filling, if water accumulates in the leak detection sump at a rate of over 500 bbl/day per Inset No. 10, Revised Form 28 Attachment L, Operating Plan and Sampling and Analysis Plan, filling will stop and evacuation of the pit will proceed. The Form 28 Attachment L is attached to this document.

## **Pit Evacuation**

If needed, evacuating the pit will be accomplished with a temporary self priming pump. This pump will be onsite throughout the test period. Water will be pumped back through the 6-inch steel pipe to an injection well facility directly west of the HWSF. The water will be injected at a rate of approximately 2,700 bbl/day.

If the rate of withdrawal needs to be increased, frac tanks will be mobilized to the injection well facility and water will be stored in them during the injection process.

# Evacuation Contingency Plan

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## **Hydrostatic Test Summary**

After filling the pit, the hydrostatic test will be conducted. Please see the Hydrostatic Testing Procedures provided by Fox Engineering. Generally, the water surface area will be determined by survey as well as the water surface elevation. An evaporation pan and rain gauge will be set up to monitor precipitation inputs and evaporative outputs. As in filling the pit, the leak detection sump will be monitored for seepage through the primary liner. The same rate of 500 bbl/day will be used to determine if pit evacuation is necessary. The method of evacuation will be the same as that described above.

# Evacuation Contingency Plan

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## Hydrostatic Testing Procedures

Prepared by

Fox Engineering Solutions, Inc.  
670 Canyon Creek Drive  
Grand Junction, CO 81507

# Hydrostatic Testing Procedures for COGCC Earthen Pits

Version 5.0



The purpose for hydrostatic testing earthen pits is to comply with COGCC approval conditions for verifying the fluid holding integrity of the pit lining system. These procedures are specific to existing or active earthen pits holding oil and gas related fluids including, but not limited to, produced water. During testing, the pit shall have fluid level as high as practical, without encroaching into the 2 ft. freeboard, and the test shall be conducted for a minimum of 72 hours, if practical. Visible portions of the liner, including the anchor trench and seams, shall be inspected for defects. The test shall be scheduled and coordinated with personnel to ensure that oil and gas activities do not interfere with the test. Testing procedures may be subject to changes as dictated by field and climatic factors. All personnel involved with testing, while onsite, shall comply with their respective EH&S requirements.

- If practical, a sign shall be placed in a conspicuous location during the test stating "Hydrostatic Testing in Progress, Pit Closed to All Water Hauling Activities". Contact information shall also be placed on the sign.
- A semi-permanent datum elevation point shall be established at the pit location. The surface area of the water surface and the surface area of the liner area, tributary to the pit shall be measured. The date and time of each measurement shall be documented.
- The pit fluid level; fluid surface area; and the lined surface area, tributary to the pit, shall be measured and recorded at the beginning of the test. The pit fluid level shall be measured again at the end of the test. A survey grade total station shall be utilized for accuracy to capture this information. The date and time of measurements shall be documented.
- A 4" diameter official rain gauge with funnel inlet shall be installed at the pit site. Precipitation shall be recorded for the duration of the hydrostatic test.
- Pan Evaporation shall be measured during the duration of the test following the procedures established by the National Weather Service – NOAA in the document entitled "National Weather Service - Observing Handbook No. 2, dated July 1989. A Class A evaporation pan shall be placed at the site, or as near as practical, with evaporation measured per established procedures.
- **For the duration of the test, all inflows and outflows, such as truck and piped transfers, shall cease. If the cessation of inflows and outflows is not practical, all pit inflows and outflows shall be accurately metered and documented during the test. 24-hour surveillance monitoring may be warranted.**
- If no precipitation has occurred during the test, compare the change in the pit fluid level with the recorded pan evaporation.
- If precipitation has occurred during the test, precipitation falling onto tributary portions of the liner, outside of the fluid surface area, must be added as an inflow to the pit and converted into inches of depth over the fluid surface area.
- The calculated change in pit level during the test is:  $\Delta S = P + I - O - E$  (all measurements converted to inches)

Where:  $\Delta S$  = Change in pit storage

P = Precipitation Inflow

I = Measured Inflows

O = Measured Outflows

E = Evaporation

- The measured change in the pit fluid level shall be compared to the calculated change, utilizing precipitation and evaporation data, in the pit fluid level during the test duration. The test procedures and results will be reviewed and analyzed for discrepancies. If the test results indicate integrity issues with the lining system, the test will be repeated.

# Evacuation Contingency Plan

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Revised Form 28  
Attachment L  
Operating Plan and Sampling Analysis Plan

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**INSERT NO. 10**

**REVISED FORM 28 ATTACHMENT L  
OPERATING PLAN  
AND  
SAMPLING AND ANALYSIS PLAN (APPENDIX B OF OPERATING PLAN)**

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## **Hotchkiss Water Storage Facility Operating Plan**

### **Overview**

The Hotchkiss Water Storage facility will be used to store produced water for hydraulic fracturing of both shale and coal production wells. The proposed facility is being designed to consist of two pits (Addendum No. 1, Sheet C101). One pit will be used to hold produced coalbed methane produced water and the second pit will be used to hold hydraulic fracturing (frac) flowback water. The proposed pits will hold approximate volumes of 307,000 barrels (bbls) and 137,000 bbls, respectively.

### **Operating Plan**

Details on all associated manifolds, piping, and instrumentation for the pits are presented on the engineering drawings. Operational characteristics and features are best identified on the Process and Instrumentation Diagram (P&ID) presented in the engineering drawings. Following standard engineering practices, at construction completion a fully comprehensive Operations and Maintenance (O&M) plan will be developed for the facility and will include details on the SCADA system that will be used to control and operate the facility. The SCADA system will contain display monitors to show real-time operational settings and allow for user control of system components.

Spill control measures for truck loading/unloading is described in the SPCC plan (Appendix C).

Updates to the plan will be provided to the COGCC with a Form 4, Sundry Notice.

### **Water Source, Treatment and Flow Rates**

There will be two sources of water stored in the pits. The first will be the produced water from coalbed methane production wells. GEC currently produces between 2000-2500 bwpd of coalbed methane production water. Currently this water is stored at a GEC disposal well, 1289-No. 18-22D location prior to being injected to the subsurface. Due to the large volumes of water necessary to frac the shale production wells, this production water will be diverted to the storage pits. The water will not be treated until it is ready to be utilized in a frac, at which time it will be filtered to remove any solids which may have accumulated in the pit. The only treatment needed will be the application of biocide in the summer months to prevent algae blooms.

The second source of water in the storage pits will be flow back water from hydraulic fracturing of wells. After the fracturing procedure of a shale well is complete, the wells will flow back at rates between 500-4000 barrels of water per day (bwpd) for some brief period of time. This water will be pumped in our existing water pipelines to the water storage facility. This water will be treated in the same way as the produced coal water.

Currently, GEC operates both water and gas pipelines to every producing well in the field. These same water lines will be used to move water both from existing producing wells and to new wells when being drilled.

Details on all associated manifolds, piping, and instrumentation for the pits are presented on the engineering drawings. Operational characteristics and features are best identified on the Process and Instrumentation Diagram (P&ID) presented in the engineering drawings. Following standard engineering practices, at construction completion a fully comprehensive Operations and Maintenance (O&M) plan will be developed for the facility and will include details on the SCADA system that will be used to control and operate the facility. The SCADA system will contain display monitors to show real-time operational settings and allow for user control of system components.

#### Stormwater Controls

Stormwater runoff at the subject site flows in a west-southwest direction to West Muddy Creek. The Facility location is graded to divert onsite runoff away from the pits wherever possible. Armored surface water diversion channels will intercept runoff stormwater and divert it around and away from the pits into sedimentation ponds prior to discharging to stormwater culverts under the access road to the south of the site.

Following stormwater flow transmissions through the diversion channels and connecting sedimentation ponds, the stormwater will outlet from the sedimentation ponds to culverts under the access roads to the south of the site. The culvert outfalls contain energy dissipation devices (rip-rap blankets) to prevent surface degradation caused by stormwater flows.

Where stormwater diversion channels intersect the proposed facility access roads within the fenced perimeter, culverts installed under the roadways will transmit flows under the roads. The access roads are graded at slopes to direct surface water flows across the road into the surrounding diversion channels.

All cut and fill slopes and soil stockpiles, including the excess cut material stockpile to the southeast of the site, will be potholed, tracked or furrowed for better seed and moisture retention to promote the establishment of desirable vegetation for erosion control and long-term soil stabilization. The well-drained, permeable soils, adequate vegetative buffer, and sedimentation ponds would prevent any remaining sediment from reaching West Muddy Creek. The excess cut material stockpile to the southeast of the site will have temporary fencing installed to prevent unauthorized entry until adequate vegetative cover has been established and maintained.

An addendum (Site Specific Stormwater Management Plan) to the existing master GEC Stormwater Management Plan further describing permanent erosion and sedimentation measures and a copy of the Colorado Discharge Permit System (CDPS) correspondence and certifications for the facility is provided in as Appendix A.

#### Dust and Moisture Control

During normal facility operations, dust control will not be needed except in the rare event that water has to be trucked to the storage facility. In that event, a water truck will be utilized to assist in dust suppression on the haul roads. Existing water pipelines will normally be used to transport the water where needed.

During facility construction, a soil stockpile location is for cut material excavated has been proposed. It is not anticipated that construction activities will create conditions requiring for dust control measures to be implemented; however, should conditions be present that would require dust control measures, a water

truck will be utilized to assist in dust suppression. Following construction of the facility, the stockpile will be permanently seeded and maintained for use in final reclamation. Following establishment of vegetation on the soil stockpile, the potential for dust will be miniscule and dust control measures are not anticipated to be necessary. Normal facility maintenance operations will monitor for any deteriorating vegetation which may expose stockpiled soils and potentially create dust due to exposed areas.

### Sampling

For this facility, any pit water that leaks from the primary liner and collects in the sump will be sampled from the leak detection system within the liner system. Confirmation of leaks in the primary liner system will be reported to COGCC immediately. Monthly samples will be collected from the storage pits and will be analyzed for the complete list of waste profile constituents as provided in the Sampling and Analysis Plan (Appendix B). Operationally, daily leakage volumes are anticipated to be around 50 Barrells in each of the upper and lower storage facilities. Calculations are provided in Appendix K which show predicted rates based on published literature (Peggs 2008) as well as the theoretical leakage rates used to size the sump pumps. After QC/QA steps are taken to ensure the quality of construction and after a period of normal operations and evaluation, these action leakage rates may be adjusted through cooperation with Gunnison County and COGCC.

Action Leakage Rates thru the primary liner for the two storage facilities are as follows:

0-4 Barrells/day	Monitor Daily Volume and run sump pump
5-19 Barrells/day	File COGCC Form 19 and run sump pump
20-499 Barrells/day	File COGCC Form 19, Notify COGCC Director within 24 hours, Notify Gunnison County, Notify Land Owner (Rule 906). Run sump pump, continue operations, begin investigation per COGCC regulations.
500+ Barrells/day	File COGCC Form 19, Notify COGCC Director within 24 hours, Notify Gunnison County, Notify Land Owner (Rule 906). Run sump pump, cease operations, begin investigation per COGCC regulations.

In addition to the storage pit sample collection, monitoring programs for site specific shallow groundwater, shallow groundwater within 1-mile of the site, and surface water in the surrounding area will be implemented to monitor for potential impacts associated with the facility. Prior to facility operation, four site-specific monitoring wells will be installed. These four wells, along with monitoring well 1289 #20-12 and the Hotchkiss Stock Pond, will comprise the site specific shallow groundwater monitoring network. Measurement of water levels and collection of samples from the site specific monitoring network will be conducted on a quarterly basis, barring special circumstances that warrant additional sampling (e.g., known leak in the primary liner), to monitor for potential impacts, if any, associated with the facility. Groundwater samples collected from the site specific monitoring well network will initially be analyzed for the parameters listed in 908.b.(9).A; however, after the initial two to four quarters of sampling, the site specific monitoring well network samples will be analyzed solely for parameters listed in COGCC Table 910-1.

According to Colorado Oil and Gas Information System (COGIS) Well database and the Department of Natural Resources Oil and Gas Well Locations database, permits have been issued for 19 wells located within a 1-mile radius of the site; however, of the 19 well permits issued, well constructions have only been verified for 10 wells. Prior to facility operation, verification of all well constructions will be completed. All verified wells within the 1-mile radius will be included in the shallow groundwater monitoring program for the facility. The shallow groundwater monitoring network will be sampled annually to monitor for potential impacts, if any, associated with the facility.

A monitoring network of five surface water stations placed in locations up-gradient and down-gradient of the facility along East Muddy Creek, West Muddy Creek, and Muddy Creek, along with the Hotchkiss Stock Pond located adjacent to the site, will be sampled annually to monitor for potential impacts, if any, associated with the facility.

Any exceedance of these allowable will be immediately reported to the COGCC and any deficiency noted. Details of each monitoring program, including sampling frequency and constituent lists, are presented in the Sampling and Analysis Plan (Appendix B).

#### Inspection and Maintenance

As part of the inspection, operation and maintenance of the facility (O&M), some of the tasks (but not limited to) GEC will perform on a routine basis (specific timing and frequency of conducting O&M tasks will be determined after construction of the facility) are provided below:

- GEC operators will be at the pits on a daily basis and will do basic pit inspection.
- GEC will provide operators with an inspection check list to be conducted once per week.
- GEC operators will ensure all facility monitoring systems are operating correctly and reporting critical information in real-time.
- GEC operators will be responsible for ensuring all equipment and system components are inspected and serviced per manufacturer's instruction.
- Maintenance will be done on the facility as recommended by the manufacturer of the liners and as needed based on weekly inspections.
- All reporting requirements will be imposed per the COGCC standard.

As previously mentioned the O&M manual that will be prepared for the site will be finalized pending construction of the facility and all systems are up and running. Included within the O&M manual will also be a training schedule for all personnel that will be involved in running the system. Training will be held periodically (schedule TBD) and will consist of utilizing component specifications and troubleshooting guidance to instruct all site personnel, both new and as a refresher.

#### Spills

A copy of GECs general Spill Prevention Control and Countermeasures plan is provided as Appendix C.

#### **Discovery, Response and Cleanup of Releases**

Inspections of the facility will be conducted as described above. In addition, employees are trained in the appropriate operation and maintenance of equipment and to look for, report and clean up releases. All

recovered materials are disposed of in accordance with all applicable federal, state and local laws and regulations as described under the response and reporting section.

### **Notification Contacts**

The list of individuals and organizations to contact should a release occur is provided Appendix D.

### **Notification Forms**

Appendix E contains the appropriate forms which must be completed when reporting a spill. These forms will help the operator with the procedures which must be followed and the information which must be furnished.

### **Response Plan**

Generally, each GEC employee and contractor is responsible for taking any immediate steps necessary to respond to a spill or release noted during a site visit. If a spill is discovered, the employee/contractor is instructed to isolate or shutdown the source of the release, either by closing valves to the affected pit, tank or other production vessel, or taking other actions deemed appropriate. After the source of the spill has been abated, the employee/contractor will contact the Response Coordinator to report the event. The contact list included in Appendix C provides the names of the primary and secondary personnel accountable for oil spill prevention and facility response. The contact list also includes important agency numbers.

In general, recovered fluids are either returned to the production pit for eventual reuse or recovered using a vacuum truck and transported offsite for disposal at a permitted commercial disposal facility. Hydrocarbon impacted soil is placed in a lined containment area then transported for disposal off-site or allowed to dry and tested to confirm no residual hydrocarbon contamination of concern. Upon receipt of acceptable analytical results, the soil is used onsite.

### ***Spill Reporting***

As described in above, the Response Coordinator will be notified in the event of a release. Notification forms are provided in Appendix E. These forms are designed to assist in providing information in the event of a discharge/release/spill. The forms will document the event, identify information that needs to be obtained, and list site specific information. Depending on the size and site conditions of the spill, the Response Coordinator may have to report the release to various state and federal regulatory agencies. The contact information is contained in Appendix D. The following paragraphs summarize the notification requirements for various regulatory programs.

The reporting requirements for spills from COGCC-regulated facilities are:

1. Spills/releases of E&P waste or produced fluid exceeding five (5) barrels, including those contained within lined or unlined berms, shall be reported on COGCC Spill/Release Report, Form 19. See Appendix E.
2. Spills/releases which exceed twenty (20) barrels of an E&P waste shall be reported on COGCC Spill/Release Report, Form 19, and shall also be verbally reported to the Director as soon as practicable, but not more than twenty-four (24) hours after discovery.

3. Spills/releases of any size which impact or threaten to impact any waters of the state, residence or occupied structure, livestock, or public byway shall be reported on COGCC Spill/Release Report, Form 19, and shall also be verbally reported to the Director as soon as practicable, but not more than twenty-four (24) hours, after discovery.
4. Spills/releases of any size which impact or threaten to impact any surface water supply area shall be reported to the COGCC Director and to the Environmental Release/Incident Report Hotline (1-877-518-5608). Spills and releases that impact or threaten a surface water intake shall be verbally reported to the emergency contact for that facility immediately after discovery.
5. For all reportable spills, operators shall submit a Spill/Release Report, Form 19, within ten (10) days after discovery. An 8.5 x 11 inch topographic map showing the governmental section and location of the spill shall be included. Such report shall also include information relating to initial mitigation, site investigation, and remediation. The Director may require additional information.
6. Chemical spills and releases shall be reported in accordance with applicable state and federal laws, including the Emergency Planning and Community Right-to-Know Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Oil Pollution Act, and the Clean Water Act, as applicable.

In addition to the spill reporting requirements listed above:

1. If the spill is less than 5 bbl and it does not threaten to impact a residence or occupied structure, livestock, public byway, or waters of the State of Colorado, it is not reportable to COGCC. However, it shall be controlled and contained immediately upon discovery and cleaned up as soon as practicable.

If a spill that threatens waters of the State occurs on land owned by Bureau of Land Management (BLM) or the Forest Service (USFS), it is reportable in quantities over 10 bbl. Similarly, if a spill threatens fish or wildlife, it must be reported to the U.S. Fish and Wildlife Service. See NTL 3-A Form in Appendix E.

#### Emergency Response

GEC maintains an existing Emergency Response Plan (ERP) for their operations. The current plan includes emergency response procedures and contacts, fire protection procedures, personal work rules and procedures, personal injury and first aid procedures, and maps for emergency response personnel. Also incorporated are the emergency contact numbers of Gunnison County, Delta County, Montrose County, the Colorado Oil and Gas Conservation Commission, Colorado Department of Public Health, the National Response Center and various private emergency response organizations. The existing ERP is provided as Appendix F.

#### Record-keeping

Record keeping will include weekly inspection logs, water analyses (groundwater and pit water) and records of throughput. All records will be made available to COGCC upon request.

#### Site Security

The water storage facility will be located in an area which is behind a security fence and locked gate. The gates at the facility are proposed as two 12 foot panels, spanning 24 feet, and will be 8 feet tall to match the surrounding site fence. The property entrance is a locked gate located on Highway 133. This gate is locked 24 hours per day with limited access. Additionally, a 8-foot high security chain link fence will also be constructed around the entire water management facility. No additional security needed.

#### Hours of Operation

Water may be flowing into and out of pits 24 hours per day, 7 days per week. The site will be manned as needed during normal operations as well as during completion operations.

During the winter shutdown, water levels at the facility during will be left at approximately 10% of capacity which will be adequate to contain greater than a 25-year annual precipitation event. Stage storage curves have been developed and can be used during winter months as an additional resource. The stage storage curves are provided as an Appendix G.

GEC maintains access to the facility, and surrounding facilities throughout the winter by means of snowmobiles, snowcats, dozers, etc. Therefore, the facility will never be inaccessible to GEC personnel.

#### Noise and Odor Mitigation

No odor anticipated, thus no odor mitigation should be needed. This site is located in a remote location therefore will likely qualify for the light industrial standard. However, low noise levels are anticipated. All pumps specified for installation will comply with all COGCC noise requirements stated in section 802 of the regulations. Any electric pumps will be powered by an electric genset. Genset will meet all COGCC noise abatement requirements.

#### Waste Management

Water no longer needed for operations will be pumped via pipeline to the Hotchkiss 1289 #18-22D wastewater disposal well located nearby. Should any additional disposal wells to be used, the well(s) will be submitted to the director for approval on a Form 4, Sundry Notice prior to use for disposal. The only other waste material would be used motor oil which will be disposed of by company which changes oil in all our gensets. Additionally, a leak detection system that monitors the space between the liners will be operating on a 24-hour basis, and will ensure that any water that is detected in the sump between the liners will be removed and pumped back into the pit or to the disposal well.

If additional disposal wells are used, they will be submitted for pre-approval by the director on a Form 4, Sundry Notice.

An operational flow chart for disposing of pit bottom sediments is included as Appendix H. Liner disposal, along with additional waste disposal during closure is addressed in the closure and reclamation plan provided as an Appendix I.

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**NOTE:** Following standard engineering practices, at construction completion a fully comprehensive Operations and Maintenance (O&M) plan will be developed for the facility. Updates to the plan as recorded will be provided to the COGCC with a Form 4, Sundry Notice.

**LINER INSPECTION REPORT**  
**FOR THE**  
**HOTCHKISS WATER STORAGE FACILITY**  
**GUNNISON COUNTY, COLORADO**

Prepared for:

**Gunnison Energy Corporation**  
1801 Broadway, Suite 1200  
Denver, Colorado 80202

Prepared by:

**Weston Solutions, Inc.**  
1435 Garrison St, Suite 100  
Lakewood, Colorado 80226

November 2011

## **Background:**

Gunnison Energy Corporation (GEC) contracted Weston Solutions, Inc. (Weston) to design a Central Exploration and Production Water Storage Facility on the Hotchkiss Ranch Property in Gunnison County, Colorado. The storage facility was designed with 2 holding pits. The upper pit was designed with a storage capacity of approximately 322, 154 barrels of produced water. The lower pit was designed with a storage capacity of approximately 140,538 barrels of produced water for a combined total of 462,692 barrels. The storage pits were to be lined with a layer of 16 ounce Geotextile fabric, a "Secondary" 60-mil high density polyethylene (HDPE) layer, a layer of 200-mil Geocomposite drainage material and an additional "Primary" 60-mil HDPE layer to contain the produced water.

## **Earthwork:**

The design of the pits was developed to use the existing grade of the site to extent practical. The amount of cut material was maximized to limit the amount of fill material required to facilitate the construction of the storage pits. Rundle Construction, Inc. was contracted as the General Contractor by GEC to perform the excavation and fill activities for the construction of the storage pits.

Construction activities at the site began in August of 2011. Weston provided Quality Control personnel to perform oversight of the construction beginning 17 September. Oversight was provided to insure that all pit grades and elevations were completed to the design specifications. Excavation and grading activities for the upper pit were completed on 25 October. The excavation and grading activities for the lower pit were completed on 18 November. General site activities are ongoing.

## **Liner Installation:**

Rundle Construction contracted Simbeck & Associates (Simbeck) to install the liner system in the storage pits. Simbeck provided documentation reflecting the required experience for the company, superintendent and seaming personnel of liner installation required by the specifications.

Liner installation activities for the geotextile fabric and "Secondary" liner in the upper pit began on 26 October. Simbeck performed air channel tests on all of their fused seams and vacuum tests on all extruded repair seams to verify that all of the seams were continuous and met the required specifications. Weston collected destructive seam tests from the "Secondary" liner per the specifications for testing by an independent laboratory to confirm the Simbeck field testing. "Secondary" liner installation was completed on 4 November.

Geocomposite and "Primary" liner installation began on 10 November. Simbeck performed air channel tests on all fused seams and vacuum tests on all extruded repair seams to verify that all were continuous and met the required specifications. Weston collected destructive seam tests from the "Primary" liner per the specifications for testing by an independent laboratory to confirm the Simbeck field testing. "Primary" liner installation is currently in progress and is scheduled to be completed on 30 November.

Geotextile fabric and "Secondary" liner installation in the lower pit is scheduled to begin on 1 December.

## Documentation:

1. HWSF Panel Placement Textile
  - This form documents date, time of placement, panel number, roll number from the manufacturer's label and panel length of the 16 ounce Geotextile fabric placed as the initial layer of the liner system.
2. HWSF Panel Placement HDPE
  - This form documents date, time of placement, panel number, roll number from the manufacturer's label and panel length of the 60-mil HDPE "Secondary" and "Primary" liner materials.
3. HWSF Trials Welds
  - This form documents all trial seam tests for extrusion and fusion welded seams prior to being used in the field. The date of the test, ambient temperature, time of the trial weld test, welder's initials, temperature that the welding equipment was running at, the rate of weld for the fusion welding machines, test values for the peel and shear tests and a determination of whether the test passed or failed are recorded on this form. A calibrated portable field tensiometer was used for all trial weld seam tests.
4. HWSF Wedge Air Test
  - This form documents all wedge air tests for the "fused" seams. The ends of the welds were sealed and air was introduced at a minimum pressure of 35 psi. The testing procedure dictates that the seam must not lose more than 2 psi in a 5 minute time span to pass. The panels connected to the seam, the date the panels were welded, time of the weld, the machine used for the weld, welder's initials, temperature and welding rate of the machine, the date the air test was conducted, start time of the test, pressure in the seam at the start of the test, end time of the test, pressure at the end of the test, initials of the Quality Control (QC) personnel performing the test and an indication of the test passing or failing are recorded on this form.
5. HWSF Repair report
  - This form documents where repairs to the "Secondary" and "Primary" liners were affected. The repair number, panels involved in the repair, location on the seam where the repair was made, size of the repair, the welder that made the repair, date of the repair, initials of the QC personnel performing the vacuum test, date of the vacuum test and an indication of the test passing or failing are recorded on this form.
6. HWSF Destructive Seam Log
  - As a part of the QC process for the liner installation, random destructive seam test samples were collected. The installation crew was not informed of where these samples were to be collected. This form documents the date the destructive seam sample was collected, the sample number, panels connected to the seam, location of the sample, the welding machine used to make the seam, the temperature and speed of the welding machine and the test values for the "peel" tests performed in the field.

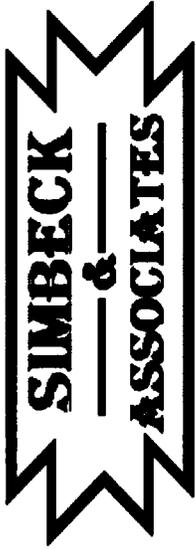
7. HWSF Independent Laboratory Test Results for Destructive Seam Testing

- The destructive seam samples that were collected were sent to an independent laboratory for testing in “peel” and “shear” to confirm that the field welds meet the required specifications. This is the data from the independent testing.

8. HWSF Shear and Peel Test Specifications

- This is a page from the specifications provided to the liner installer detailing the required “peel” and “shear” strengths for the fused and extruded seams of the liner.

## **1. HWSF Panel Placement Textile**



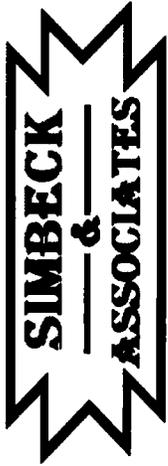
# Panel Placement Log

Date: 10/29/11 Page: 1

Job Name: Hotchkiss Water Storage Upper Pond Secondary Layer

Material Desc: 16 oz. Textile Job #: 2012

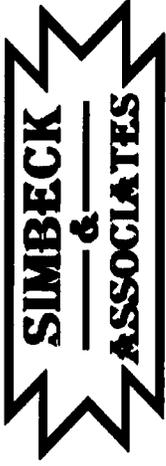
Date	Time	Panel # / Roll #	Panel Length	Panel Width	Panel Location / Comments
10/29/2011	10:15	#1/ 104	146		Fill Out Off as-Built
10/29/2011	10:30	#2/ 106	135		
10/29/2011	10:40	#3/ 105	84		
10/29/2011	10:45	#4/ 105	64		
10/29/2011	10:50	#5/ 107	26		
10/29/2011	10:55	#6/ 107	61		
10/29/2011	10:58	#7/ 107	63		
10/29/2011	10:58	#8/ 106	8		
10/29/2011	11:00	#9/ 109	55		
10/29/2011	11:01	#10/ 109	35		
10/29/2011	11:02	#11/ 109	32		
10/29/2011	11:04	#12/ 109	9		
10/29/2011	11:12	#13/ 86	147		
10/29/2011	11:20	#14/ 108	105		
10/29/2011	11:22	#15/ 108	61		



# Panel Placement Log

Date: 10/30/11 Page: 2  
 Job Name: Hotchkiss Water Storage Upper Pond Secondary Layer Job #: 2012  
 Material Desc: 16 oz. Textile

Date	Time	Panel # / Roll #	Panel Length	Panel Width	Panel Location / Comments
0/30/2011	11:27	#16/ 61	44		
0/30/2011	11:29	#17/ 61	105		
0/30/2011	11:30	#18/ 61	33		
0/30/2011	11:35	#19/ 123	72		
0/30/2011	11:37	#20/ 123	105		
0/30/2011	11:40	#21/ 123	12		
0/30/2011	11:43	#22/ 124	105		
0/30/2011	11:44	#23/ 124	64		
0/30/2011	11:48	#24/ 125	16		
0/30/2011	11:50	#25/ 125	72		
0/30/2011	11:52	#26/ 125	48		
0/30/2011	11:56	#27/ 87	32		
0/30/2011	12:00	#28/ 87	54		
0/30/2011	12:02	#29/ 87	51		
0/30/2011	12:08	#30/ 60	40		
0/30/2011	12:11	#31/ 60	31		
0/30/2011	12:14	#32/ 60	24		
0/30/2011	12:25	#33/ 122	126		



# Panel Placement Log

Date: 10/31/11 Page: 3  
 Job Name: Hotchkiss Water Storage Upper Pond Secondary Layer Job #: 2012  
 Material Desc: 16 oz. Textile

Date	Time	Panel # / Roll #	Panel Length	Panel Width	Panel Location / Comments
10/31/2011	8:50	#34/ 80	141		
10/31/2011	8:55	#35/82	142		
10/31/2011	9:00	#36/ 81	143		
10/31/2011	9:05	#37/ 157	144		
10/31/2011	9:10	#38/ 155	146		
10/31/2011	9:13	#39/ 154	147		
10/31/2011	9:15	#40/ 153	148		
10/31/2011	9:20	#41/ 83	128		
10/31/2011	9:22	#42/ 83	17		
10/31/2011	9:30	#43/ 84	110		
10/31/2011	9:33	#44/ 89	35		
10/31/2011	9:40	#45/ 85	92		
10/31/2011	9:42	#46/ 85	53		
10/31/2011	9:48	#47/ 156	75		
10/31/2011	9:50	#48/ 156	70		
10/31/2011	9:57	#49/ 88	53		
10/31/2011	10:00	#50/ 88	88		
10/31/2011	10:10	#51/ 152	39		
10/31/2011	10:14	#52/ 152	107		
10/31/2011	10:23	#53/ 57	20		



## **2. HWSF Panel Placement HDPE**



# Panel Placement Log

Date: 10/29/11 Page: 1

Job Name: Hotchkiss Water Storage Upper Pond Secondary Layer

Material Desc: 60 Mil HDPE Smooth

Job #: 2012

Date	Time	Panel # / Roll #	Panel Length	Panel Width	Panel Location / Comments
10/29/2011	1:45	#1/ #237508-11	274	22.5	
10/29/2011	1:50	#2/ #237508-11	81	22.5	
10/29/2011	2:00	#3/ #237508-11	81	22.5	
10/29/2011	2:05	#4/ #237508-11	74	22.5	
10/29/2011	2:15	#5/ #237511-11	60	22.5	
10/29/2011	2:21	#6/ #237511-11	33	22.5	
10/29/2011	2:38	#7/ #237511-11	47	22.5	
10/29/2011	2:50	#8/ #237511-11	81	22.5	
10/29/2011	2:54	#9/ #237511-11	81	22.5	
10/29/2011	2:58	#10/ #237511-11	81	22.5	
10/29/2011	3:01	#11/ #237511-11	81	22.5	
10/29/2011	3:12	#12/ #237624-11	81	22.5	
10/29/2011	3:21	#13/ #237624-11	62	22.5	
10/29/2011	3:25	#14/ #237624-11	72	22.5	
10/29/2011	3:33	#15/ #237624-11	43	22.5	
10/29/2011	3:51	#16/ #237624-11	29	22.5	
10/29/2011	3:55	#17/ #237624-11	10	22.5	













# Panel Placement Log

Date: 11/11/11 Page: 7  
 Job Name: Hotchkiss Water Storage Upper Pond Primary Layer Job #: 2012  
 Material Desc: 60 Mil HDPE Smooth

Date	Time	Panel # / Roll #	Panel Length	Panel Width	Panel Location / Comments
11-Nov	12:15	#1 / 237364-11	284	22.5	Begin Primary Liner
11-Nov	12:35	#2 / 237364-11	86'	22.5	
11-Nov	12:38	#3 / 237364-11	86'	22.5	
11-Nov	12:40	#4 / 237364-11	61'	22.5	
11-Nov	12:53	#5 / 237509-11	80'	22.5	
11-Nov	12:56	#6 / 237509-11	56'	22.5	
11-Nov	1:00	#7 / 237509-11	25'	22.5	
11-Nov	1:08	#8 / 237506-11	85'	22.5	
11-Nov	1:15	#9 / 237506-11	84'	22.5	
11-Nov	1:18	#10 / 237506-11	82'	22.5	
11-Nov	1:30	#11 / 237513-11	81'	22.5	
11-Nov	2:06	#12 / 237513-11	81'	22.5	
11-Nov	2:10	#13 / 237506-11	76'	22.5	
11-Nov	2:16	#14 / 237513-11	43'	22.5	
11-Nov	2:30	#15 / 237513-11	66'	22.5	
11-Nov	2:40	#16 / 237513-11	37'	22.5	
11-Nov	2:45	#17 / 237513-11	24'	22.5	



### **3. HWSF Trial Welds**

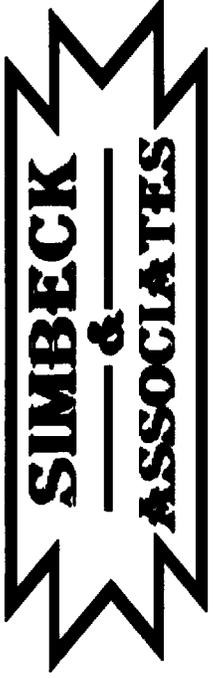








## **4. HSWF Wedge Air Tests**



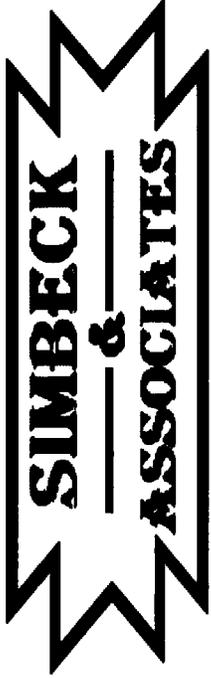
# Wedge & Air Test Form

Date: 10/29/11 Page: 1

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth QC/QA Monitor: DFO

Wedge Information						Air Channel Pressure Test Information				
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results
13-16	29-Oct	9:10	XL-1	NJ	750	10	29-Oct	41 - 4:32	40 - 4:37	P
14-15	29-Oct	4:01	XL-1	NJ	750	10		42 - 4:58	42 - 5:03	P
-2-3-8-9-10-11-12-14	29-Oct	5:03	XL-1	NJ	750	10	30-Oct	39 - 1:39	37-1:43	P
								38 - 1:37	37-1:42	P
								36 - 1:48	34-1:53	P
								36 - 2:00	34-2:05	P
12-13-14-15-16	29-Oct	4:47	XL-1	NJ	750	10	29-Oct	40- 4:30	38- 4:35	P



# Wedge & Air Test Form

Date: 10/30/11 Page: 2

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth QC/QA Monitor: DFO

Wedge Information						Air Channel Pressure Test Information				
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results
18-19	30-Oct	12:47	XL-2	DW	750	12'	30-Oct	32- 12:52	30- 12:58	P
1, 18-19	30-Oct	1:05	XL-1	NJ	750	12'	30-Oct	45 - 4:47 44 - 5:00	44 - 4:52 42 - 5:05	P P
21, 22	30-Oct	2:08	XL1	NJ	750	12'	30-Oct	42- 2:15	41- 2:20	P
18 19 20	30-Oct	1:40	XL-1	NJ	750	12'	31-Oct	35 - 9:25 40 - 9:09	34 - 9:30 38 - 9:14	P P
20, 21-22	30-Oct	2:21	XL-1	NJ	750	12'	30-Oct	42 - 5:10	40 - 5:15	P
21, 22 ,23	30-Oct	2:48	XL-1	NJ	750	12'	30-Oct	47 - 5:12	46 - 5:17	P
25,24	30-Oct	3:17	XL1	NJ	750	12'	30-Oct	33- 3:33	35- 3:38	P
23,24,25	30-Oct	3:25	XL-1	NJ	750	12'	31-Oct	35- 9:15	34- 9:20	P
24,25,26	30-Oct	3:52	XL-1	NJ	750	12'	30-Oct	45- 5:24	44- 5:29	P



# Wedge & Air Test Form

Date: 10/31/11 Page: 3

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth QC/QA Monitor: DFO

Wedge Information						Air Channel Pressure Test Information				
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results
27, 28	31-Oct	1:03	XL1	NJ	750	12'	31-Oct	35 - 1:10	35 - 1:15	P
26,27,28	31-Oct	1:17	XL1	NJ	750	12'	31-Oct	35 - 2:28	34 - 2:33	P
27,28,29	31-Oct	1:35	WW2	BC	750	11.5	31-Oct	37 - 2:33 35 - 2:34	36 - 2:42 35 - 2:39	P
31,30	31-Oct	2:00	XL1	NJ	750	12'	31-Oct	32 - 2:10	32 - 2:15	P
29, 30, 31	31-Oct	2:13	XL1	NJ	750	12'	31-Oct	40 - 3:00	40 - 3:05	P
30,31,32	31-Oct	2:15	WW2	BC	750	11.5'	31-Oct	35 - 3:03	34 - 3:08	P
32, 33	31-Oct	2:57	XL1	NJ	750	12'	31-Oct	31 - 3:33	29 - 3:38	P



# Wedge & Air Test Form

Date: 11/1/11

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth

QC/QA Monitor: DFO

Wedge Information										Air Channel Pressure Test Information			
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results			
34, 35	1-Nov	10:50	WW2	BC	750	11'	1-Nov	35 - 11:05	35 - 11:10	P			
33,34,35	1-Nov	11:05	WW2	BC	750	11'	1-Nov	40- 11:40	40- 11:45	P			
34,35,36	1-Nov	11:45	WW2	BC	750	11'	1-Nov	40- 12:50	40- 12:55	P			
36,37,38	1-Nov	1:05	WW2	BC	750	11'	1-Nov	25- 1:44	34- 1:50	P			
37, 38	1-Nov	1:25	XL1	NJ	750	12'	1-Nov	35 - 2;12	35 - 2;17	P			
39,40,41	1-Nov	1:50	WW2	BC	750	11'	1-Nov	30 - 2:45	29 - 2:50	P			
40 , 41	1-Nov	1:42	WW2	BC	750	11'	1-Nov	35 - 1:50	35 - 1:55	P			
38, 39	1-Nov	1:03	XL1	NJ	750	12'	1-Nov	32 - 1:08	32 - 1: 13	P			



# Wedge & Air Test Form

Date: 11/3/11

Page: 5

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth

QC/QA Monitor: DFO

Wedge Information										Air Channel Pressure Test Information			
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results			
51,52	3-Nov	2:40	XL1	NJ	750	12'	3-Nov	32 - 2:50	32 - 2:55	P			
46, 51	3-Nov	2:30	XL1	NJ	750	12'	3-Nov	36 - 2:43	36 - 2:48	P			
43,42	3-Nov	3:01	XL1	NJ	750	12'	3-Nov	35 - 3:25	35 - 3:30	P			
46, 47	3-Nov	1:50	XL1	NJ	750	12'	3-Nov	40 - 2:07	39 - 2:12	P			
43, 44	3-Nov	1:35	XL1	NJ	750	12'	3-Nov	38 - 2:50	38 - 2:55	P			
47, 49	3-Nov	2:07	XL1	NJ	750	12'	3-Nov	35 - 2:07	35 - 2:12	P			
44,45	3-Nov	2:07	WW2	BC	750	11'	3-Nov	35 - 2:50	35 - 2:55	P			
49, 50	3-Nov	2:22	XL1	NJ	750	12'	3-Nov	35 - 2:35	35 - 2:40	P			
45,48	3-Nov	1:56	WW2	BC	750	11	3-Nov	35 - 2:00	35 - 2:05	P			
43,44,45,48,49,50,47 (NE CORNER)	3-Nov	2:55	WW2	BC	750	11	3-Nov	30 - 3:12	29 - 3:17	P			



# Wedge & Air Test Form

Date: 11/4/11

Page: 6

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth

QC/QA Monitor: DFO

Wedge Information						Air Channel Pressure Test Information				
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results
52,54	4-Nov	9:58	XL1	NJ	750	12	4-Nov	36 - 10:35	35 - 10:40	P
54,59	4-Nov	10:12	XL1	NJ	750	12	4-Nov	37 - 10:37	36 - 10:42	P
59, 60	4-Nov	10:25	XL1	NJ	750	12	4-Nov	30 - 10:47	30 - 10:52	P
60,56	4-Nov	10:30	XL1	NJ	750	12	4-Nov	38 - 10:53	37 - 10:58	P
57,58	4-Nov	10:47	XL1	NJ	750	12	4-Nov	34 - 11:05	32 - 11:10	P
55,57	4-Nov	10:39	XL1	NJ	750	12	4-Nov	32 - 11:07	32 - 11:12	P
53,54	4-Nov	11:11	XL1	NJ	750	12	4-Nov	37 - 1:00	35 - 1:05	p
53,59								34 - 12:50	34 - 12:58	p
53,60	4-Nov	11:11	XL1	NJ	750	12	4-Nov	40 - 1:12	38 - 1:17	P
53,56								40 - 1:13	38 - 1:18	P
53,58	4-Nov	11:40	XL1	NJ	740	12	4-Nov	35 - 1:35	35 - 1:40	P
								40 - 1:42	38 - 1:47	P
								38 - 1:44	36 - 1:49	P

Comment: Secondary Liner Complete



# Wedge & Air Test Form

Date: 11/11/11 Page: 7  
 Job Name: Hotchkiss Water Storage Upper Pond, Primary Layer  
 Material Description: 60 Mil HDPE Smooth QC/QA Monitor: DFO

		Wedge Information					Air Channel Pressure Test Information				
Panel #	Date	Time	WW	Welder	Temp	Speed	Date	Start - Time	End - Time	Results	
5,6	11-Nov	1:13	XL1	NJ	750	12	11-Nov	47 - 1:57	45 - 2:02	P	
6,7	11-Nov	1:23	XL1	NJ	750	12	11-Nov	52 - 1:50	52 - 1:55	P	
4, 17	11-Nov	2:55	XL1	NJ	750	12	11-Nov	42 - 3:10	42 - 3:16	P	
3,4	11-Nov	1:37	XL1	NJ	750	12	11-Nov	39 - 2:09	38 - 2:14	P	
2,3	11-Nov	1:01	XL1	NJ	750	12	11-Nov	40 - 2:08	38 - 2:13	P	
2,8	11-Nov	1:40	XL1	NJ	750	12	11-Nov	36 - 1:30	36 - 1:35	P	
8,9	11-Nov	1:50	XL1	NJ	750	12	11-Nov	35 - 2:45	35 - 2:50	P	
9,10	11-Nov	2:00	XL1	NJ	750	12	11-Nov	45 - 2:46	45 - 2:51	P	
17,4	11-Nov	2:55	XL1	NJ	750	12	11-Nov	35 - 2:48	34 - 2:53	P	
10,11	11-Nov	2:11	XL1	NJ	750	12	11-Nov	42 - 3:10	42 - 3:16	P	
3,5,4,6,7,17 SW CORNER	11-Nov	3:25	XL1	NJ	750	12	11-Nov	36 - 3:38	36 - 3:43	P	
11, 12	11-Nov	2:21	XL1	NJ	750	12	11-Nov	45 - 3:54	44 - 3:59	P	
12, 13	11-Nov	2:20	#2	BC	750	10	11-Nov	36 - 3:36	35 - 3:41	P	
13,14	11-Nov	2:35	#2	BC	750	10	11-Nov	34 - 3:26	33 - 3:31	P	
15,16	11-Nov	2:45	XL1	NJ	750	12	11-Nov	34 - 3:16	34 - 3:21	P	
15,16,14,13 NW CORNER	11-Nov	3:45	#2	BC	750	10	11-Nov	41 - 3:20	40 - 3:25	P	
TIE IN	11-Nov	4:00	#2	BC	750	10	12-Nov	36 - 9:08	35 - 9:14	P	
							12-Nov	35 - 9:15	35 - 9:20	P	
							12-Nov	35 - 8:55	35 - 9:01	P	
							12-Nov	40 - 8:50	39 - 8:55	P	
							12-Nov	36 - 8:40	36 - 8:35	P	
							12-Nov	35 - 8:30	35 - 8:35	P	



# Wedge & Air Test Form

Date: 11/16/11 Page: 8  
 Job Name: Hotchkiss Water Storage Upper Pond, Primary Layer  
 Material Description: 60 Mil HDPE Smooth QC/QA Monitor: DFO

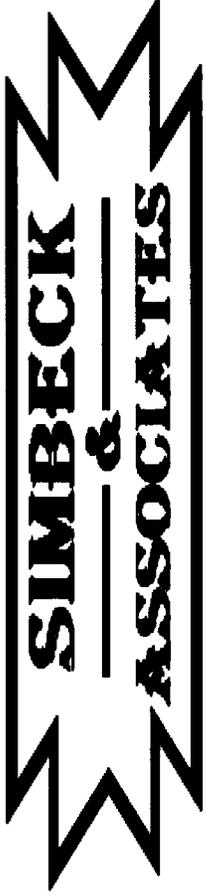
Wedge Information				Air Channel Pressure Test Information					
Panel #	Date	Time	Welder	Temp	Speed	Date	Start - Time	End - Time	Results
24,26,25	16-Nov	2:25	BC	850	18	17-Nov	38 - 9:30	37 - 9:35	P
							45 - 9:29	45 - 9:34	P
26,27,25	16-Nov	2:39	NJ	750	12	17-Nov	36 - 9:35	35 - 9:40	P
18,19	16-Nov	10:52	BC	850	21	16-Nov	36-1:40	36-1:45	P
1,18,19	16-Nov	11:15	BC	850	18	16-Nov	52 - 4:25	53 - 4:32	P
							32 - 4:25	32 - 4:25	P
							44 - 4:18	44 - 4:23	P
21,22	16-Nov	11:50	NJ	750	12	16-Nov	41 - 11:57	40 - 12:02	P
25,26	16-Nov	2:20	BC	850	20	16-Nov	35 - 2:20	35 - 2:25	P
28,29	16-Nov	3:00	BC	850	18	16-Nov	41 - 3:10	40 - 3:15	P
28,29,30	16-Nov	3:20	BC	850	18	17-Nov	36 - 9:55	36 - 10:00	P
							40 - 9:48	40 - 9:53	P
27,28,29	16-Nov	3:08	NJ	750	12	17-Nov	35 - 9:55	35 - 10:00	P
							35 - 9:45	35 - 9:50	P
24,23	16-Nov	1:57	NJ	750	12	17-Nov	38 - 9:15	38 - 9:20	P
							40 - 9:15	37 - 9:20	P
21,22,20	16-Nov	12:15	BC	850	18	17-Nov	40 - 9:10	40 - 9:15	P
							37 - 9:10	35 - 9:15	P
20,21,22	16-Nov	12:01	NJ	750	12	17-Nov	40 - 9:22	40 - 9:28	P
18,19,20	16-Nov		BC	850	18	16-Nov	38 - 3:55	36 - 4:00	P
							42 - 3:56	42 - 4:01	P
							52 - 4:00	52 - 4:05	P

## **5. HWSF Repair Report**









# Repair Report

Date: 11/4/11 Page: 4

Job Name: Hotchkiss Water Storage Upper Pond, Secondary Layer

Material Description: 60 Mil HDPE Smooth

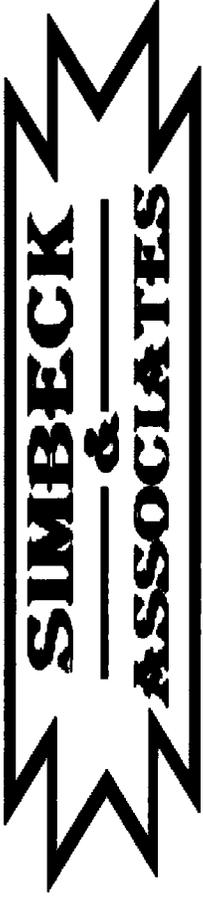
QC/QA Monitor: DFO

Repair #	Panels/ Location	Dimension	Welder	Date	Vacuum Testing	
					QC	P / F
26	42,43 63' N AT	2'X10'	DW	4-Nov	DFO	P
27	42,43 83' N AT	2'X10'	DW	4-Nov	DFO	P
28	53,56,60 26' E AT	2'X3'	BC	4-Nov	DFO	P
29	59,60,53 55' E AT	2'X3'	BC	4-Nov	DFO	P
30	53,55,57 72' E AT	2'X3'	BC	4-Nov	DFO	P
31	52,53,54 96' E AT	2'X2'	BC	4-Nov	DFO	P
32	58,57,53 23' S AT	2'X3'	BC	4-Nov	DFO	P
33	53, 55,57 60' S AT	18"X2'	BC	4-Nov	DFO	P
34	53,52 86' S AT	2'X2'	BC	4-Nov	DFO	P
35	PANEL 53 - 10' E OF R-34	2'X2'	BC	4-Nov	DFO	P
36	55,42 79' S AT	1'X1'	BC	4-Nov	DFO	P
37	P 42, 10' W R-36	1'X1'	BC	4-Nov	DFO	P
38	55,52 81' S AT	1'X1'	BC	4-Nov	DFO	P
39	52,42 96' E AT	2'X2'	BC	4-Nov	DFO	P
40	42,51,52 98' E AT	2'X2'	BC	4-Nov	DFO	P
41	42,43 89' N AT	2'X2'	BC	4-Nov	DFO	P
42	42,43 87' N AT	2'X2'	BC	4-Nov	DFO	P
43	P 32, N AT DOWN SLOPE	36'	DW	4-Nov	DFO	P

Comment: Secondary Liner Complete







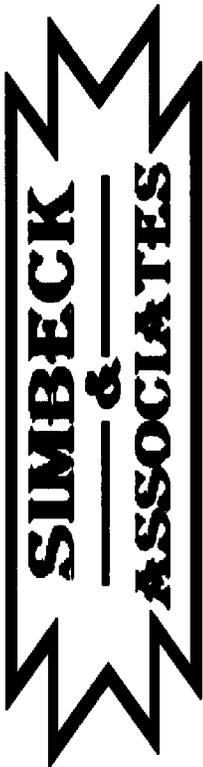
# Repair Report

Date: 11/17/11  
 Job Name: Hotchkiss Water Storage Upper Pond, Primary Layer  
 Material Description: 60 Mil HDPE Smooth

QC/QA Monitor: DFO  
 Page: 5

Repair #	Panels/ Location	Dimension	Welder	Date	Vacuum Testing	
					QC	P / F
11	1,19 / 63' S AT	3'X3'	DW	17-Nov	DFO	P
12	19, 20/ 75' S AT	2'X4'	DW	17-Nov	DFO	P
13	1, 19/ 95' S AT	2'X2'	DW	17-Nov	DFO	P
14	1,18,19/ 135' S AT	2'X3'	DW	17-Nov	DFO	P
15	1, 18/ 71' N AT	10'X2'	DW	17-Nov	DFO	P
16	1, 18/ 61' N AT	5'X2'	DW	17-Nov	DFO	P
17	24,25/ 108' S AT	8'X2'	BC	17-Nov	DFO	P
18	27,28,29/ 148' S AT	2'X3'	BC	17-Nov	DFO	P
19	28,29,30/ 148' S AT	2'X3'	BC	17-Nov	DFO	P

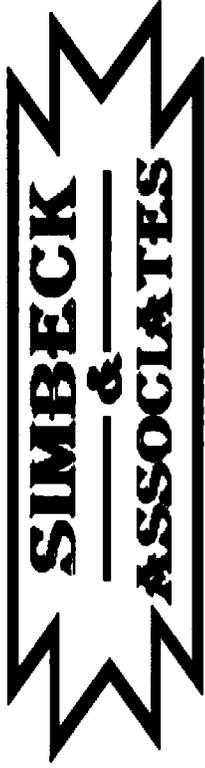
## **6. HWSF Destructive Seam Log**



# Destructive Test Seam Log

Date:	10/31/11						Page:	1				
Job Name:	Hotchkiss Water Storage Upper Pond, Secondary Layer											
Material Description:	60 Mil HDPE Smooth		QC/QA Monitor:		DFO							
Values												
Date	Sample	Panels	Location	Machine	Temp	Speed	Test	1	2	3	4	5
31-Oct	#1	3&8	61' W AT	XL-1	750	12	Peel:	118/128	131/144			
							Shear:					
31-Oct	#2	1&8	113' S AT	XL-1	750	12	Peel:	152/155	121/127			
							Shear:					
31-Oct	#3	1&18	145 S AT	XL-1	750	12	Peel:	137/113	141/138			
							Shear:					
31-Oct	#4	20&21	63' N AT	XL-1	750	12	Peel:	118/128	146/138			
							Shear:					
31-Oct	#5	23&25	112' N AT	XL-1	750	12	Peel:	125/141	135/137			
							Shear:					
31-Oct	#6	26&25	6' N AT	XL-1	750	12	Peel:	121/121	127/121			
							Shear:					
31-Oct	#7	27&29	64' N AT	WW 2	750	11.5	Peel:	135/122	152/140			
							Shear:					
31-Oct	#8	31&32	124' N AT	WW2	750	11.5	Peel:	137/132	136/138			
							Shear:					
Comments:												





# Destructive Test Seam Log

Date:	11/4/11					Page:	3					
Job Name:	Hotchkiss Water Storage Upper Pond, Secondary Layer											
Material Description:	60 Mil HDPE Smooth		QC/QA Monitor:	DFO								
Values												
Date	Sample	Panels	Location	Machine	Temp	Speed	Test	1	2	3	4	5
4-Nov	#13	52,54	1' E AT	XL1	750	12	Peel:					
							Shear:					
4-Nov	#14	46,42	100' N AT	XL1	750	12	Peel:					
							Shear:					
							Peel:					
							Shear:					
							Peel:					
							Shear:					
							Peel:					
							Shear:					
							Peel:					
							Shear:					
							Peel:					
							Shear:					
Comments:								Secondary Liner Complete				



## **7. HWSF Independent Laboratory Destructive Seam Tests**



TRI/Environmental, Inc.  
A Texas Research International Company

Date: 2011-11-03

**Mail To:**  
**Dave Goertz**  
**Weston Solutions**  
**1435 Garrison, Ste. 100**  
**Lakewood , CO , 80215**

**Bill To:**  
  
**Weston Solutions**

e-mail:  
dave.goertz@westonsolutions.com timothy.maher@westonsolutions.com

Dear Mr. Goertz,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** **Hotchkiss Water Storage Facility**

TRI Job Reference Number: **7257**

Material(s) Tested: (12) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear  
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
<http://www.geosyntheticstestinc.com>



**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-1   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	132	123	139	132	138	<b>133</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	129	130	131	138	107	<b>127</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	168	168	164	174	163	<b>167</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-2   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	135	138	141	135	133	<b>136</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	125	123	129	117	123	<b>123</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	164	174	166	163	164	<b>166</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**  
**TRI Client: Weston Solutions**  
**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**  
**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**  
**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-3   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	122	134	137	123	137	<b>131</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	134	128	112	135	128	<b>127</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	166	170	167	168	166	<b>167</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-4   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	118	133	126	129	124	<b>126</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	149	141	138	144	129	<b>140</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	165	169	166	172	169	<b>168</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-5   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	132	128	128	132	131	<b>130</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	131	124	131	136	124	<b>129</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	172	173	171	168	165	<b>170</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-6   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	131	129	126	131	128	<b>129</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	129	127	117	130	128	<b>126</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	168	172	166	171	167	<b>169</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-7   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	116	122	122	122	129	<b>122</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	131	128	132	131	130	<b>130</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	168	166	163	162	161	<b>164</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-8   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	132	137	127	133	130	<b>132</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	130	134	124	130	124	<b>128</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	162	164	162	162	171	<b>164</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-9   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	118	138	119	137	125	<b>127</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	111	129	133	121	129	<b>125</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	169	165	163	177	164	<b>168</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-10   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	126	130	126	128	126	<b>127</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	133	132	143	147	140	<b>139</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	170	176	164	166	172	<b>170</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7257**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-11   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	120	120	122	125	121	<b>122</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	144	136	131	139	137	<b>137</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	167	175	167	165	164	<b>168</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-12   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	128	122	125	124	132	<b>126</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	141	129	123	135	126	<b>131</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	171	164	162	174	164	<b>167</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2011-11-18

**Mail To:**  
**Dave Goertz**  
**Weston Solutions**  
**1435 Garrison, Ste. 100**  
**Lakewood , CO , 80215**

**Bill To:**  
  
**Weston Solutions**

e-mail:  
dave.goertz@westonsolutions.com timothy.maher@westonsolutions.com

Dear Mr. Goertz,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** **Hotchkiss Water Storage Facility**

TRI Job Reference Number: **7431**

Material(s) Tested: (5) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear  
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney  
Project Manager  
Geosynthetic Services Division  
<http://www.geosyntheticstestinc.com>



**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7431**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-13   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	129	139	133	132	135	<b>134</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	120	120	115	122	109	<b>117</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	168	172	164	175	171	<b>170</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-14   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	128	114	134	129	132	<b>127</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	144	137	141	139	132	<b>139</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	168	173	164	170	164	<b>168</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7431**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-15   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	130	132	134	132	134	<b>132</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	131	140	136	132	137	<b>135</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	166	167	166	167	167	<b>167</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
<b>Sample ID: DS-16   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	138	128	127	130	127	<b>130</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	131	135	125	133	123	<b>129</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	166	172	166	169	168	<b>168</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



**DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS**

**TRI Client: Weston Solutions**

**Project: Hotchkiss Water Storage Facility**

**Material: 60mil. HDPE**

**SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)**

**TRI Log#: 7431**

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
<b>Sample ID: DS-17   Weld: Heat Fusion</b>						
<b>Side: A</b>						<b>Peel A</b>
Peel Strength (ppi)	122	123	122	129	118	<b>123</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Side: B</b>						<b>Peel B</b>
Peel Strength (ppi)	125	131	117	124	118	<b>123</b>
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
<b>Shear</b>						<b>Shear</b>
Shear Strength (ppi)	164	167	169	164	161	<b>165</b>
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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## **8. HWSF Shear and Peel Test Specifications**

**TABLE 02770-2  
REQUIRED GEOMEMBRANE SEAM PROPERTIES**

PROPERTIES	QUALIFIERS	UNITS	SPECIFIED VALUES	TEST METHOD
<u>Shear Strength<sup>(1)</sup></u>				
Fusion	minimum	lb/in	120	ASTM D 6392
Extrusion	minimum	lb/in	120	ASTM D 6392
<u>Peel Adhesion</u>				
FTB <sup>(2)</sup>				
Fusion	minimum	lb/in	91	ASTM D 6392
Extrusion	minimum	lb/in	78	ASTM D 6392

- Notes: (1) Also called "Bonded Seam Strength".  
 (2) FTB = Film Tear Bond means that failure is in the parent material, not the seam. The maximum seam separation is 25 percent of the seam area.

[END OF SECTION]