

**BEFORE THE ENVIRONMENTAL QUALITY COUNCIL  
STATE OF WYOMING**

In the Matter of the Appeal Notice of	)	
Violation and Order #4824-11 Issued to:	)	
Envirotank, Inc. (51.031)	)	Docket No. 11-5208A
P.O. Box 302	)	
Ft. Lupton, CO 80621	)	

**ENVIROTANK'S DESIGNATION OF EXPERT WITNESS-JAMES F. BOWLBY, JR.**

COMES NOW Envirotank, Inc., by and through its attorney, Mary A. Throne, of Throne Law Office, P.C., and hereby designates the following expert witness:

1. James F. Bowlby, Jr.  
Senior Hydrologist  
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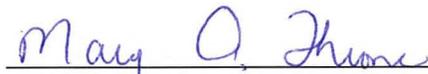
Mr. Bowlby is a Senior Hydrologist. A copy of Mr. Bowlby's CV is attached as Appendix "A" in Exhibit "A" and incorporated fully herein by this reference. Mr. Bowlby may testify about his education and professional experience as a Senior Hydrologist in accordance with his resume. He will charge an hourly rate of \$175.00 for his work in this matter and will charge this hourly rate for both deposition and hearing testimony.

Mr. Bowlby's opinions and the bases for those opinions are contained in his Expert Witness Report, attached hereto as Exhibit "A" and incorporated fully herein by this reference. Mr. Bowlby will testify about those matters and opinions and the bases for those opinions as contained in his Expert Witness Report. Mr. Bowlby may

also testify about any subjects asked about or discussed in any deposition he may give in this matter.

2. Envirotank, Inc. reserves the right to supplement and amend the designation of this expert.

Respectfully submitted this 27<sup>th</sup> day of October, 2011.



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**CERTIFICATE OF SERVICE**

The undersigned hereby certifies that a true and correct copy of the foregoing *Designation of Expert Witness* was served by depositing the same in the US Mail, first class postage prepaid, and by email, on the 27<sup>th</sup> day of October, 2011, to the following:

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**EXPERT WITNESS REPORT  
ENVIROTANK, INC.  
WYOMING ENVIRONMENTAL QUALITY COUNCIL  
SOUTH OF GILLETTE, WYOMING 82718**

**Aquaterra Project Number 04992.10  
October 2011**

*Prepared For:*

**Throne Law Office P.C.**

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**ENVIROTANK, INC.**  
**EXPERT WITNESS REPORT**  
**ON BEHALF OF THRONE LAW OFFICE, P.C.**  
**Mr. Jim Bowlby October 2011**

**1.0 BIOGRAPHY**

I have more than 34 years' experience, 22 in consulting and 12 with the private mining industry in Sheridan, Wyoming. I have a B.S. degree (1975) from Colorado State University (CSU) in Watershed Sciences and additional graduate work at CSU. My technical experience includes regulatory compliance, permitting, and agency negotiation; expert witness testimony; design and implementation of hydrogeological, hydrological, and sedimentation studies; watershed management projects; stormwater management; wetlands delineation and permitting; and reclamation/remedial design and implementation. I have also managed Phase I and II site assessments, compliance audits, and due diligence projects for manufacturing, construction, oil field, and mining properties; and property for transfer and mergers. I have led investigations and remedial evaluations for numerous private industry clients, State of Colorado municipal clients, U.S. Army, U.S. Air Force, U.S. Navy, and U.S. Environmental Protection Agency (EPA) Region 8. I am a hydrologist and an environmental permitting and regulatory compliance expert. I have been an operations manager, department manager, chief hydrologist, environmental services manager, ARCS program manager, Air Force base-specific contract manager, project manager, and principal-in-charge on a broad array of environmental and capital improvement projects. My qualifications resume is provided in Appendix A.

Over the past five years, I have presented several regulatory compliance seminars on a number of subjects including National Environmental Policy Act (NEPA), wetlands determination, storm water compliance, and U.S. Environmental Protection Agency (EPA) Storm Water General Permit for Construction Activities, and a number of related regulatory compliance topics. I have not prepared formal technical papers over the past five years.

I have provided deposition testimony for two clients over the past year. Under the direction of Featherstone, Petrie, DeSisto LLP., I provided a deposition in 2010 but no formal trial testimony for inactive surface uranium mine located near Spokane, Washington. The testimony concerned regulatory compliance from 1955 until 1981, and specifically dealt with water quality inputs and discharge issues. The case was settled without a trial.

In a second deposition and trial testimony in 2010 and 2011, respectively, under the direction of Waas Campbell Rivera Johnson & Velasquez, I provided expert testimony on redevelopment potential for a site that had been previously contaminated with chlorinated solvents, petroleum hydrocarbons, and other constituents in soil and groundwater. The Denver-area Regional Transportation District (RTD) condemned the property for the Light Rail West Corridor expansion, and the client contested the valuation by RTD. The case went to a trial and an opinion was rendered.

I have not provided other deposition or trial testimony over the past 5 years, other than written environmental regulation feedback to new or revised federal or state environmental regulations.

## **2.0 STATEMENT OF ISSUE**

The subject property is owned by the Lange family and is located at 227 Bell South Road, south of Gillette in Campbell County, Wyoming. Based on a site reconnaissance and interview with the former lessee Mr. Brian Morgan, Envirotank Inc. (Envirotank) was contracted to place windbreaks and/or corrals at five locations on the property with large used off-road heavy equipment or mine truck tires. The windbreaks are located in Township 48N, Range 73W, Sections 14, 23, and 26. The five windbreak locations are shown on the topographic map (Figure 1) and on the aerial photograph (Figure 2).

The purpose of this expert witness report is to generally assess the regulatory framework and potential environmental impacts of the windbreaks constructed from used large off-road tires. It is my understanding that Envirotank merely responded to a business request from the lessee to build windbreaks with used mine vehicle tires at five locations and completed four of the five windbreaks at the time the original Letter of Violation was issued by Department of Environmental Quality (DEQ) on July 28, 2008.

The intent of this expert witness report is to complete the following:

- Document and briefly evaluate the history of the compliance issue
- Provide the results of the site reconnaissance and literature review
- Briefly evaluate the environmental impacts of the tires on soil, water, and air; based on the site reconnaissance, knowledge of the area, and existing literature
- Briefly discuss the issue of mosquito larvae breeding habitat
- Discuss the current reuse of tires in the area
- Provide expert opinions

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Based on U.S. EPA data, over 290 million used tires are generated each year in the U.S. (Al Vick. 09/23/2011). As our waste disposal facilities struggle with the decisions regarding these tires, some facilities have banned tire disposal based on landfill capacity and waste volume. In fact, Envirotank contacted the Campbell County solid waste facility in 2008, and the landfill responded that they would not accept used tires for disposal. The Campbell County landfill, Department of Public Works, Ms. Marie Boyle, was contacted on October 19, 2011 regarding disposal of tires. Based on information provided by Campbell County, the landfill does not dispose of tires; rather they contract with Moore Services, a transportation recycler, to transport the tires to North Dakota to use as a fuel source in an incinerator.

Other landfills in Wyoming are reaching their capacity. In the City of Cheyenne, municipal solid waste is transported to the Weld County (Ault, Colorado) landfill due to space and capacity restrictions at the landfill. At the Wyoming Solid Waste and Recycling Association August 2010 and 2011 meetings in Wyoming, there was discussion about State guidance on solid waste disposal in Wyoming. It is our understanding that the State is looking at regionalizing three Subtitle D-compliant landfills (Sheridan, Cheyenne and Casper) and closing the smaller county landfills. Under the proposal, transfer stations will be constructed at these closed landfill facilities. Any disposal of suspect waste would have to be completed at these regional landfills and solid waste transported to these landfills.

Transporting solid waste off-site or out of state is costly. The size of the off-road tires presents difficulties in transportation and with the number of tires that can be transported at a time. With transportation costs increasing, the concerns for highway safety, wear-and-tear on equipment, fuel use, vehicular emissions, landfill capacity, and limitations of landfill availability for disposal; there are few options for used tires except for reasonable reuse or disposal.

The people of Wyoming have seen extreme economic fluctuations over the past 80-100 years. With that in mind, it has been my experience that the people of Wyoming, especially the ranching community, have a history of finding beneficial reuses of used and presumably waste materials. Having visited many ranchers in Johnson, Sheridan, and Campbell County over the past 34 years, I have witnessed used and waste materials put back to productive reuses such as livestock cattle controls, livestock water/feeding devices, erosion control along river banks, irrigation structures, and other innovative methods of reuse. This can include storage of these materials in the shop or corral equipment storage yard for future uses that are yet to be determined. Tires are commonly reused in the surrounding area and in agricultural and ranching settings. It seems logical that a viable reuse, without health and

safety and environmental consequences, of these used tires would be an appropriate approach.

The opinions rendered in this expert report are based on the information available at the time the report was submitted and represent my opinions, as an environmental permitting and regulatory compliance expert.

### **3.0 REGULATORY TIMELINE**

Based on the available information, the windbreaks were placed at five locations between November 2004 and November 2007 (State of Wyoming DEQ April 18, 2011). In order to put the issue in perspective, a timeline of relevant decisions and documentations was developed from available and published information. The following is a summary of these decisions and documents reviewed for this expert witness report and for the expert opinions rendered.

#### **Timeline**

- 11/25/2003 – DEQ states position on permit requirements for beneficial use of tire bales in Wyoming.
- 11/15/2004 – Solid Waste Operating Permit # 51.031 issued to John Hull by DEQ.
- 11/2004 – Lange family began leasing property to Brian Morgan located at 227 Bell Road South of Gillette in Campbell County, Wyoming. United States Postal Service lists zip code as 82718-9350.
- 4/19/2006 – DEQ approved the transfer of the Solid Waste Operating Permit # 51.031 to Michael Bulger, Envirotank.
- From approximately November 2004 through November 2007 (DEQ NOV. 2011) windbreaks constructed on Lange property.
- 7/11/2008 – DEQ Solid Waste Guideline #21, Standards for Scrap Tire Management, issued.
- 7/28/2008 – Letter of Violation from the DEQ to Envirotank (under Permit # 51.031) in response to a complaint concerning an alleged unauthorized storage/management of large off-road scrap tires issued.

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- 9/17/2008 – Letter from Envirotank to DEQ proposing hole drilling as an abatement method to prevent the possibility of mosquito larvae breeding habitat.
- 9/23/2008 – Follow-up letter to DEQ from Envirotank, Inc. presenting background information, restating the possible use of drilling holes in the tires to render them non-water holding, and information that the Campbell County Landfill would not accept used whole tires for disposal.
- 10/13/2008 – Letter to DEQ from Envirotank, Inc. providing notification that Envirotank is in compliance with the permit and that they have only been owners of record since Department approval on April 19, 2006.
- 10/24/2008 – Letter from DEQ to Envirotank, Inc. resolving the compliance matter once holes are drilled in the tires.
- 10/29/2008 – Letter from Heather A. Jacobson claiming Sandra Lange will not consent to any plan unless it includes total removal of the tires and/or scraps from the property.
- 11/11/2008 – Letter to Heather A. Jacobson informing her that the removal of the tires is not the obligation of Envirotank.
- 4/18/2011 – Notice of Violation and Order issued to Envirotank, Inc. by the DEQ.

The history of DEQ decisions on this matter has been inconsistent and varied. Among the various documents reviewed, the following policies and decisions concerning used tires changed from beneficial use, to solid waste only, to the Administrator can and has approved reuses of tires as a beneficial use. In 2008, the DEQ issued a Letter of Violation to Envirotank that had been apparently resolved by Envirotank proposing to drill holes in the whole tires to drain any potential standing water. Then in 2011, the DEQ issued a NOV to Envirotank, which is the subject of this hearing. The following sequence puts the inconsistencies in context.

On September 19, 1997, DEQ established a policy on tire bales (Mr. Dave Finley, Administrator Solid and Hazardous Waste Division [SHWD]). Based on the information available, the DEQ “determined that the use of tire bales as an alternative building material is a beneficial reuse of this solid waste”.

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Under the Wyoming Environmental Quality Act, the duties of the administrator of the solid and hazardous waste management division were established (W.S 35-11-502). In subsection (a) "No persons, except when authorized under the permit system established pursuant to this act, shall: (i) Locate, construct, operate or close a solid waste management facility". Through the research conducted for this expert report, I believe the windbreaks constructed from used off-road tires does not meet the definition of a solid waste management facility and this rule would not apply to the subject property as determined under Wyoming Solid Waste Management Rules and Regulations (SWMRR), Chapter 1, Sec. 1(f) (i) "A permit or a one-time or emergency disposal authorization is required for the location, construction, operation or closure of any new or existing solid waste management facility as specified by Chapter 1, Section 5, or by the applicable chapter(s) of these rules and regulations".

If it is determined that the windbreaks do not meet the definition of a solid waste management facility, permitting would not be required. In the event the Lange facilities meet the definition, I believe that the structures qualify as a beneficial use exemption as defined under SWMRR Chapter 1, Sec. 1(l)(xxi):

The administrator may exempt the following from a permit or any requirement to obtain a waste management authorization under these regulations, provided that persons engaged in activities which are otherwise exempted may be required to supply information to the administrator which demonstrates that the act, practice, or facility is exempt, and shall allow entry of department inspectors for purposes of verification of such information:

...

(xxi) The reuse of wastes in a manner which is both beneficial and protective of human health and the environment, as approved by the administrator.

In this case, it is my opinion the subject property meets the definition of a beneficial use. The information provided in this expert report will substantiate this opinion.

DEQ has approved the reuse of tires in the past. On May 06, 1998, stock feeders and water containers were approved by Mr. David Finley, Administrator SHWD, DEQ.

On November 25, 2003, The DEQ published a "Notice to Affected Parties" for the removal of solid waste exemption for tires and acknowledges that properly managed tire bales can be beneficial when used as a wind break for livestock, or as a fence under certain conditions that include the reduction of mosquito breeding habitat.

On September 12, 2008, the DEQ issued Guideline # 21 "Standards for Scrap Tire Management" that indicated the "Department will not approve whole scrap tires, tire shreds, or tire bales for use in windbreaks, fences, or other exposed applications. Envirotank had completed four of the five windbreaks when this guideline was issued. None-the-less, Section 5.1, (xxi) allows the "reuse of wastes in a manner which is both beneficial and protective of human health and the environment, as approved by the administrator". Even though this is not a statute or a regulation and is only a "guideline", it acknowledges that reuse is viable and the Administrator can provide approval.

On July 20, 2009, Mr. Carl Anderson, Administrator Solid & Hazardous Waste Division, approved the reuse of industrial tire sidewalls for building a snow fence, windbreak, and a section of a property fence. Mr. Anderson determined the proposed use constitutes a beneficial use per SWMRR Chapter 1 Section 1 (l) (xxi) and approved the application with three stipulations that included: no other tires can be used, the site must be cleaned up and tires disposed of properly in the event of a fire, and access will be granted to DEQ for inspections.

DEQ regularly approves the disposal of tires at mine sites without considering groundwater impacts. For example, the DEQ approved the mine permit application for the April 2010 Black Thunder Mine Permit. Black Thunder encouraged reuse of off-road tires in the permit application, and in the event no reuses could be found, the permit authorizes burial of the tires in the pit floor after recovery of the coal has ceased. This application, along with the coal mining permits, are regularly approved by DEQ and would indicate that DEQ does not consider the burial of tires to present a post mining groundwater impact.

This summary of events is based on information provided by legal counsel to Envirotank and through electronic records discovery, and is assumed to represent the actual events leading to the Notice of Violation (NOV) 04/18/2011. The opinions and recommendations are based generally on this timeline of activities and technical information readily available.

#### 4.0 LITERATURE SUMMARY

Based on U.S. Environmental Protection Agency estimates, 290 million used tires (based on 2003 data) are generated annually in the U.S. ([www.ehow.com/about\\_environmental\\_impact-burying-tires.html](http://www.ehow.com/about_environmental_impact-burying-tires.html)). Recent estimates of used tires is in excess of 300 million annually. Modern tires are composed of single polymers or a blend of polymers with high molecular weight (styrene-butadiene, polymers), a small amount of natural rubber, fillers

(carbon black and zinc oxide for color and to control hardness), chemical vulcanizers such as mercaptobenzothiazole used in the production process, small additions of plasticizers and chemical protective agents such as antioxidants and antiozonants (Day April 13, 1993).

The following summarizes the regulatory framework and guidance for used (scrap) tires in Wyoming and assesses the designed application of these materials to the subject property and reuse of the tires for windbreaks. The summary also includes a literature review of environmental impacts, with particular emphasis on water, air, and fire hazards.

#### **4.1 Definitions of Solid Waste and Disposal in Wyoming**

In W.S. 35-11-502(a), "No persons, except when authorized under the permit system established pursuant to this act, shall: (i) Locate, construct, operate or close a solid waste management facility." Through the research conducted for this expert report, I believe the windbreaks constructed from used off-road tires do not meet the definition of a solid waste management facility and this rule would not apply to the subject property. Thus, a permit would not be required.

Even if the Lange property were subject to the requirement for a solid waste permit, I believe that it meets the requirements for a beneficial use exemption under SWMRR Chapter 1, Section 1(l)(xxi), as quoted above. As described in detail in the following, the reuse of tires at the Lange property is in a manner which is both "beneficial and protective of human health and the environment." In this case, it is my opinion that the windbreaks represent a beneficial use and do not pose a risk to human health and the environment, as constructed.

Solid waste is defined by the Wyoming Environmental Quality Act, W.S. 35-11-103(d)(i) and more specifically in Chapter 1, Section 1(e) of the SWMRR ([www.deq.state.wy.us/shwd](http://www.deq.state.wy.us/shwd)) as:

Garbage, and other discarded solid materials, materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but, unless disposed of at a solid waste management facility, does not include:

Solids or dissolved material in domestic sewerage or other significant pollutants in water resources, such as silt, dissolved solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants;

Liquid, solids, sludges, or dissolved constituents which are collected or separated in process units for recycling, recovery or reuse including the

recovery of energy, within a continuous or batch manufacturing or refining process, or  
Agricultural materials which are recycled in the production of agricultural commodities.

The subject property does not meet the definition of a solid waste disposal facility or a solid waste management facility in W.S. 35-11-103(d)(ii) defined as “any facility for the transfer, treatment, processing, storage, or disposal of solid waste.”

The subject property is not intended for this purpose, rather the windbreaks and/or corrals are designed as a beneficial reuse and the subject property does not meet this definition.

Solid waste disposal is defined by SWMRR Chapter 1, Section 1(e) ([www.deq.state.wy.us/shwd](http://www.deq.state.wy.us/shwd)) as “discharge, deposit, injection, dumping, spilling, leaking, or placing of any waste material into or on any land or water so that such waste material or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.”

The managed placement of reused tires for windbreaks and/or corrals does not meet the definition of disposal. The intent of placing the tires at the subject property is for a productive and beneficial use. The used tires are a valuable recycled product and are not being disposed.

Envirotank did not dispose of the used off-road tires, rather they were beneficially reused as a windbreak. As such, no permit is required since the materials were not disposed of at a solid waste management facility. Even if the reuse was determined to be a disposal of a solid waste, the subject property meets the definition of a beneficial use and would be subject to the exemption.

Envirotank placed recycled used off-road tires at the subject property and these tires are being put to a beneficial use. As such, the used off-road tires are not intended to be a solid waste. It is up to the discretion of the Administrator to determine that this is a valid beneficial reuse of the materials.

#### **4.2 Wyoming DEQ Guidance # 21 Standards for Scrap Tire Management**

The Wyoming DEQ Guideline # 21, developed under W.S. 35-11-502, was apparently prepared to provide guidance for scrap tire management in Wyoming under the Solid and Hazardous Waste Management Division. It is not a statute or a regulation, as defined under

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Section 1.0 Introduction, paragraph 1 “This document provides guidance for the management of scrap tires in Wyoming”. The justification for the guideline is identified in Section 1.0 Introduction, paragraph 3, where the DEQ has identified “scrap tires and tire bales where accumulation of tires have been a source of historic public complaints and problems in Wyoming resulting in unsightly appearance of tire piles, potentially uncontrollable tire fires, and the spread of West Nile virus from the mosquito habitat from accumulated tires”.

It is my opinion that the reuse of tires may be unsightly to some and a beneficial reuse of a valuable product to others. While the windbreaks may result in a slight but insignificant increase in fire hazard, they certainly are not located near any facilities or structures and the potential for fire damage is very low.

Water does accumulate in the inner core of tires, but standing water is found in other sources in the area, including existing ponds, reservoirs, streams (when flowing), livestock watering tanks, and irrigation ditches (when flowing). A review of the two U.S. Geological Survey Topographic Quadrangle maps surrounding the subject property (Scaper Reservoir and Appel Butte) representing an area of 72 square miles, indicates approximately 69 identified stock ponds, reservoirs, or coal bed methane ponds. It is assumed that a majority of these ponds and reservoirs have been approved by the Wyoming State Engineers Office and may have been reviewed or approved by the DEQ itself.

The windbreaks on the Lange property represent a potential minimum source of standing water and mosquito habitat of approximately one per Section (1 square mile). Along with potential standing water in streams after a runoff event (snowmelt or rainfall), irrigation ditches, livestock watering troughs or holding tanks (some designed and constructed with used tires), and potential new ponds created by expanding coal bed methane development in the area, the quantity and location of the potential standing water in the tires, for mosquito larvae breeding habitat, is insignificant.

The justification for “cart blanche” disapproval of the use of scrap tires for use in windbreaks, fences, or other exposed applications is not justified or warranted. This decision should be based on existing statutes and regulations, Article 5 of the Wyoming Environmental Quality Act and the SWMRR, actual beneficial reuse, and at the discretion of the Administrator. In fact, the Guideline Section 5.1 quotes the beneficial use exemption from subsection (xxi) and allows: “The reuse of wastes in a manner which is both beneficial and protective of human health and the environment, as approved by the administrator”. The reuse of tires on the Lange property is not a reuse of solid waste or a disposal in a solid waste management facility. Rather, it is beneficial and as demonstrated in the following sections,

the placement of the windbreaks and/or corrals are protective of human health and the environment.

#### **4.3 Potential for Human Health and Environmental Impacts to Water, Land, and Air**

The placement of the five windbreaks is on relatively level ground within a fenced area on private property and they are not directly in a stream or ephemeral channel, shallow groundwater does not appear to be an issue under the windbreaks sites, and no erosional features were observed from the windbreaks to the stream channels. There was also no apparent staining of soils in the vicinity of the windbreaks. The subsequent sections, observations, and opinions will also demonstrate that the tires will not have an adverse effect on human health and the environment, including emissions into the air or discharged into any waters, including groundwater.

There is a significant history of literature that reports the potential beneficial reuse of tires, either whole or partially cut tires, tires shreds, and pelletized rubber (crumbs) for ball fields and other recreational field uses. Along with site observations and an assessment of potential receptors, the literature and data will support the opinion that the tires have no significant impact on human health or the environment.

The following discussion provides a summary of the studies conducted to determine the potential health and safety and environmental impacts of used tires. It is a rigorous unbiased examination of literature, but is by no means a complete review.

The placement of tire chips within leachate columns was conducted (J&L Testing Company, Inc. May 31, 1989). Metals, pH, and some other constituents were tested. No appreciable change in chemistry was detected over the 90-day timeframe.

The levels of chemical leached from tires under the Toxicity Characterization Leaching Procedure (TCLP) was studied to determine the leaching characteristics of the tires (Rubber Manufacturers Association. September 25, 1989). None of the rubber products tested, cured or uncured, exceeded proposed TCLP regulatory levels. Most compounds were detected at trace levels (near the method detection limits).

The organic and inorganic compounds resulting from the exposure of waste tires in roadbed fill applications that were exposed to different leachate chemicals were then analyzed (Twin City Testing Corporation. J.L. Zelibor. March 26, 1991). Results of chemical analysis for metals indicated that metals were found at higher concentrations when the pH in the extraction fluid is low (acidic conditions). The study reported that only in extreme

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environments, such as acid mine drainage water, would have a pH as low as 3.5 as used in the study (Twin City Testing Corporation. J.L. Zelibor. March 26, 1991). The study results indicated that neutral (pH 7.0) or slightly basic conditions (pH 8.0), metal values fell within established standards for Minnesota. The extraction fluids for total petroleum hydrocarbons and polynuclear hydrocarbons indicated that the highest concentrations were observed using ammonia hydroxide (pH 8.0). Ammonia hydroxide is an unlikely component used in roadbed fill.

The Virginia Department of Transportation evaluated the leaching potential from scrap tires (November 18, 1992). Tires were shredded, and a TCLP analysis was conducted. Metals leached most readily at a pH of 4.0. The most abundant metal in the leachate was iron. Zinc was also readily leached at the low pH. At the higher pH levels (8.0), carbon black and some oily material was detected and was consistent with the Twin City findings (March 26, 1991). The results of the TCLP test indicated that the concentrations of metals in the leachates were well below the regulatory limits, consistent with past studies (Rubber Manufacturers Association. September 25, 1989).

Leaching of metals was evaluated by analyzing two types of samples from constructed reactors, soil and water (University of Maine. August 26, 1996). Based on this study, chromium, copper, iron, and manganese could be expected to leach from tires since they are components of the steel tire core and bead wire. The samples were collected after a rigorous acid digestion (TCLP) and as a result, the concentration of metals were higher in the soils sampled. Metals leached to water samples after the acid digestion were chromium, iron, manganese, and zinc. Organic compounds were not found at concentrations above the federal drinking water standards for the compounds. The reactor sampling did not mimic field conditions. For the field trench study, iron was found to be elevated in the groundwater samples collected. The iron did not appear to migrate downgradient of the sites. Manganese was also detected but the concentration was below the drinking water standard. At one location (peat), chromium was detected but well below the drinking water standard.

Two field trials were constructed to investigate the effect on water quality of tire chips placed above the groundwater table (Humphrey Dana N., Lynn E. Katz, and Michael Blumenthal. 1997). There was no evidence that tire chips increased the level of substances that have a primary drinking water standard. Under some conditions, iron levels may exceed their secondary drinking water standard. Manganese may exceed the secondary level, however, as reported both manganese and iron are naturally occurring in groundwater. For organic compounds, all result were below the method detection limit for all compounds.

One study summarized the impacts of used tires (Chelsea Center for Recycling and Economic Development. August 1998. Technical Report #2). Scrap tires are considered a major component of municipal solid waste and stock piling them can introduce serious issues. The study assessed the environmental findings of reuse and recycling scrap tires. In summary, concentrations of metals tend to appear at lower (acidic) pH conditions. Organics concentrations are detected under high (basic) pH conditions. Both the metallic and organic compounds were below the TCLP concentrations and scrap tires would not be a hazardous waste. When tire chips are spread over the ground, emission of volatile and semi-organic compounds (VOC and SVOC) can be emitted into the air when exposed to heat. Latex allergens have also been reported. Field studies (Minnesota Pollution Control Agency) did not identify significant differences between waste tire areas and control areas for soil samples and for a biological survey.

In a study in Maine (Humphrey Dana N. January 2, 1999), tire shreds did not cause the levels of metals to exceed the primary drinking water standard. The levels of organic and semi volatile organic compounds were all below the method detection limit.

In a second study in Maine (Humphrey Dana N. and Lynn E. Katz. March 16, 2001), tire shreds were placed above the water table and groundwater samples were collected. This study confirmed the result of the previous study. Most of the inorganic substances that can potentially leach from tires are naturally occurring at low levels in groundwater. There was some evidence that tire shreds could increase the concentrations of iron and manganese, but the shreds placed above the groundwater table had little impact on water quality for the near-neutral pH conditions. Organic compounds were below the method detection limits.

In a field study of tire shreds that were placed below the groundwater table (Humphrey Dana N. and Lynn E. Katz. November 2001 and Humphrey Dana N. and Michael Swett. November 29, 2006), the results showed a negligible effect on the concentration of metals with primary drinking water standards. Furthermore, concentrations of iron, manganese, and zinc were elevated but concentrations decreased to near background 0.6 to 3 meters downgradient from the test site. Trace concentrations of a few organic compounds were detected, but concentration were below the method detection limit for virtually all the samples collected from downgradient wells. The study concluded "tire shreds placed below the water table appear to have a negligible off-site effect on groundwater quality".

A study conducted by the Virginia Department of Transportation (Hoppe, Edward J., and Grigg Mullen. April 2004) concluded the use of shredded tires in highway embankments does not create an adverse environmental impact on groundwater quality.

Crumb rubber was studied to determine the toxicity from exposure in playgrounds and artificial turf playing fields (Ledoux, Thomas. June 2007). The study concluded with the exception of possible allergic reactions among individuals sensitized to latex, rubber and related products present no obvious toxicological concerns that would cause health effects in the normal population. This result was also reported in USA Today (Perez, A.J. June 3, 2009) where tests indicated the presence of inorganic chemicals, including lead, zinc, and benzene, but all below the federal safety standards. The article reported the results developed by the New York State Department of Environment Conservation and the New York Department of Health.

The inhalation hazard from artificial turf fields made from recycled crumb rubber (often derived from waste tires) was studied (Calrecycle accessed October 2010) ([www.opa@calrecycle.ca.gov](mailto:www.opa@calrecycle.ca.gov)). The results of the California Office of Environmental Health Hazard Assessment concluded that the inhalation hazard (particulates matter and volatile organic compounds) were either below the health screening levels or similar to background concentrations in the surrounding area.

An aquatic testing study (Sheehan, P.J., J.M. Warmerdam, D.N. Humphrey, and S.M. Patenaude. Undated) indicated that for sites where the dissolved oxygen is greater than 2.0 mg/L and the pH is greater than 5.8, a buffer distance of tire shreds and adjacent surface water of 10 feet is sufficient to limit potential aquatic toxicity in streams. Dispersion and infiltration modeling show that at site where these geochemical conditions are not met, a buffer zone of 35 feet is adequate to limit potential aquatic toxicity for nearly all soil and groundwater conditions.

A literature review was conducted by the U.S. Environmental Protection Agency (EPA) (U.S. EPA. Wastes-Resource Conservation-Common Waste & Materials - Scrap Tires. September 6, 2011) to assess the reuse of scrap tires as subgrade fill and/or embankments. According to the EPA, the summary referenced many of the citations above. Several environmental studies have been performed to assess the potential for toxics to leach from tires when placed in wet soils. According to the EPA, the impact of the tires on the environment varies according to the local water and soil conditions, especially pH value. When the tires are placed below the water table and the groundwater is near neutral, "tire shreds have only a small impact on groundwater quality".

### Summary

Most studies of scrap tires have been conducted for shredded or pelletized (crumb rubber) tires components. The windbreaks are comprised of whole tires and tire tops; thus the surface area for exposure to leaching is much lower. Studies indicate that leaching of tire

shreds have resulted, in certain circumstances, in increased levels of iron, manganese, and sometimes zinc under acidic conditions. Organic compounds are typically not detected under field conditions, but can be leached under basic (pH 8.0) conditions. Soil conditions and groundwater in the area south of Gillette, Wyoming are typically neutral or slightly basic, not acidic. Therefore, the potential for leaching metals is low. The tires are not located near a surface water drainage and groundwater under the site is expected to be very deep. As such, no impacts to water (surface or groundwater) are anticipated.

Few studies have been conducted to assess the impacts on air quality, but an increase in particulates as the tires degrade and possible volatilization of organic and semi organic compounds is possible under very hot (especially fire) conditions. These compounds diffuse quickly into the atmosphere and would only be a potential but insignificant impact if there was a residence adjacent to the windbreaks. The windbreaks are located in a very low residential density and ranchland area, therefore, no residences are expected to be impacted. Also, the inhalation hazard (particulate matter and volatile organic compounds) from crumb rubber (typically used on artificial recreational fields) were either below the health screening levels or similar to background concentrations in the surrounding area. Thus, the inhalation hazard from whole or tire tops would also be negligible.

#### **4.4 West Nile Virus**

DEQ has expressed concerns (Guideline #21) that accumulation of water in the tires could result in breeding habitat for mosquito larvae that may carry the West Nile Disease. My expertise is not disease control, since I am not a medical doctor, however certain facts can be reported from literature.

Based on information provided by the Center for Disease Control (CDC) (CDC October 17, 2011) in the West Nile Virus Fact Sheet, the risk of infection from West Nile Disease is highest during mosquito season (until freezing temperatures occur). There is no specific treatment for the West Nile Disease virus infection. The CDC recommends first monitoring bird populations (since birds are most commonly affected) that are sick or have died. Second, control stagnant water, especially if it is nutrient laden. Third is the use of widespread mosquito control efforts, including the use of spraying and larvacide that can be effective.

The infection is carried from infected birds to people by mosquitos; there is no evidence for the transmission from people to people (Medicinenet. accessed 10/17/2011 ([www.cdc.gov/ncidod/dvbid/westnile/wnv\\_factsheet.htm](http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm); [http://www.medicinenet.com/west\\_nile\\_encephalitis/article.htm](http://www.medicinenet.com/west_nile_encephalitis/article.htm)).

Based on the CDC Fact Sheet, there are no confirmed cases of West Nile Disease in Campbell County, Wyoming ([www.cdc.gov/ncidod/dvbid/westnile/USGS\\_frame.html](http://www.cdc.gov/ncidod/dvbid/westnile/USGS_frame.html)).

Water does accumulate in the inner core of some whole tires. Based on the site reconnaissance, whole tires comprise roughly ½ of the total tires at the windbreaks and approximately ½ of the tire inner rims contained some standing water. But standing water is also found in existing ponds, reservoirs, streams (when flowing), livestock watering tanks, and irrigation ditches when flowing. A review of the two U.S. Geological Survey Topographic Quadrangle maps surrounding the subject property (Scaper Reservoir and Appel Butte) representing an area of 72 square miles, indicated approximately 69 identified stock ponds, reservoirs, or coal bed methane ponds. It is assumed that a majority of these ponds and reservoirs have been approved by the Wyoming State Engineers Office and may have been reviewed or approved by the DEQ itself. These standing water sources are also potential mosquito larvae breeding habitat in the area.

Based on this review of the most recent CDC information, there were no reported cases of the West Nile Disease virus reported in Campbell County and there are many existing sources of standing water for breeding mosquitos in the area. There is a potential for standing water in some of the tires in the windbreaks, however, based on the prevalence of other water sources in the area, the tires present an insignificant level of breeding habitat for mosquitos. In the event abatement would be required, options are presented in "POTENTIAL REMEDIES".

#### **4.5 Fires**

Under certain circumstances, used tire windbreaks do present a minor increase in fire hazard, however, the windbreaks are on private land within secured and fenced areas in livestock grazing and grassed areas. There are no structures in the immediate vicinity of the windbreaks. For the tires to ignite, they would have to be directly ignited by a lightning strike or be deliberately sabotaged. It is possible, but doubtful, a grass fire would be hot enough to ignite the tires. It would seem the potential to ignite the reused tire windbreaks and to impact any structures would be remote and the impact is insignificant.

#### **5.0 SITE RECONNAISSANCE**

A site reconnaissance was conducted on September 30, 2011. Mr. Brian Morgan, former lessee, and Ms. Mary Throne, attorney, accompanied me on the reconnaissance of the five

windbreak areas. A photographic log is provided as Appendix B-1. All five windbreak locations were examined, along with the proximity to natural water bodies and ephemeral stream channels. The integrity of the tires was examined and appeared to be in good condition. One incomplete windbreak pile of tires (locations # 05) was observed. Based on the discussion with Mr. Morgan, the windbreak completion was discontinued when the 2008 Letter of Violation was received from DEQ and the tires remain on-site.

### **5.1 Interview with Former Lessee**

An interview was conducted with Mr. Morgan prior to the site reconnaissance. Mr. Morgan contracted with Envirotank to build the windbreaks. Mr. Morgan stated that the landowner provided permission to build windbreaks. All the windbreaks were constructed between November 2004 and November 2007 (DEQ NOV and Order 2011). Three were completed as windbreaks, and one as a windbreak/corral. In addition, one was not completed but the tires were delivered to subject property and only a few tires were stacked.

The placement of the windbreaks were based on practical applications. Mr. Morgan observed that cattle typically huddled at the southeastern corner of a field, since the wind is predominantly from the northwest and north. Thus, they were constructed at the southeast corner of fields and downwind to maximize protection of the cattle. Four of the five locations are within site of the Bell Road or improved ancillary access roads, and easily accessible. One site (Windbreak locations #2) is located approximately ¼ mile west of the Bell Road and can be accessed during dry weather conditions, from a primitive ranching road.

Mr. Morgan indicated that the tires work well as a windbreak, and he was not aware of any noticeable problems with the four constructed windbreaks on the subject property or other windbreaks in the area on other properties.

He indicated that Envirotank did not complete Windbreak location #5, since Envirotank received the Letter of Violation (July 2008) from DEQ and they stopped work accordingly, pending resolution of the issue.

### **5.2 Site Reconnaissance Observations**

Each of the five windbreak locations were examined and a photolog was developed during the site reconnaissance activities (Photolog B-1). The windbreaks were constructed and were operational at four of the five locations. At Windbreak location #5, the tires were delivered to the site but the windbreak had not been fully constructed.

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The tires appeared to function as designed. In fact, vegetation percent cover downwind from the windbreaks appeared to be slightly enhanced, most likely the result of acting as a snow fence and providing additional soil moisture during the initial growing season (April and May). This observation was confirmed by Mr. Morgan.

Windbreak #1 was designed as a windbreak and a corral. The tires include whole and tire tops stacked 4 to 6 high to a height of roughly 5 to 7 feet above the ground surface and on relatively flat topography. The site also includes corral fencing and gates. The windbreak was 100 percent in-tact and in good condition. There was no staining (red for iron or black for manganese) in the soils adjacent to the tires. The tires were exposed and not covered with soil. The windbreak is visible from Bell Road. In fact, during the site reconnaissance, the corral was being used by local ranchers as viewed on horseback (see photolog B-1, photo # 4).

Windbreak #2 was designed as a windbreak only. The tires include whole and tire tops stacked four to six high to a height of roughly five to seven feet above the ground surface and relatively flat topography. The windbreak was 100 percent in-tact and in good condition. There was no staining (red for iron or black for manganese) in the soils adjacent to the tires. The tires were exposed and not covered with soil. The windbreak is not visible from Bell Road.

Windbreak #3 was designed as a windbreak only. The tires include whole and tire tops stacked four to six high to a height of roughly five to seven feet above the ground surface and relatively flat topography. The windbreak was 100 percent in-tact and in good condition. There was no staining (red for iron or black for manganese) in the soils adjacent to the tires. The tires were exposed and not covered with soil. The windbreak is visible from an ancillary private access road west of Bell Road.

Windbreak #4 was designed as a windbreak only. The tires include whole and tire tops stacked four to six high to a height of roughly five to seven feet above the ground surface and relatively flat topography. The windbreak was 100 percent in-tact and in good condition. There was no staining (red for iron or black for manganese) in the soils adjacent to the tires. The tires were exposed and not covered with soil. The windbreak is visible from Bell Road.

Windbreak location #5 consists of primarily used tires not yet constructed as a windbreak. A few of the tires had been stacked as a windbreak but the windbreak had not been fully constructed. The used tires that were stacked include whole and tire tops stacked three to four high to a height of roughly four to six feet above the ground surface and relatively flat topography. There was no staining (red for iron or black for manganese) in the soils

adjacent to the tires. The tires were exposed and not covered with soil. The windbreak is visible from Bell Road.

Based on the site reconnaissance, whole tires comprise roughly ½ of the total tires at the windbreaks and approximately ½ of the tire inner rims contained some standing water. All five windbreak areas are within fenced livestock grazing areas on private land. The four completed windbreaks were in-tact and in good condition. There was no staining (red for iron or black for manganese) in the soils adjacent to the tires. There was no soil rilling, downcutting, or erosional features emanating from the windbreaks.

### **5.3 Soil Type and Runoff Potential**

The basic soil types in the vicinity of the windbreaks were identified from the U.S. Department of Agriculture, Natural Resources Conservation Service, Soil Survey and Map for Southern Campbell County, Wyoming, February 12, 2010. The predominant soils are identified as:

- 166 - Jaywest loam
- 223 - Ucross loam
- 224 - Ucross-lwait loams
- 225 - Ucross-lwait-Fairburn loams

These soil types all are well drained, a range of low to high infiltration capacity, show no frequency of flooding, and have a depth to groundwater exceeding 80 inches (6.67 feet). In addition, the Ucross loam and Ucross series has a restrictive feature that bedrock is encountered at a depth of 20 to 40 inches.

This assessment indicates that the soils are not in a flood zone, groundwater is deep, and the bedrock is encountered in the Ucross series at a relatively shallow depth. The runoff potential varies (based on the infiltration capacity), but is limited.

Based on the site reconnaissance, there was no soil rilling, downcutting, or erosional features emanating from the windbreaks. Based on the flat topography and soil types, there is little potential for concentrated surface water runoff. Therefore, it was assumed that, based on the low annual precipitation in the area, no erosional features, and distance from the surface water features, that surface runoff was not generated in the vicinity of the windbreaks that would be capable of reaching the surface water features.

#### **5.4 Potential Flow Path to Surface Water Receptors**

All four windbreaks and the unassembled pile of tires are located in an area that is relatively flat, within the confines of a livestock grazing fenced area. Bluegate Creek and Moser Draw are the most prominent surface water features in the area. These channels are ephemeral, and flow in response to precipitation and snowmelt runoff. Neither Creek had flowing water during the site reconnaissance activities.

The five areas are sufficiently far away from the ephemeral drainages or tributaries to be protective of surface water quality. Based on the topographic map (Figure1) and observations, the minimum distances to the stream channels are as follows:

Windbreak #1: 75 to 100 feet from Bluegate Creek

Windbreak #2: 50-60 feet from the ephemeral tributary to Bluegate Creek

Windbreak #3: Private access road prohibits runoff to the tributary to Bluegate Creek and is approximately 50 feet from the Creek

Windbreak # 4: 90 to 100 feet from Moser Draw

Windbreak #5 (unassembled): 110 to 120 feet from Moser Draw

Based on the distance from the creeks and tributaries, soil types (loam), and the site observations that there are no defined channels or erosional features emanating from the windbreaks, there is no significant threat to surface water quality from the tires.

#### **5.5 Potential Flow Path to Groundwater Receptors**

Along ephemeral stream courses tributary to and including Bluegate Creek, shallow groundwater could be encountered seasonally at depth of less than 20 feet. This potential groundwater would be confined to the local alluvial/colluvial deposits themselves, identified as less than 100 feet in width in the vicinity of the windbreaks. Based on the review of the Groundwater Atlas of The U.S. (U.S. Geological Survey, accessed 10/2011), there are no significant alluvial aquifers in the vicinity of the subject property and the presence of shallow groundwater, based on the composition of the ephemeral drainages, soil types, and distance from the drainages, at the windbreak locations is not likely.

Groundwater is encountered in the area in Lower Tertiary aquifers and in some locations along the edges and outcrops of the Powder River Basin, in the lower geological unit that is located stratigraphically below the Lower Tertiary, the Upper Cretaceous aquifers (U.S. Geological Survey, accessed 10/2011). For the Lower Tertiary formation, the aquifers consist mainly of sandstone beds and localized coal seams in the Fort Union Formation. The Fort Union also includes interbedded fine grained sediments (shale) that exhibits a very

low permeability and is an aquatard to downward movement of water. Wells in the underlying aquifers are typically 300 to 900 feet deep. Wells in the Upper Cretaceous aquifers can be completed at depths of less than 300 feet in interbedded sandstone but typically are only along the edges of the Powder River Basin where the coal is burned at the surface (known as clinker). The aquifers associated with the Upper Cretaceous are typically saline in their deeper parts (U.S. Geological Survey, accessed 10/2011). The subject property is located approximately in the geographic middle of the Powder River Basin. Therefore, groundwater in these aquifers is deep and infiltration is limited due to the predominance of interbedded shale.

Based on the distance from the limited lateral and vertical extent of the alluvium/colluvium associated with the creeks, limited infiltration capacity from fine grained sediments (shale), the distance from the creeks, and the depth of underlying aquifers, there is no threat to groundwater from the tires.

Based on the soil types, observations during the site reconnaissance, distance from creeks and tributaries, and the apparent lack of groundwater underlying the windbreaks, there is no or an insignificant potential for the tires to impact water at the site. Any impacts to soils would be local and insignificant and no discoloration of the soils were identified during the site reconnaissance.

## **6.0 REUSE OF TIRES**

In my opinion, the reuse or recycling of used tires, as stated in the NOV by DEQ, is not "storage and management of a solid waste material" and would be outside the scope of the permit requirements for a solid waste management facility. Alternatively, the tires are being reused and if a permit is required, the windbreaks would qualify for an exemption as a beneficial use, as defined SWMRR Chapter 1, Section (l) (xxi).

After conducting the site reconnaissance, I surveyed other uses of whole tires south of Gillette and north of Bill, Wyoming. The results are provided in Photolog B-2. I found that used whole tires are being reused in day-care center playgrounds (two locations), for protective barriers, for stock watering and feeding, and for other agricultural uses. In most applications, whole tires or tire tops were reused. The survey focused only on the area along and near State Highway 59, from Gillette to Bill, Wyoming. It was obvious, that with mining prevalent in the area and the desire to reuse materials that would otherwise end up as a waste (and landfilled or shipped out of state), local ranchers and residents are seeing the tires as valuable and safe. These other applications of used tires are similar to the

reuse of whole or tire tops for windbreaks or corrals, except for the number of tires used in the windbreaks.

In preparation of this expert report, the disposal of used tires in a mining application was examined. This was an important finding since mines are closely scrutinized by the DEQ and operate under approved permits. We found that mines typically discard the tires at the floor of the mine or in the mined out pit, with no regard to groundwater or other conditions. In the case of the mine permit application dated April 2010 Section MP-3.7 and approved by DEQ, the Black Thunder Mine (233 Permit to Mine) south of Gillette has reported "Disposal in the solid waste dump is appropriate for a large percentage of the wastes generated at the Black Thunder Mine. Large Off Road Vehicle Tires may be disposed on the pit floor, as described under subsection MP-3.7.3 below". Section 3.7.3 identifies the preferred method of disposition of off-road vehicle tires is to reuse or recycle the tires, to take advantage of the resource. Tire may be disposed, when there is no reuse option, on the pit floor after salvageable coal is removed and covered in a timely manner, either by cast blasting or by haul trucks covering them with backfill. Final burial depth will be no less than 75 feet of backfilled overburden.

This practice of dealing with used tires is commonly approved by DEQ. There was no stipulation that the tires be placed above the groundwater table, just that the tires be placed in the floor of the pit. Since this practice appears to be commonly accepted by DEQ, we have assumed that the DEQ does not believe that the disposal of used tires will have an impact on post-mining groundwater quality.

In the adjacent state, Colorado, the Colorado Department of Public Health and Environment (CDPHE) allows the reuse of tires under the CDPHE Hazardous Materials and Waste Management Division (HMWMD) (6 CCR, 1007-2) regulations for solid waste sites and facilities. Section 8, Recycling, 8.2.1 indicates "The Department recognizes that many materials that are found in the solid waste stream have the potential to be recycled or reused in commerce." As such, CDPHE allows the administrator to allow other uses of tires, rather than landfilling and disposal as a solid waste. In an e-mail communication between Envirotank and the CDPHE (September 26, 2011) Mr. David Snapp explained that the CDPHE HMWMD has determined that the reuse of tires is authorized by responding that "the use of waste mining tires as windbreaks and livestock feeders to be a beneficial use when there is an actual need for those items. Care should be taken to prevent ponding of water within the waste tires and to prevent the waste tires from catching on fire. Also, the proposed uses must be allowed by the local governing authority". In Colorado, the reuse of tires is considered a beneficial use.

When not managed properly, waste tires can present a hazard. Tire Mountain located north of Hudson, Colorado is an example of poor management of used tires. As reported by the Denver Post (October 20, 2011), Tire Mountain is one of the if not the largest waste tire pile in the country. Attempts to sell the tires for fuel to foreign countries has repeatedly failed and the owners are being investigated for fraud. It would seem that the reuse as a windbreak would be a more appropriate use than disposal or storage for future use as a fuel. Campbell County reportedly transports it's used tires from the landfill to North Dakota for use as a fuel in an incinerator. It was not reported if the net fuel consumption for the transport of the tires was more or less than the fuel value of the tires themselves at the incinerator.

It would seem that the reuse of tires for windbreaks, corrals, or snow fences would be a more appropriate beneficial use than for fuel or disposal in a landfill.

## **7.0 POTENTIAL REMEDIES**

The large off-road used tires are a beneficial use. Envirotank was asked to construct the windbreaks at the five locations by the lessee. The cost of removal of the tires was estimated, by Envirotank, to be on the order of \$350,000, plus the cost of labor and materials to load the tires at the five locations for transport. This would be an undue cost to Envirotank.

Over the past 20 years, recycling and reuse has been emphasized in the country, but it has always been at the core of the Wyoming ranching and farming communities. Our Subtitle D permitted solid waste disposal landfills have space and capacity limitations and are filling up. Many, such as Campbell County, do not accept tires for disposal. Rather, they employ costly and exotic methods to rid themselves of the nuisance (such as transporting tires to Colorado and North Dakota).

The windbreaks are located away from surface water bodies and groundwater is presumed to be too deep to be impacted. Abatement for the control of mosquito larvae breeding habitat could be considered and in fact, the DEQ previously approved the drilling of holes in the whole tires that could abate the accumulation of standing water (approval by DEQ 2008). Other mosquito larvae control could be considered.

I do not believe that the DEQ has identified other impacts from the windbreaks on human health and the environment. Based on my opinion, there is no indication, from my literature review and site observations, that there are any significant impacts.

## 8.0 SUMMARY AND OPINIONS

Based on the literature reviewed, there were 290 million used tires generated in 2003 and estimates for 2011 are over 300 million. Our solid waste disposal facilities are filling up and space is a valuable asset. In fact, the Cheyenne, Wyoming landfill is trucking its solid waste, including used tires, to Colorado due to space restrictions. Campbell County is transporting its used tires to North Dakota to be burned in an incinerator. Today, there is an increased emphasis in recycling by the solid waste management industry, particularly to recover the reusable products (such as paper, plastics, aluminum, and other compounds) and to maximize the space of existing landfills. In fact, these materials are recycled at my house, curbside, and to make it convenient and accessible, there is little need to segregate these wastes. As such, all of my neighbors support and participate in curbside recycling. Permitting new landfills is a costly enterprise, and in a way, the waste disposal facilities are maximizing their return on investment by recycling, while meeting the needs and desires of the public.

Reusing tires, especially large off-road mining and large equipment tires, is a beneficial use. The ranching community in Wyoming has found various uses for the tires, including windbreaks, corrals, stock watering tanks, playgrounds, and protective barriers. These uses are appropriate and are innovative.

In reviewing the decisions of the DEQ and subsequent guidance on used tires (Guideline # 21), in my opinion, it appears that the DEQ may have exceeded its authority in dictating a NOV for the reuse of the tires as windbreaks without considering the beneficial reuse derived. The mere title of the guideline "Standards for Scrap Tire Management" implies the tires are a waste to be handled as such. In fact, the DEQ Administrator has the authority to determine that the tires used as windbreaks are a beneficial reuse.

It is understandable that some residents may deem the windbreaks unsightly. When touring around Wyoming, I see many ranching and farming remnants that may also seem unsightly but I respect that ranchers' and farmers' right to put used products to beneficial reuse. There is also significant coal mining development, oil and gas development, and recently coal bed methane development in the region that some may consider to be unsightly.

No significant impacts to human health and environmental impacts have been reported. The windbreaks are located on relatively flat ground and there was no staining of soils that was identified during the site reconnaissance. The locations of the windbreaks are adequately removed from surface water features and there was no evidence that runoff from

the windbreaks discharged to any surface water bodies. Shallow groundwater is typically only associated with the actual stream alluvial/colluvial sediments, and would be localized and seasonal. Aquifers under the subject property would be deep and infiltration of water is restricted by underlying fine sediments (shale) of the Fort Union Formation. Studies on the impacts of crumb (pelletized) rubber at recreational field have indicated that the inhalation hazard would be negligible. Air quality impacts would also be negligible, since there are no receptors in the vicinity of the windbreaks and any contaminants would disperse easily. There would be a minor increase in fire hazard, but it is unlikely since the windbreaks are located far away from structures or inhabited dwellings.

Whole tires can retain ponded water after a rainfall or snowmelt runoff event. Standing water can contribute to mosquito larvae breeding habitat and the possibility of the West Nile Disease virus. There are many larger sources of standing water in the area. Many of these sources are stock ponds and reservoirs that have been approved by the State of Wyoming for the intended use. By far, these other sources of standing water present far more breeding habitat for the virus. Luckily, there have been no reported CDC cases of West Nile Disease in Campbell County. In any event, there are remedies that could be considered.

It is my opinion, that the constructed windbreaks are a reuse of off-road tires, and not disposal of a solid waste to a solid waste management facility. In any event and at a minimum, the windbreaks would qualify as a beneficial use under the Wyoming solid and hazardous waste regulations previously referenced.

It is my opinion that the reuse of whole or rubber tire tops from large off-road vehicles is an appropriate beneficial reuse of the tires. The condition of the windbreaks was good and all four of the constructed locations were in-tact. The conditions of the windbreaks could be inspected by DEQ periodically if the long term viability is a concern. Envirotank should construct the Windbreak location #5 or remove the tires, since this could be interpreted by DEQ, as time elapses, as inappropriate dumping of a solid waste.

Human health and environmental impacts (to land, water, and air), based on the site observations and literature reviewed, are assumed to be negligible. For the control of mosquito larvae breeding habitat and West Nile Disease, the water could be drained from the tires by drilling holes in the whole tires or the application of a larvacide to the inner portions of the whole tires could be considered. With all the other source of mosquito larvae breeding habitat (standing water) in the area, especially with the expansion of coal bed methane development and produced water issues, it would seem that any remedy required by DEQ would have no impact on the mosquito population in the area.

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It is my opinion that the windbreaks should remain in-place as they provide a valuable reuse of the large off-road tires that are typically generated at construction sites and at the coal mines in the area.

Sincerely,  
**Aquaterra Environmental Solutions, Inc.**



Jim Bowlby  
Senior Hydrologist  
Regulatory Expert

## **9.0 REFERENCES**

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## EXHIBIT "A"

**APPENDIX A**

**EXPERT WITNESS RESUME**

# James F. Bowlby, Jr.

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## **EDUCATION**

*Graduate Studies,  
Hydrology/Watershed  
Sciences, Colorado State  
University, 1977*

*B.S. Hydrology/Watershed  
Sciences Colorado State  
University, 1975*

## **EXPERTISE**

- Hydrology/Hydrogeology
- Permitting
- Agency Negotiation
- Regulatory Compliance and Compliance Audits
- Environmental Assessments
- Due Diligence
- Expert Witness Testimony
- Watershed & Storm water Management
- Remedial Design/Implementation
- Mitigation Measures & Best Management Practices

## **WORK HISTORY**

*Adaptive Environmental  
Solutions, Principal  
2010 - 2011*

*LFR, Inc.  
Principal Scientist, Operations  
Manager  
2008 – 2010*

*Tetra Tech EM Inc., Program  
Manager, 1999 – 2008*

*ENSR, Senior Program  
Manager, 1995 – 1999*

*Brown & Caldwell  
Environmental Services  
Manager, 1992 – 1995*

*Geraghty & Miller, Inc. Senior  
Scientist, 1989 – 1992*

*Peter Kiewit Sons, Inc.; Chief  
Hydrologist 1977 – 1989*

*U.S. Forest Service, Research  
Assistant, 1976 – 1977*

## **PROFESSIONAL EXPERIENCE**

Mr. Bowlby has more than 34 years' experience, 22 in consulting and 12 with private industry. He has been operations manager, department manager, chief hydrologist, environmental services manager, ARCS program manager, Air Force base-specific contract manager, project manager, and principal-in-charge on a broad array of environmental and capital improvement projects. His technical experience includes regulatory compliance, permitting, and agency negotiation; expert witness testimony; design and implementation of hydrogeological, hydrological, and sedimentation studies; watershed management projects; stormwater management; wetlands delineation and permitting; and reclamation/remedial design and implementation. Mr. Bowlby has also managed Phase I and II site assessments, compliance audits, and due diligence projects for manufacturing, construction, oil field, and mining properties; and property for transfer and mergers. He has led investigations and remedial evaluations for numerous private industry clients, State of Colorado municipal clients, U.S. Army, U.S. Air Force, U.S. Navy, and U.S. Environmental Protection Agency (EPA) Region 8.

## **PROJECT EXPERIENCE**

Mr. Bowlby's project experience includes the following:

### ***SITE ASSESSMENTS DUE DILIGENCE/UNDERGROUND STORAGE TANKS/NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE/ACM AND LBP***

- **Expert Witness Reports and Testimony. Waas Campbell Rivera Johnson & Velasquez.** The case involved the condemnation of two properties from Quadrant Properties LLC formerly known as the Denver Toluene Site (DTS) and Rocky Mountain News (RMN) printing site in Denver, Colorado. The Regional Transportation District (RTD) condemned the properties as part of the Burnham Yard Lead project just south of the Auraria college campus. Expert reports and testimony were focused on site history, regulatory status (including State of Colorado Voluntary Clean-Up Program [VCUP] status), groundwater and residual soil contamination issues (primarily tetrachloroethene), and the potential and costs of redevelopment of the properties.

- **Expert Witness Report and Testimony. Behre Dolbear on behalf of Featherstone Petrie DeSisto LLP.** The case in federal court involves a former uranium open pit mine located in the Pacific Northwest in the State of Washington that has been identified by U.S. EPA as a Superfund Site under CERCLA. The expert testimony involves the environmental permitting and compliance status of the mine located on Native American Tribal Lands, from the mid-1950's to the early 1980's. The open pit mine was permitted under the U.S. Department of Interior Bureau of Indian Affairs. The client is seeking insurance recovery for reclamation of the mine site pits, waste rock stockpiles, and the stockpiled ore. Acid rock drainage is one concern at the closed site.
- **Regulatory Compliance and Permitting Specialist. Pincock Allen & Holt.** Participated on a team assessing the regulatory status and cost implications for a confidential rare earth open pit mining and ore processing project in California. The mining company was seeking financial support from an international bank for start-up operations to support the 2010 public offering. The mine received county approval to resume mining in November 2010 and facilities upgrades are planned for 2011.
- **Regulatory Compliance and Permitting Specialist. Pincock Allen & Holt.** Participated on a team assessing the current regulatory status and reclamation bond cost implications for an existing open pit gold mine in Colorado. The objective of the annual confidential analysis was to certify the mine was in compliance with applicable federal, state, and local rules and regulations. A certification report was prepared for the mining company.
- **Regulatory Compliance and Permitting Specialist. Pincock Allen & Holt.** Participated on a team assessing the regulatory status and cost implications for an open pit coal mine located in southeastern Wyoming. In order to submit a competitive bid, the perspective confidential purchaser requested a review of the existing permitting and compliance status and an evaluation of the reclamation bond cost estimate. The mine site has been active prior to existing surface coal mining and reclamation federal and state regulations and an assessment of proposed and completed reclamation activities are being assessed prior to preparation of the bid package.
- **Regional Representative, Bank of America.** Provides technical and project management oversight for an array of projects including mold indoor air quality investigations and remediation, asbestos building inspections and abatement oversight, LEED certification, training, and other related regulatory compliance activities. Region includes New Mexico, Colorado, Utah, Arizona, and Texas. Contracting and oversight of subcontractors and internal resource personnel. Interfaces with BoA corporate personnel and CB Richard Ellis Facility Management partner for Boa.
- **Technical Manager, Defense Access Road (DAR) EA. Pueblo Chemical Depot.** Completed an EA with public meetings for the DAR for the Pueblo Chemical Depot in southern Colorado (in-progress). The sponsoring agencies are the CDOT and FHA. The decommissioning of mustard gas in compliance with International Treaties will require the treatment and disposal of hazardous waste. The DAR will be constructed for transport of the waste off-site.

- **Project Manager and Client Director, State of Colorado Voluntary Cleanup Program (VCUP) Plan. Quadrant Auraria Partners.** Developed a VCUP for the former Rocky Mountain News site south of Colfax Avenue and the Auraria College Campus and submitted to the CDPHE in February 2007. Additional monitoring wells were drilled and registered with the State of Colorado. The investigation included an investigation trench and sampling existing monitoring wells on the site and adjacent and downgradient of the site. The VCUP included an interim remedial plan that includes a permeable chemical reactive barrier. Implementation of the VCUP was completed in 2009 and a No Further Action letter received from the State of Colorado.
- **Technical and Task Manager, IUSA (Denison Mines) Tony M Mine EA and EA Checklist.** Completed the NEPA Checklist for the reopening of the underground uranium mine in southern Utah. The sponsoring agency is the U.S. DOI BLM Hanksville Field Office. The checklist was prepared under BLM Utah protocols. The EA (in-progress) will assess the impacts of the reopening of the mine, reactivation of the evaporation pond, new vents, and new facilities. The EA will rely on the Operations Plan submitted to the Utah DOGM and BLM. Included oversight of the cultural resource assessment. Uranium ore will be transported to the mill operated by IUSA.
- **Technical Lead Energy Fuels Corporation, EA for Underground Mine in western Colorado.** Provided expert assistance with an Environmental Assessment for the Bureau of Land Management for an underground mine located in western Colorado to be reopened under existing regulations. Technical resource and expert for the hydrology, hydrogeology, water quality, air resources, and transportation sections of the EA. Evaluated the mine Spill Prevention Control and Countermeasures Plan under U.S. Environmental Protection Agency requirements and Storm water Management Plan requirements under the Colorado Department of Public Health and Environment.
- **Compliance Assessor. Confidential Construction Company.** Mr. Bowlby conducted compliance assessments of gravel pit and asphalt batch plants in Colorado under client confidentiality protocols. The internal assessments were precipitated by a Department of Justice injunction against the company in a region outside of Colorado. The compliance assessment evaluated all air, water, and waste permitting issues and provided suggestions for program improvements.
- **Project Manager. The Industrial Company (TIC).** Provided support with a hydrocarbon release to soil and groundwater. Included the sampling soils in the release zone; and installation of additional monitoring wells, well sampling, and obtaining well permits with the State of Colorado. All assessment work was completed in compliance with the State of Colorado Division of Oil and Public Safety (OPS). Assisted the client with negotiations with the OPS.
- **Technical Lead, Due Diligence and Regulatory Compliance Assessment-Confidential International Oil and Gas Company.** Assessed liabilities and compliance issues for an international oil and gas company for sites in Utah, Texas, Wyoming, and Oklahoma. The client had sold several drilling and storage facilities to a company that had declared bankruptcy and the client's legal counsel was interested in assessing its potential liabilities and the compliance status of the facilities under client confidential conditions. The assessment

was completed over a two-month period of time for approximately 100 facilities. Data were limited since site-specific data had been transferred with the sale of the properties.

- **Technical Lead, Due Diligence and Regulatory Compliance Assessment-Confidential National Gas Company.** Assessed the compliance status of approximately 80 gas compressor stations and gas plants located in Utah, Texas, and Oklahoma prior to purchase for a Gas Company. The project included an intensive records review, aerial photography interpretation, sampling soils, subsurface drilling, and sampling surface water and groundwater to determine the potential environmental issues at these sites. In addition, the regulations in these states were evaluated against the current status of the sites to determine the compliance status of the facilities. A remedial cost estimate was provided and applied against the sale price. The project was completed over a two-month period of time under extremely tight schedule demands of the seller.
- **Technical Advisor and Quality Control, Buckley Air Force Base on Behalf of Hunt Brother Construction.** Completed an Environmental Baseline Survey (EBS) for an area within the Buckley Air Force Base that was to be redeveloped with private residential housing.
- **Program Manager, USDA Natural Resources Conservation Service.** Provided oversight and technical review support for the completion of Comprehensive Nutrient Management Plans for Area Feedlots (AFO's) in western and northeastern Colorado. The CNMP's were completed using NRCS guidance and protocols and were used in the planning for design and implementation of runoff controls.
- **Program Manager, USDA Natural Resources Conservation Service.** Provided program and contract oversight for the implementation of designs and runoff control structural for AFO's in eastern Colorado. Grants were provided to the producers under the federal government EQUIP program. Runoff control structures were designed for cattle and for dairy feedlots. The design support included floodplain analysis, runoff prediction analysis, and monthly reporting. All plans were reviewed by staff Professional Engineer and are to be stamped by NRCS State Engineer P.E.
- **Project and Technical Manager, Confidential Manufacturing Client.** Numerous Phase I ESA's under the ASTM Standard Practice E 1527-00 and E 1527-05. Several Phase II assessments evaluating floor and storm drain connectivity; subsurface conditions such as soil and groundwater contamination, and other process related acted activities in support of the purchase of manufacturing and distribution facilities. Including non-ASTM issues such as floodplains, wetlands, asbestos, lead-based paint and radon.
- **Project and Technical Manager, Confidential Investment Client.** Numerous Phase I ESA's under the ASTM Standard Practice E 1527-00 and 1527-05. Several Phase II assessments evaluating floor and storm drain connectivity; subsurface conditions such as soil and groundwater contamination, and other process related acted activities in support of the purchase of manufacturing and distribution facilities. Including non-ASTM issues such as floodplains, wetlands, asbestos, lead-based paint and radon. Also provided preliminary opinion on workers health and safety issues such as noise and confined space, as well as mold.

- **Technical Assessor, The Trust for Public Lands.** Evaluated several claims and previously mined areas in southern Colorado for transfer of land not currently under a State Attorney General Decree to the U.S. Forest Service. The Trust is a non-profit organization that is acting as an unbiased intermediary between the mining company and the USFS. Assessed historical documents at the local mining office located in Ouray, CO and county records for historical information. Reviewed historical topographic maps and aerial photographs and conducted site reconnaissance activities. Collected limited samples from surface runoff and existing tailings piles and analyzed samples for potential contaminants. The properties were recommended for transfer, with additional sampling proposed at some select locations.
- **Project Manager, U.S. Air Force Academy.** Project manager for conducting a Cadet Area Tunnel Asbestos Study for the U.S. Air Force Academy. Mr. Bowlby has lead the effort in to conduct an asbestos survey, including bulk sampling and labeling of all suspect asbestos-containing material (ACM) within the utility tunnels associated with the Cadet Area of the Air Force Academy for four phases of study over a 5 year period of time. Personal air sampling and analysis by Transmission Electron Microscopy (TEM) has also been collected during assessment and sampling activities. Tetra Tech developed a Quality Program Plan (QPP) which included the Work Plan (WP), the Health and Safety Plan (HSP), and the field Sampling and Analysis Plan (SAP). Tunnel Orientation Plan. Based on information provided in Academy drawings, Tetra Tech conducted an asbestos survey of over 15,000 LF of tunnels in two phases. Two additional phases of work have been completed for the heat plant and selected mechanical rooms in the Cadet Area. Samples were analyzed in layers by Polarized Light Microscopy (PLM) methods by an accredited laboratory. The Final Reports include a summary of findings and laboratory data provided in acceptable format to the Air Force Academy's RAPb database. Currently conducting Phase V of the project.
- **Project Manager and Client Director, The Nature Conservancy.** Providing technical oversight and project management for an array of due diligence projects typically to reassign large parcels of land as conservation easements.
- **Project Manager and Client Director, Peter Kiewit Sons-Kiewit Western Company.** Providing corporate Kiewit personnel support in assessing existing vendors and potential vendors liabilities under the corporate Kiewit approval process. Several sites evaluated in IL, IN, TN, and KY.
- **National Pork Producers Council-Compliance Audits.** Conducted audits in eastern Colorado for confidential clients to determine compliance with the NPPC Environmental Assessment Program.
- **Technical Resource/Reviewer and Asbestos Inspector, D.R. Horton Pillars of Fire Westminster, Colorado.** Conducted a screening level asbestos and lead-based paint assessment of 5 buildings on the property. Interviewed site personnel concerning potential environmental liabilities and reviewed the Phase I report. Reviewed and assessed geotechnical subsurface soil borehole drilling and prepared sand isopach and structure contour maps to evaluate potential and existing upgradient contaminant migration on-site.

- **Technical Resource, D.R. Horton Catellus Property, Commerce City, Colorado.** Conducted a peer review of existing documents and regulatory determinations for this property. Plans include the development of single or multiple housing at this property that is underlain by a contaminant plume of a by-product of nerve gas that was produced by the Rocky Mountain Arsenal (RMA) in the 1950's. TCE solvent has also been detected in the groundwater under the site. The RMA has established a North Boundary treatment system adjacent to the property. Concerns include health and safety, as well as plume migration and mitigation. Also provided technical review of the Phase I ESA conducted for this site.
- **Project Manager, City of West Valley, Utah Auto Properties Salvage Brownfields Redevelopment.** Managed the Phase II assessment activities at this Brownfields potential redevelopment site at the intersection of the proposed western beltway west of Salt Lake City. Installed 8 temporary wells and collected groundwater samples. Developed a "developers" brochure that identified the relevant issues at this site, including analytical data, to be distributed to potential redevelopers at site. Financial support for the project was from State of Utah development grants.
- **Project Manager, NPDES Groundwater Assessment Work Plan and Sampling and Analysis Plan (SAP) - Nebraska Public Power District.** Completed a Work Plan and SAP for a groundwater assessment for this active RCRA permitted facility. The assessment was required by the Nebraska Department of Environmental Quality (NDEQ) for the RCRA permitted ash disposal facility's proposed dike extension. The study included soil and groundwater sampling, including well installation and monitoring well permitting. The implemented study emphasizes the study of infiltration and communication potential to an underlying and regionally significant aquifer. The parameters were used in a HELP model simulation. A hydrogeologic assessment report was submitted to the NDEQ for review.
- **Technical Oversight, NEPA Transmission Line Project – Basin Electric Power Cooperative.** Provided technical oversight on a Proposed 230kV Transmission Line ER/EA near Rapid City, South Dakota for the Rural Utilities Service. Provided guidance to field teams and oversight of the technical aspects of the project. Included a PUC permit application to the Public Utilities Council.
- **Technical Expert, Testimony preparation for Power Utilities Commission and Flood Plain Study for Pennington County, South Dakota, Basin Electric Power Cooperative.** Prepared expert witness testimony for the Public Utilities Commission for the Rapid City DC Tie Project. Also prepared a 100-year floodplain study using the ACE HEC-2 flood model for Rapid Creek near Rapid City, South Dakota.
- **Technical Manager, NEPA Support for a 230 kv Transmission Line from Teckla to Carr Draw, Campbell County, Wyoming. Basin Electric Power Cooperative.** Environmental Assessment for the U.S. Forest Service Douglas, Wyoming for a 73.3-mile long power transmission line east of Gillette, Wyoming. Includes an assessment of the sensitive and management indicator species in the Forest Plan.

- **Technical Manager, Providing a Biological Assessment/Biological Evaluation for the Teckla to Carr Draw 230 kv Transmission Line in Campbell County, Basin Electric Power Cooperative.** Biological Assessment/Biological Evaluation for the U.S. Forest Service in cooperation with the U.S. Fish and Wildlife Service. Includes Threatened and Endangered Species, Sensitive Species, and Forest Management Species evaluation. Field surveys included winter raptor survey, swift fox survey, black-tailed prairie dog survey, and multiple mountain plover surveys.
- **Technical Oversight and Assistant Project Manager, NEPA Combustion Turbine and Microwave Tower Project – Basin Electric Power Cooperative.** Provided project management and technical oversight on a proposed ER/EA project for the Rural Utilities Service project in Campbell County, Wyoming. The project included 3 combustion turbines at different locations and two ancillary microwave towers to provide power to the local grid and to support coal-bed methane development power needs in the basin. Provided technical guidance to field teams, conducted field surveys, and provided oversight of the technical aspects of the project.
- **Technical Oversight, NEPA and Macro-Corridor Study – Basin Electric Power Cooperative.** Provided technical oversight on a proposed ER/EA project with scoping for the Rural Utilities Service project in Campbell County, Wyoming. The project includes a 70-mile long 230 kV transmission line and converter station east of Gillette, Wyoming. The transmission line will provide power to the local grid and to support coal-bed methane development power needs in the basin. Provided guidance to field teams, conducted field surveys, will conduct public meeting in the winter of 2001, and provided oversight of the technical aspects of the macro-corridor project, including technical review.
- **Technical Reviewer, NEPA Support for an 80-100 MW Simple Gas Turbine in Eastern South Dakota. Basin Electric Power Cooperative.** Environmental Assessment for the U.S. Department of Energy Western Area Power Administration (RUS Cooperating Agency). Included an EA and Biological Report.
- **Technical Manager, Environmental Assessment for Defense Access Road, Pueblo Colorado.** Development of reader-friendly EA and decision document for road extension and improvements in support of US Army Pueblo Chemical Depot weapons demilitarization program. Leads interagency team including representatives from Pueblo Chemical Depot, Pueblo County Public Works, Colorado Department of Highways. Responsible for scoping, agency interaction, public communication process, and FHWA acceptance of EA leading to Finding of No Significant Impact. This project will generate the first reader-friendly visual EA ever produced in Colorado and the third in the US.
- **Project Manager, Numerous Phase I and II Site Assessments in the Western U.S. - Various Private Sector, Property Management and Lending Institutions.** Managed the assessment of numerous Phase I site assessments under American Society for Testing and Materials (ASTM) standards. Many of the site assessments included asbestos sampling, radon and a few included lead issues (lead-based paint and lead in drinking water). Several of the sites required additional Phase II assessments, primarily addressing subsurface soil and groundwater issues. Projects were usually low cost and quick turnaround.

- **Assistant Project Manager, Nance/Brown Alluvial Valley Floor Environmental Impact Statement (EIS) - Ashland, Montana.** Managed the exchange of coal under the Tongue River Alluvial Valley Floor for Federal Coal under Bureau of Land Management (BLM) control for the Miles City, Montana BLM Area Office. Site was adjacent to the Northern Cheyenne Tribal Boundary along the Tongue River. The project was proposed as a Third-Party EIS for a private entity Montco.
- **Program Manager, Global Engagement Environmental Assessment (EA) - US Air Force Academy.** Managed Environmental Assessment for an in the field class instruction of wartime engagement of the enemy. Includes landing site development, patrols, and wartime simulations along the Front Range in Colorado. Issues include erosion and sedimentation, noise, and threatened and endangered species. Noise monitoring activities were conducted during and after the training activities to assess the potential noise impacts to local residents.
- **Program Manager, Jack's Valley Update Environmental Assessment (EA) - US Air Force Academy.** Oversaw the development of this Environmental Assessment Update to Jack's Valley at the U.S. Air Force Academy. Jack's Valley is the primary training area for cadets. A detailed Ecological Simulation Model (EDYS) was used to quantitatively assess the various impacts from more than 100 training activities and outside users of the valley. This project included the oversight of the modeling subcontractor and coordination of the Jack's Valley Users Group that was organized to determine the Academy's required end point uses and acceptable environmental consequences of the uses in the valley.
- **Project Manager, Water Supply Improvement and Assessment Project, Nebraska Public Power District Sheldon Station, Nebraska.** Conducted pumping tests and water quality sampling for nine existing 18-inch diameter production water supply wells at this electric generating power station. These studies were initiated to improve the produced quality of water and improve well efficiency. The testing also included video inspection on a number of the wells and conversion of two of the wells to submersible pumps. In addition, six pilot holes were drilled to a depth of approximately 300 feet and packer tests conducted at specific intervals to evaluate the water quality of this aquifer. Two additional production wells were drilled and completed in a specific zone of this aquifer where the water quality was optimal. Pumping tests and water quality sampling was conducted to calculate the specific yield of the wells for pump sizing and influent water quality during pumping.
- **Project Manager, Asbestos and Lead-Based Paint Assessment Program - Fort Carson, Colorado.** Pilot study for Army post under a Tulsa U.S. Army Corps of Engineers contract. Delivered asbestos and lead-based paint work plans and base-wide management plans. Conducted a pilot study for ACM and lead-based paint, developed and organized a database, and completed more than 30 additional full Asbestos Hazard Emergency Response Act (AHERA)/State of Colorado certified ACM inspections and abatement cost estimates.
- **Chief Hydrologist, Property Assessments to Evaluate Regulatory Compliance Issues - Peter Kiewit Sons' Company.** Responsible for evaluating numerous existing properties and prospective properties for regulatory compliance. The screening process was similar to Phase I environmental transactional screens and site assessments with the particular intention of avoiding costly compliance programs prior to purchasing properties. Involved in providing litigation support in numerous issues involving water-related issues.

- **Principal-In-Charge, Phase I Site Assessment - Ball Aerospace, Boulder, Colorado.** Provided oversight of a Phase I site assessment to enable properties to be sold or leased.
- **Chief Hydrologist, Environmental Assessment (EA)/Environmental Impact Statements (EIS) - S&G Mining Company, Montana and Nevada.** Conducted an EA and provided oversight for the development of an EIS to comply with NEPA for various mining properties.
- **Project Manager, Site Assessment - Colorado National Bank, Larimer County, Colorado.** Provided oversight for the installation of wells and sampling of groundwater and soil for a property downgradient of the Larimer County Landfill. Coordinated activities with county personnel and provided oral testimony in Larimer County Court on behalf of the client.
- **Project Manager, Site Assessment/Risk Assessment - Essex Group, Inc., Hoisington, Kansas.** Conducted a site assessment and preliminary risk assessment of a leaking process water pond containing metal wastes (primarily copper) and sludge.
- **Project Manager, Phase II Environmental Site Assessment - PPG Industries, Inc., Denver, Colorado and Kansas City, Missouri.** Conducted Phase II site assessments at two facilities. The results indicated that free diesel fuel product on the groundwater table was found at one facility located in Colorado. The other facility located in Kansas involved an asbestos abatement issue.
- **Site Assessor, Phase I Environmental Site Assessments - Confidential Client, Colorado, Wyoming, and Nebraska.** Worked with legal counsel to help a confidential client interested in divesting itself of numerous properties across the United States. Conducted Phase I site assessments on properties containing underground storage tanks (USTs), solid waste disposal facility, oil and gas wells, oil and gas transmission lines, abandoned surface and underground coal mines, farm wastes, and other environmental issues.
- **Technical Reviewer, Phase I and II Site Assessment - Chevron U.S.A., Western United States.** Reviewed numerous environmental site assessments for technical completeness for various retail outlets (gas stations).
- **Field Assistant, UST and Contaminated Soil Removal/Disposal - Walter Industries, Aurora, Colorado.** Provided site assistance and oversight with UST removal and soil removal/disposal for this gasoline and diesel fuel contaminated site.
- **Project Manager, Phase II Environmental Site Assessment - Young Electric Sign Company, Denver, Colorado.** Completed well installation, soil sampling, and groundwater sampling for this site. The site previously contained an UST and was located in a business park along Sand Creek.
- **Research Assistant, Assessment of Housing Development and Grazing Activities on Mountain Streams North of Woodland Park, Colorado - U.S. Department of Agricultural Forest Service, Rocky Mountain Experiment Station.** Collected surface water samples, measured streamflow, conducted laboratory analysis, and completed a groundwater monitoring well in this mountain region northwest of Colorado Springs, Colorado.

- **Chief Hydrologist, Rocky Mountain Region - Peter Kiewit Construction Company.** Conducted hydrogeological investigations, including drilling, aquifer pump tests, and groundwater quality sampling for production water wells for various construction projects.
- **Project Manager, UST Compliance Program and Database - Martin Marietta, Waterton Facility.** Developed a database of approximately 100 past and present USTs to assist with compliance with the State of Colorado UST Program.
- **Project Manager, UST Inventory and Database - Fort Carson.** Developed an UST database for Fort Carson, Colorado for use in inventory and assessment reporting and tracking. Database was compiled in Excel.

### ***STORM WATER***

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- **Technical Advisor/Quality Control Oversight, Storm Water Pollution Prevention Plans, Hunt Building Company (2004-2005).** Storm water pollution prevention plan preparation for the Buckley Air Force Base Housing Privatization Project. The SWPPP for this project encompassed local CDPHE requirements, EPA Region 8 requirements, US Air Force requirements, and the City of Aurora, Colorado requirements.
- **Technical Advisor, Storm Water Pollution Prevention Plans - Colorado, Arizona, and Wyoming - Federal Express.** Completed storm water pollution prevention plans for 20 Federal Express facilities subjected to the storm water regulations from outside storage, fueling, or truck washing facilities. The facilities were located in Colorado, Wyoming, and Arizona, and services included a dye tracer study at one facility and completion of Notice of Intent.
- **Technical Advisor/ Quality Control Oversight, Storm Water Management Plans – DR Horton (2004-2005).** Fourteen storm water management plans for DR Horton, Continental and Melody series. These storm water management plans are consistent with CDPHE requirements and multiple municipal separate storm sewer (MS4) programs throughout Colorado's Front Range.
- **Technical Advisor/Quality Control Oversight, Storm Water Management Plans, Construction Site Inspections, and Training – Remington Homes (2004-2005).** Provided technical oversight for the completion of seven storm water management plans for Remington Homes. These storm water management plans are consistent with CDPHE requirements and multiple municipal separate storm sewer (MS4) programs throughout Colorado's Front Range. In addition, the team conducted 14-day and post weather event inspections and trained on-site inspectors for Remington Homes.
- **Technical Advisor/Quality Control Oversight, NPDES Municipal Separate Storm Sewer Annual Reporting and Program Implementation (2004-2005) Douglas County School District and Academy 20 School District.** Annual reports and coordinated program implementation for these school districts to ensure compliance with CDPHE's municipal separate storm sewer requirements.
- **Municipal Industrial Discharge Permitting and Site Sampling, DR Horton Continental Series (2003-2005) Technical Advisor/Quality Control Oversight.** Completed permit

writing and industrial discharge sampling for the Alpers Farm infill home construction site in Littleton, Colorado. In addition to providing technical services for this project, Mr. Bowlby completed a wetlands assessment, 404 permit, species consultation with the Colorado Division of Wildlife, and asbestos building inspection.

- **Project Manager, Storm Water Permit Applications for Several Industrial Facilities - City of Colorado Springs, Colorado.** Completed individual storm water permit applications for facilities owned or operated by the city, including a maintenance shop, small landfill, bus terminal, sludge/fly ash disposal facility, and three electric power generating facilities. Prepared storm water sampling protocols and conducted internal training for city personnel. Proposed several storm water drainage modifications to reduce storm water pollution potential.
- **Project Manager, Storm Water Group Permit Application - Coors Ceramics Company.** A storm water group permit application was prepared under a very tight deadline. The sites were located primarily in Colorado, Tennessee, and in the southeast. A storm water sampling protocol was prepared and internal training conducted so plant personnel could collect samples. The application and storm water pollution prevention plan was coordinated with and implemented by facility personnel.
- **Project Manager, Sitewide and Flowing Adit Storm Water Permit Applications - Parcel, Mauro, Hultin & Spaanstra/Confidential Gold Mining Client.** Two storm water permit applications were prepared for this high altitude gold mine site located in southern Colorado. The first application was for a site wide storm water permitting and incorporated best management practices and monitoring already in place at the site. The second application was for discharges from two abandoned adits. It was argued that the flow increased substantially during snowmelt and precipitation runoff and was therefore representative of a storm water event. Of particular concern were low pH and metals concentrations that discharged to a cold-water fishery.
- **Project Manager, Storm Water Permit Application Evaluations - Martin Marietta, Various Facilities.** An evaluation was conducted of several Martin Marietta facilities to evaluate whether storm water permits were required. Some facilities met the requirements of the regulations, and others did not. Information was compiled to determine that no permit application was required. For instance, one site in Colorado (Deer Creek) required a permit application, while a second site (Broadway) did not, since all storm water was contained on site.
- **Project Manager, Storm Water Assessment and Sampling Programs - Martin Marietta, Waterton Facility.** A detailed storm water assessment was conducted 1 year before the Colorado regulations were promulgated. More than 75 storm water outfalls were identified. A sampling protocol was developed, and representative outfalls were sampled using grab and automatic sampling and flow monitoring equipment. A storm water permit application was prepared. During the evaluation, a few sites were discharging during the dry weather survey. Intrusive methods, such as dye testing, video inspection, and smoke testing, were used to identify the source of the discharge. As a result, the pipelines were either plugged or the source (usually cooling water condensate) was rerouted to the sanitary system. The cooling

water was a concern because of residual chlorine in the water and the potential harm to biota in the receiving waters.

- **Technical Advisor, Storm Water Audit - Monsanto, Dayton, Ohio.** Conducted a storm water audit of this chemical manufacturing facility. The results of the audit were incorporated into the facility's storm water permit application and pollution prevention plan.
- **Project Manager, Storm Water and Compliance Audit - Detroit Diesel, Cambridge, Ohio.** A storm water and compliance audit was conducted at this diesel engine manufacturing facility. The audit included locating storm water outfalls and review of existing best management practices and housekeeping at the site. The results were incorporated into the storm water permit application and pollution prevention plan. The application was used as a template for other Detroit Diesel facilities.
- **Technical Advisor, Storm Water Training - General Signal Company, Stamford, Connecticut.** Prepared documentation and training materials for corporate and facility personnel. The 1 day storm water training session was conducted at the corporate headquarters in Connecticut and included regulatory considerations, pollution prevention plans, and sampling protocols and procedures.
- **Technical Advisor, Storm Water Permit Applications - Hewlett Packard, Colorado Springs, Colorado.** Storm water permit applications were prepared for this components manufacturing facility in Colorado Springs, Colorado. A sampling protocol for facility personnel was prepared. The applications included pollution prevention plans for the facilities.
- **Trainer, Storm Water Training to Facility Managers - Kimberly Clark, Roswell, Georgia.** Prepared documentation and training materials for corporate and facility managers. The one-day training session was conducted at the corporate headquarters in Georgia and included an overview of various state and federal regulations, pollution prevention plans, and sampling protocols and procedures.
- **Technical Advisor, Storm Water Audit and Permit Application - Rhone Polenc, Cranbury, New Jersey.** A storm water audit was conducted for this New Jersey facility. A storm water sampling protocol was prepared for facility personnel. A storm water permit application was prepared and submitted. The application included sampling data and a pollution prevention plan for the facility.
- **Technical Advisor, Storm Water Audit - Alcoa Aluminum, Davenport, Iowa.** A storm water audit was conducted for this aluminum manufacturing facility in Iowa. The results of the audit were incorporated in the facility's storm water permit application and pollution prevention plan.
- **Project Manager, Group Storm Water Permit Application and Sampling Program - Safety Kleen Nationwide.** A group storm water permit application was completed for approximately 200 Safety Kleen hazardous waste storage and transportation facilities nationwide. A storm water sampling protocol was developed. Internal training was conducted for sampling approximately 25 facilities that involved 20 consulting offices. The internal training was conducted in Denver, Colorado, and included all aspects required for the

application, including outfall location, sampling techniques and demonstration, and pollution prevention audits. Automatic sampling and flow monitoring equipment was provided and used at most facilities.

- **Project Manager, Storm Water Permit Applications in Missouri - Safety Kleen.** Individual storm water permit applications were prepared for six Safety Kleen facilities in Missouri that were restricted by regulation from participating in the group application. The application included monitoring results and a storm water pollution prevention plan for each facility.
- **Principal-In-Charge, Storm Water Permit Application - Wright & McGill.** Prepared a storm water permit application for this fish hook manufacturing facility. A storm water sampling protocol was developed for facility personnel, and a pollution prevention plan was prepared and included in the application.

### ***MINING***

- **Technical Manager, Granite Gravel Quarry near Laramie, Wyoming – Martin Marietta Corporation.** Evaluated and assisted with the permitting of a gravel quarry operations in southeastern Wyoming. The evaluation determined that the underlying geology would prevent the migration of contaminants to groundwater. Included an assessment of best management practices for reclaimed areas and other permitting issues required by the Wyoming Department of Environmental Quality.
- **Chief Hydrologist, Community Liaison: Private Water Well and Water Supply Issues – Kiewit Mining and Engineering Company.** Evaluated water well complaints from private residents concerning impacts of blasting, water quality issues, and general well construction issues. Provided advice to private residents concerning improving water well yield, water quality treatment, and in some cases, installed new water wells for domestic, irrigation, or stock watering purposes.
- **Technical Expert, Expert Testimony before the Wyoming Department of Environmental Quality – Big Horn Coal Company.** Provided expert testimony before the Water Quality Control Board of the Wyoming DEQ regarding the impacts of blasting on private water wells. In addition, provided testimony on the post-mining impacts of mining on groundwater quality. The application to mine was challenged by the Powder River Basin Resource Council and a few private residences in the vicinity of the mine. The permit application was granted by the DEQ and mining proceeded. The Big Horn Mine continued to respond to private landowner complaints concerning blasting and investigated and successfully resolved approximately 10 additional complaints.
- **Chief Hydrologist, Drinking System Compliance for Several Mines - Peter Kiewit Sons' Company.** Provided Safe Drinking Water Act compliance and technical support for remote mine sites in the western United States. This effort ranged from the study and installation of wells (including well permits) and pumps to the establishment of sampling and reporting systems to comply with SDWA.
- **Chief Hydrologist, Coal Mining Permit Applications, Regulatory Compliance, and Reclamation Activities - Black Butte, Rosebud, Big Horn, Decker Coal Mines and Developing Properties.** Managed coal mining permit applications, regulatory compliance

and negotiation issues, and reclamation at several coal-mining properties located primarily in Wyoming, New Mexico, and Montana. Permit applications and permit compliance including monitoring well permitting and appropriations, pre-mining baseline studies, during-mining impact analysis, and post-mining reclamation and groundwater impact analysis. More than 500 monitoring and production wells were installed and monitored. Pre-mining studies involved assessment of all aspects of the hydrologic balance, particularly surface water and groundwater quantity and quality. Alluvial valley floor assessments were particularly emphasized where agriculture could be impacted. During-mining assessments ranged from blasting impacts to pit dewatering and discharge. Post-mining assessments included reclamation revegetation and erosion control, drainage reconstruction, and groundwater impact analysis from spoils. Other special projects such as final impoundment design and impact analysis to reduce reclamation costs and to provide recreation opportunities were also conducted.

- **Chief Hydrologist, Gold Mining Permit Application, Water Supply, and Heap Leach Design - Rawhide Mining Company Near Fallon, Nevada.** Assisted in preparation of a permit application for a heap leach gold mine near Fallon, Nevada. The project was a joint venture with Kennecott. Also investigated potential water supplies for this remote mine site and installed pilot wells, appropriated well permits, designed production wells, conducted water quality sampling/analysis, including aquifer pumping tests, and a step-drawdown test. The operation required a minimum of 1,000 gallons per minute for the heap leach and office complex. Assisted with the design of the heap leach pad leak detection system and other environmental issues.
- **Chief Hydrologist, Testimony in Federal Claims Court - Holland and Hart, Washington D.C.** The Montana Department of State Lands required the Decker Mine to change mining methods and pit dimensions from a strictly dragline operation to a dragline/shovel operation. This change and realignment increased the cost of mining and created a significant groundwater inflow problem to the pits. The existing contracts were challenged as a result of this unanticipated action and resulted in testimony before the Federal Claims Court in Washington, D.C.
- **Chief Hydrologist, Gravel Mine Permit Applications and Impact Analysis at Two Sites in Southeastern Wyoming.** Peter Kiewit Construction Group. Provided oversight with the application for a permit with the Wyoming Department of Environmental Quality at two sites in southeastern Wyoming. Gravel from the sites was used for highway construction. Also, studied the impact from the mining activity on adjacent landowners, with particular attention to groundwater.
- **Chief Hydrologist, Alluvial Valley Floor Coal Exchange - Peter Kiewit Sons' Company, Whitney Benefits Project, Wyoming.** Worked on the alluvial valley floor BLM coal exchange. Evaluated existing and potential water quality, hydrology, and hydrogeology issues and potential liabilities, and evaluated potential mine plan alternatives.
- **Hydrologist, Regulatory Compliance Activities - Phillips Petroleum Company.** Installed surface water monitoring system near Gillette, Wyoming. The system included the installation and renovation of parshall flumes and weirs, surface water flow, and quality

monitoring instrumentation in ephemeral and intermittent tributary streams to the Powder River.

- **Chief Hydrologist, Coal Mining Permit Applications, Regulatory Compliance, and Reclamation Activities - Black Butte, Rosebud, Big Horn, Decker Coal Mines and Developing Properties.** Managed coal mining permit applications, regulatory compliance and negotiation issues, and reclamation at several coal mining properties located primarily in Wyoming, New Mexico, and Montana. Permit applications and permit compliance including pre-mining baseline studies, during-mining impact analysis, and post-mining reclamation and groundwater impact analysis. More than 500 monitoring and production wells were installed and monitored. Pre-mining studies involved assessment of all aspects of the hydrologic balance, particularly surface water and groundwater quantity and quality. Alluvial valley floor assessments were particularly emphasized where agriculture could be impacted. During-mining assessments ranged from blasting impacts to pit dewatering and discharge. Post-mining assessments included reclamation revegetation and erosion control, drainage reconstruction, and groundwater impact analysis from spoils. Other special projects such as final impoundment design and impact analysis to reduce reclamation costs and to provide recreation opportunities were also conducted.
- **Project Manager Providing Assistance with Negotiating and Implementing a Compliance Agreement with the Colorado Attorney General's Office - Parcel, Mauro, Hultin & Spaanstra.** Managed negotiation and implementation of the compliance agreement in association with client's counsel for a confidential gold mining client. The negotiation included several interim and final reclamation and remediation issues under a very tight schedule. Under the agreement, the client was required to improve active wastewater treatment, evaluate passive treatment, implement interim corrective measures for acid mine drainage, improve runoff control, evaluate options to remediate the valley fill heap leach, and reclaim the site. Site conditions permitted access for reclamation activities only four to five months of the year. Permit and work plan acceptance by the agencies and the attorney general's office. On-site work activities were closely controlled and monitored.
- **Chief Hydrologist, Testimony in Federal Claims Court - Holland and Hart, Washington D.C.** The Montana Department of State Lands required the Decker Mine to change mining methods and pit dimensions from a strictly dragline operation to a dragline/shovel operation. This change and realignment increased the cost of mining and created a significant groundwater inflow problem to the pits. The existing contracts were challenged as a result of this unanticipated action and resulted in testimony before the Federal Claims Court in Washington, D.C.
- **Technical Advisor for Evaluation of Groundwater, Hydrological, and Permitting Implications of a Potential Purchase of a Copper Mine in Chile - Magma Copper.** Provided technical assistance to Magma Copper with the evaluation of the hydrological and hydrogeological implications of the purchase. Also, evaluated potential water supplies for the project.
- **Chief Hydrologist, Aquifer Testing for Groundwater Inflow Containment - NERCO Mining near Decker, Montana.** Conducted aquifer testing for groundwater inflow containment for an active NERCO mine in southeastern Montana. The study included aquifer pump tests and evaluation of aquifer hydraulic properties to assist with the design of pit inflow and groundwater containment structures.

- **Chief Hydrologist, Gravel Mine Permit Applications and Impact Analysis at Two Sites in Southeastern Wyoming - Peter Kiewit Construction Group.** Provided oversight with the application for a permit with the Wyoming Department of Environmental Quality at two sites in southeastern Wyoming. Gravel from the sites was used for highway construction. Also, studied the impact from the mining activity on adjacent landowners, with particular attention to groundwater.
- **Chief Hydrologist, Evaluation of the Potential Environmental Impacts Prior to Considering the Purchase of Mining Properties in the U.S., Peter Kiewit Sons' Company.** Evaluated environmental consequences and state regulatory climate for the potential purchase of surface and underground coal mining properties in the western and eastern United States, gold mining properties in Montana and Nevada, and oil shale properties in Colorado.
- **Project Specialist, Abandoned Mine Reclamation, Montana Department of State Lands, Abandoned Mine Lands Division.** Worked on the design and assessment of spoil pile stabilization and mine adit discharge control near Red Lodge, Montana. The project included the removal of spoil piles located in critical floodways and stabilizations by reconfiguring, applying suitable growth media, and reseeding spoil piles. The project also included an assessment of the impacts of flowing adit groundwater discharges on receiving water quality and an assessment of the potential to close and stabilize adits. The project included construction oversight and field verification.
- **Chief Hydrologist, Mining Regulatory Compliance - Olinghouse Gold Mine, Peter Kiewit Sons' Company.** Worked on various compliance issues for this gold mine near Reno, Nevada. The projects included waste handling, permitting, and preliminary environmental impact assessment.
- **Chief Hydrologist, Alluvial Valley Floor Coal Exchange - Peter Kiewit Sons' Company, Whitney Benefits Project.** Worked on the alluvial valley floor BLM coal exchange. Evaluated existing and potential water quality, hydrology, and hydrogeology issues and potential liabilities, and evaluated potential mine plan alternatives.
- **Technical Expert, Expert Testimony Before the Wyoming Department of Environmental Quality – Big Horn Coal Company.** Provided expert testimony before the Water Quality Control Board of the Wyoming DEQ regarding the impacts of blasting on private water wells. In addition, provided testimony on the post-mining impacts of mining on groundwater quality. The application to mine was challenged by the Powder River Basin Resource Council and a few private residences in the vicinity of the mine. The permit application was granted by the DEQ and mining proceeded. The Big Horn Mine continued to respond to private landowner complaints concerning blasting and investigated and successfully resolved approximately 10 additional complaints.
- **Chief Hydrologist, Drinking System Compliance for Several Mines - Peter Kiewit Sons' Company.** Provided Safe Drinking Water Act compliance and technical support for remote mine sites in the western United States. This effort ranged from the study and installation of wells and pumps to the establishment of sampling and reporting systems to comply with SDWA.

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**TELECOMMUNICATIONS**

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- **Regional Manager, Comcast Communication.** Regional manager and project manager for several work orders in the region for Comcast, including SPCC plans, Tank permitting, Air APEN permits, Asbestos Building Inspections, Mold oversight, and other regulatory permitting tasks. Provides technical resource and technical review and oversight to a vast array of projects.
- **Project Manager/Regional Manager, Confidential Telecommunications Client.** Rapid response to a site in Pueblo, Colorado where the subcontractor had excavated fill material that would not be accepted by the local landfill for disposal. responded, Soil/fill materials were collected for analysis from the waste pile, contracted with a backhoe company and excavated a trench. In the trench, samples were screened with a PID, a depth to groundwater was measured in an adjacent well, and samples were collected from the trench. Assisted client in getting approval from the local landfill for disposal, arranged for the transport of the materials, and assisted with a thorough analysis of potential liabilities associates with the installation of a tower at this location.
- **Contract Manager, Qwest, April 2004 - 2008.** Contract manager for Qwest national contract. Projects typically include regulatory compliance; building assessments for asbestos, LBP, and other issues; corporate template development; small cleanup projects such as drains and sumps; and risk assessment. Negotiating new national contract for 5 year contract extension. Worked with all Qwest regional environmental managers and corporate real estate personnel on a broad array of projects including asbestos building inspections, SPCC plans, vault cleanouts, UST/AST permitting and leak detection system installation, rapid response, commuter trip reduction program, carbon emissions inventory, and various state and federal permitting assistance.
- **Project Manager/Regional Manager, Confidential Telecommunications Client.** Completed SPCC plan for a new Above-Ground Storage Tank at a switch located south of Denver. The tank was installed without pre-construction approval from the South Metro Fire District and provided assistance in gaining approval. Conducted spill response and SPCC annual training for facility personnel and established the monthly inspection procedures and documentation. Also, obtained a permit from the State Agency for the AST. Completed a Chemical Safety Plan for this tank in compliance with the Uniform Fire Code and the South Metro Fire Rescue.
- **Project Manager/Regional Manager, Confidential Telecommunications Client.** Assisted client with Vaulted AST permitting issues at switches located south and north of Denver, Colorado. Conducted confined space entries at two sites, removed and disposed diesel fuel-contaminated rainwater from the vaults, inspected the tanks, and developed plans and specifications since existing drawings could not be found by client. Assisting client with various permitting issues for these tanks and is in the process of completing SPCC plans for the vaulted tanks. Developed emergency evacuation plans for these facilities. Assisting client by overseeing contractors that will install leak detection instrumentation in compliance with State Tank Regulations and assisting with the modification of landscaping at these sites to eliminate the source of water to these vaults.

- **Project Manager/Regional Manager, Confidential Telecommunications Client.** Conducted inspections at over 70 city and county of Denver cellular sites for the Denver Fire Department. Completed Hazardous Materials Inventory Statements and Hazardous Materials Management Plans for these sites in compliance with the Uniform Fire Code and local ordinances. Provided spill response and notification training for client's cellular site technicians responsible for these sites and integrated quarterly inspections during the technicians regularly scheduled maintenance activities for these sites.
- **Project Manager/Regional Manager, Confidential Telecommunications Client.** Conducted inspections for 44 south and over 30 west Denver-metro cellular sites for the South Metro Fire Rescue. In the process of completing Chemical Inventory Statements and Chemical Safety Plans for these sites in compliance with the Uniform Fire Code, International Fire Code and local ordinances. Also designed and implemented a similar program in the Salt Lake City-metro area. Developed and implemented training program for cellular site technicians responsible for these sites.
- **Project Manager/Technical Reviewer, Confidential Telecommunications Client.** Conducted due diligence Phase I site assessments at numerous sites in Wyoming, Colorado, Idaho, and Utah. Completed NEPA checklist and agency reviews under NEPA for these sites. Presently working on two Phase II site assessment follow-ups and compliance issues with the State Historical Society.
- **Project Manager/Asbestos Inspector, AirTouch Cellular.** Rapid response to a site located in downtown Denver where the contractor for client responsible for retrofitting the basement of an apartment complex for a cellular site encountered suspicious-looking thermal system insulation. The contractor encountered these suspicious materials and the materials were sampled for and contained asbestos. The asbestos was apparently removed by the owner of the apartment. Also, sampled contractors roll-off for asbestos-containing materials and provided advice to the contractor on disposal options.
- **Technical Advisor/Reviewer, Commnet/AirTouch Cellular.** Completed Tier II reports for over 350 sites formerly owned by Commnet. Commnet was acquired by AirTouch Cellular prior to the merger. These sites were located in 16 states in the western and mid-western U.S. Completed the Tier II reports for these sites in 20 days and submitted the reports on time. Also, developed a Microsoft Access database for the Tier II reports to assist client with reporting in subsequent years.
- **Regional Manager, Confidential Telecommunications Client.** Provided regulatory support for a number of miscellaneous issues, including local fire ordinances, waste disposal, confined space and OSHA issues, and state and federal permitting issues. Provided various pollution prevention strategies and provided advice on the location of future cellular sites. Assisting with the evaluation of other related compliance issues.
- **Assistant Contract Manager/Regulatory Specialist, Qwest.** Provided regulatory review of several federal regulations for corporate staff at a national telecommunications company. The reviews are used in establishing corporate policies and procedures.

- **Technical Reviewer/Asbestos Inspector, Nextel and Qwest.** Conducted numerous Phase I and II site assessments for two national telecommunications companies. Conducted NEPA reviews at these sites. Conducted a limited asbestos survey at one of the facilities.
- **Assistant Contract Manager/Technical Expert, USWEST.** Assisted the corporate EH&S group at a national telecommunications company in establishing their national SPCC program. Included establishing a template to be used by all company personnel, inspections at over 20 facilities, development of SPCC plans at these facilities, and development of action items for regulatory compliance at these facilities. Assisted in developing a SPCC training program for company personnel, with emphasis on spill response.

#### ***WATER AUDITS AND ASSESSMENTS***

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- **Chief Hydrologist, Various Coal and Gold Mines in Wyoming, Nevada, and Montana.** Conducted complete hydrologic balance assessments of several active and proposed mines in these western states. Included provided an influent potable water source by installing groundwater production wells, water well permits and appropriations, assessing shop and office water needs, monitoring for Safe Drinking Water Act compliance, and predicting and monitoring discharges under an NPDES discharge permits. Included installing flow monitoring devices, including weirs or flumes, to measure effluent flows. Evaluated containment pond efficiencies, including florescent dye studies and instituted pond modifications to eliminate retention short-circuiting. Land application practices were also implemented to reduce discharges and the impacts to vegetation, soil, and groundwater were preliminarily evaluated.
- **Project Manager, Sutherland Ethanol Plant.** Evaluated water inflow, plant water usage, and outflows at an ethanol production plant in Nebraska. Potable water was provided by a water well and the focus of the audit and evaluation was to eliminate discharges. Plant processes included personnel use, boilers and blow down, and cooling towers. Effluent was discharged to two unlined ponds. The effectiveness of the unlined ponds, evaporative rates, and potential leakage to groundwater was assessed.
- **Project Manager, Wright McGill.** Potable influent water and discharge to the Denver Metro wastewater facility was assessed for this fishhook manufacturing facility. Monthly potable water bills and influent quantity was compared to effluent quantity. Process use for manufacturing was also determined. The audit determined that the effluent quantity was over predicted, due to the improper installation of a Palmer Boules flume and a new flume was installed. The result was a significant savings in discharge fees and compliance with Denver Metro pre-treatment regulations.
- **Technical Water Lead, Confidential Timber Mill.** The uses and discharge of water were assessed for this South Dakota timber mill. The processing of coniferous pine trees into wood products utilizes a significant amount of water. The assessment focused on water conservation and removing potential sources of discharge to the near-by perennial stream.
- **Project Manager, Nebraska Public Power District.** Conducted water audit and assessment for a coal-fired power plant south of Lincoln, Nebraska. Included assessment of the plants potable groundwater supply, processes including blow down and cooling

towers, discharge retention pond, and other potential water losses at the plant. Since the plant depended on 9 existing production water wells that were installed in the 1960's, water conservation was essential. Replaced one of the process wells with a 18-inch diameter well, evaluated efficiencies in the cooling process, and evaluated various other methods of detainment since discharges did not consistently meet in-stream standards during the duration of in-stream low flow conditions.

- **Project Manager, Aquilla (formerly West Plains Energy) Power Plant in Liberal, Kansas.** Assessed influent water and discharges to an unlined pond system. Water was utilized in cooling towers and the recycling of cooling water was essential to conserve water and to reduce the quantity of effluent. The focus of the study was to reduce the quantity of water discharged to the unlined retention pond. Water was discharged to the pond and the potential toxicity of the cooling tower water was assessed.
- **Project Manager, Parcel, Mauro, Hultin & Spaanstra.** Conducted inflow versus effluent water assessment for a confidential gold mine in Colorado. Influent water included surface water run-on to the site, pit water, and process water. The assessment focused on reducing influent water by diverting clean water run-on and by reducing the quantity of process water generated in the processing of the gold. Since the wastewater treatment plant was near capacity, the reduction of the quantity of water was paramount to the success of meeting effluent standards without replacing the existing wastewater treatment facility.
- **Regional Manager, Confidential Telecommunications Client.** Existing lawn and landscaping watering activities was entering vaulted diesel tanks through the manhole covers and saturated soil infiltration. The water in these vaults had to be periodically pumped to a vac-truck and treated at an off-site facility, at considerable expense. To effectively remove the source of the water and to conserve water, the landscaping was modified and redistributed, to remove the source of the water in the vaults.

#### ***CLEAN WATER ACT***

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- **Technical Lead, Colorado Discharge Permit System (CDPS) Storm water Permits and Storm water Management Plans. Various Private Developers.** Assisted with the development of permits and SWMP's for several development sites in Colorado, particularly along the Front Range. Plans incorporated drainage plans and erosion control BMP's provided by civil design firms, management of solid and hazardous materials, inspection requirements, reporting requirements, and various other related permit compliance issues.
- **Technical Lead, CDPS Municipal Separate Storm Sewer System (MS-4) permits, annual reports and compliance activities. Douglas County School District and Academy School District.** Developed annual reporting requirements and actions to meet the MS-4 requirements of the school district's MS-4 permits for the school campuses over 1000 students. The State has prepared a list of 5 compliance areas and assisted the school district with each area of compliance. Included site-specific activities such as storm sewer identification, specific BMP's for chemical and fertilizer usage, and school curriculum requirements.

- **Project Manager, NPDES Compliance and Production Well Monitoring Program - West Plains Energy, Mullegren Station, subcontractor to Regulatory Management Inc.** Developed Work Plan to implement a NPDES Compliance program. The implementation of the Work Plan includes sampling the stream and discharge to evaluate the impacts of discharges during low flow conditions and improvements to the production well influent quality. In addition, the wastewater streams from the plant and cooling towers was sampled and evaluated. The algorithm for pumping the well field was modified to take advantage of better influent quality wells geographically and by modifying the duration of pumping and pumping rate. Production wells are sampled the changes in quality are being evaluated to further improve influent quality for the well field.
- **Project Manager, NPDES Compliance and Production Well Monitoring Program – Nebraska Public Power District Sheldon Station.** The effluent wastewater streams from the cooling towers and other wastewater sources were sampled and data evaluated to identify the water quality of each waste stream prior to discharge to a holding pond and discharge to Salt Creek upstream of Lincoln, Nebraska. Once the quality was determined, specific activities were implemented to improve the effluent quality. These activities included product substitution, operational changes, and improvement of influent water quality. The improvement of influent water quality from the production well field included changing production well algorithms to only utilize wells with acceptable quality and modifying the duration of pumping in several of the existing wells, the redevelopment of one well, installation of grout in the lower portion of the screened interval of a second well, and the construction of one addition production well using current well installation practices and screening only a portion of the water bearing zone, including well permitting and re-appropriations. To date, the facility has been successful in meeting WET tests and has met discharge quality limitations in their existing NPDES permit.
- **Project Manager, National Pollutant Discharge Elimination System (NPDES) Compliance and Criteria Manual - Martin Marietta, Waterton Facility.** Worked on various NPDES discharge permits issues including interpretation of key elements of the permit, evaluation of acceptable and unacceptable treatment alternatives, and development of an internal criteria manual for use by treatment plant operators. The manual addressed compliance and operations and maintenance issues to help internal operations and ensure compliance.
- **Chief Hydrologist, NPDES Permit Application and Compliance - Big Horn Coal Company.** Reviewed and prepared responses to EPA's proposed NPDES permit applications every 5 years for this mine site in Wyoming. Worked with mine personnel to ensure compliance with the permit and assisted with negotiating specific terms of the permit with the Wyoming DEQ. Installed all monitoring equipment required for compliance. Also evaluated impacts to the receiving perennial stream by collecting data regularly from the discharge points and stream and assessing mass balance upstream and downstream of the discharges.

- **Chief Hydrologist, NPDES Permit Application and Compliance - Decker Coal Company.** Reviewed and prepared the response to the NPDES permit applications every 5 years for these mine sites in Montana proposed by the State of Montana, Water Quality Bureau. Of particular concern to the company State of Montana, Water Quality Bureau proposed was the state's nondegradation provisions. In addition, negotiated acceptable mass loadings for various constituents (particularly selenium and mercury) with the agency. Installed all monitoring equipment required for compliance. Also evaluated impacts to the receiving Tongue River Reservoir, which is used for irrigation and as a warm water fishery, by collecting data regularly from the discharge points and stream and assessing mass balance upstream and downstream of the reservoir.
- **Project Manager, NPDES Compliance and Feasibility of Land Application - Parcel, Mauro, Hultin & Spaanstra/Confidential Gold Mining Client.** In support of an attorney general's negotiated compliance program, managed the feasibility studies for land application and passive wetlands treatment for this confidential high altitude mine site in southern Colorado. The existing wastewater treatment facility was unable to consistently comply with water quality standards for silver and copper. The feasibility of land application was explored with limited success. The feasibility of passive wetlands construction was feasible during warm weather; however, the feasibility was not promising during cold winter months. A combination of wastewater plant efficiency improvements, along with land application and limited bench scale tests for constructed wetlands, was proposed and partially implemented at this site.
- **Project Manager, Spill Prevention Control and Countermeasure Plan - Martin Marietta, Deer Creek Facility.** To comply with this provision of the Clean Water Act, a Spill Prevention Control and Countermeasures (SPCC) plan was developed for this site. The plan included a leak detection plan, secondary containment, spill control procedures/equipment, and general housekeeping measures. The overall cost to the client was minimal for compliance, and internal training was conducted to ensure readiness and compliance.
- **Project Manager/ Principal-In-Charge, NPDES Compliance Regarding Discharges from Plant and Remediation Wastewater Treatment System - Eagle-Picher Industries, Inc.** Provided technical negotiation, and compliance support for the process wastewater and remediation wastewater treatment systems. Wastewater at the site is treated before being discharged to the publicly owned treatment works (POTW). Of particular concern in the process wastewater was sulfate and metals and in the remedial system pH adjustment. Nitrate was a concern from both systems. The support also included sampling the sewer line pipe system from the plant to the POTW to ascertain the level of natural denitrification in the system and to identify other unknown sources in order to obtain higher discharge loadings in the permit.
- **Project Manager, NPDES Compliance and Groundwater Monitoring Program - West Plains Energy, Judson Large Station, subcontractor to Regulatory Management Inc.** Provided regulatory compliance and agency negotiation support with provisions of the power plant's NPDES permit. The plant utilizes treated groundwater as cooling water. It was in the best interests of the client to maintain a no surface water discharge status at the plant. A groundwater monitoring program and modifications to the plant's total containment lagoon system was required to demonstrate compliance with the state pond liner policy. Wells were

drilled and sampled, and aquifer tests completed to demonstrate that the underlying alluvial and Ogallala aquifers were not affected.

- **Project Manager, Assistance with Pretreatment Compliance from Industrial Wastewater Treatment Facility - Wright & McGill Co., Commerce City, Colorado.** Provided compliance and negotiation support with the local wastewater utility pretreatment compliance group. Process wastewater from the electroplating operation is treated and discharged to the POTW. The facility received a notice of violation for quantity of flow and constituent mass loading. Installed a new flow monitoring device under restrictive conditions, conducted an internal water balance study, and demonstrated compliance with the existing pretreatment permit and persuaded the municipal agency to waive all actions against the client. Also managed several minor modifications to the pretreatment plant in order to comply with the permit conditions.

### **WASTEWATER**

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- **Project Manager, Evaluation of the Effectiveness for the Removal of Silver and Copper from Existing Wastewater Treatment Facility - Parcel, Mauro, Hultin & Spaanstra/Confidential Mining Client.** Managed the study of, and modifications to the wastewater treatment system at this high elevation mine site. The existing standard polymer and settling system was periodically unable to reduce metal concentrations (particularly silver and copper) below discharge limits. The treated wastewater discharged into a cold-water fishery. The minor modifications included physical changes to the system, development of an operations and maintenance program, and operator training. The changes improved the overall operation of the system and consistency in meeting NPDES permit requirements; however, other means of meeting standards for metals (land application, constructed wetlands, major plant modifications, and changes to the in-stream classification based on metals speciation) were evaluated to increase compliance.
- **Project Manager, Operations and Maintenance for Existing Wastewater Treatment Facility - Martin Marietta, Waterton Facility.** Managed development and refinement of an operations and maintenance manual for this industrial and domestic wastewater treatment system. This system treated domestic wastewater using activated sludge/trickling filters from the facility with an employee population of up to 10,000 people. Industrial wastewater from various sources such as a chem mill, groundwater interceptor system, and drummed waste were also treated by batch treatment and combined with the domestic discharge. An operations and maintenance manual was prepared to improve plant efficiency and to provide operator training. The manual included items such as regular maintenance, equipment change out, effluent quality compliance, and other issues specific to the treatment process needed.
- **Project Manager, Phosphorus Removal Study - Martin Marietta, Waterton Facility.** Managed the study of phosphorus sources to the domestic and industrial sections of the wastewater treatment plant and potential improvements to the treatment process. The treated effluent was discharged into a tributary of the South Platte River upstream from Chatfield Reservoir. The Denver Regional Council of Governments sponsored a study of phosphorus sources upstream of the reservoir that led to increasingly more stringent limits to point sources of phosphorus. We evaluated product changeout that would result in less phosphorus in the wastewater streams, improvements to plant efficiency, and improved treatment technology

(such as the induction of dissolved oxygen at various locations in the plant). Many of the recommendations were implemented, which resulted in compliance with phosphorus limits imposed in the NPDES permit.

- **Project Manager, Hazardous Waste/Industrial Wastewater/Sludge Compliance Program - Martin Marietta, Waterton Facility.** Provided services to support management of the industrial and domestic wastewater treatment program for the Waterton facility. Services included NPDES compliance, disposal of listed hazardous waste sludge, plant efficiency improvements for removal of phosphorus, and tracking and segregation of wastewater containing hazardous constituents into the industrial wastewater or hazardous waste storage/disposal waste streams. Measured flow in domestic and industrial sewer lines and developed water balances. Also, evaluated sludge removal options from the previous used aeration basin and potential for contaminant leakage into underlying soils.
- **Project Manager, Provide Assistance with 503 Sludge Disposal Program - City of Colorado Springs, Colorado.** Provided technical assistance to the city before and after the submittal of a 503 permit application to EPA Region 8. In the 1980s, a Denver consultant designed the sludge disposal facility. After the facility was completed, the city constructed a total containment dam to contain surface and groundwater on site. Subsequent studies by the U.S. Geological Survey-Pueblo (USGS) determined that the dam leaked and that nitrate concentrations in groundwater upgradient of the dam were more than 100 times greater than background. Assisted the city in preparing the 503 sludge disposal permit application and, as a subcontractor to a Denver geotechnical firm, designed and implemented a barrier trench remedy to minimize the potential for future groundwater leakage off site.
- **Project Manager/ Principal-In-Charge, Compliance and Assistance with Existing Plant and Remediation System Wastewater Treatment System - Eagle-Picher Industries, Inc.** Assisted facility personnel by providing technical assistance with implementation of a groundwater extraction treatment system. The system included completion of the extraction well, well permits, and water appropriations for the pumped water to be treated. The system was designed to adjust pH, provide sedimentation/flocculation treatment, and stripping of PCE. Provided periodic assistance with removal of metals from the process wastewater treatment system. Also provided assistance with the efficiency of nitrate treatment in the process wastewater system.
- **Project Manager, Facilities Operations Plan, Mullergren Station - West Plains Energy.** Developed a facilities operations plan for a groundwater treatment system. The system was designed to treat groundwater for boiler cooling water and blowdown. The operations plan included a specific treatment operations protocol, operations and maintenance, waste disposal, and training requirements. Brine from the treatment process was discharged to an evaporation pond. The sludge (mostly waste lime) was removed periodically and dried and stored on site. The plan also discussed waste handling practices.

#### **RCRA/CERCLA**

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- **Project Manager, Dike Extension Permit Application - Nebraska Public Power District.** Completed a Work Plan and SAP for a groundwater assessment for an active ash disposal RCRA permitted facility. The assessment was required by the Nebraska Department of Environmental Quality (NDEQ) for the RCRA permitted ash disposal facility's proposed

dike extension and included the installation of monitoring wells, implementation of pumping tests and water quality sampling, and evaluation of fate and transport of contaminants from the clay-lined disposal facility. The study emphasized infiltration and communication potential to an underlying and regionally significant aquifer. The parameters were used in a HELP model simulation. A hydro-geologic assessment report was submitted to the NDEQ for review.

- **Project Manager, Hazardous Waste, PCB, Lead Based Paint (LBP), and Asbestos Management Plans - Fort Carson, Colorado.** Developed the format and worked cooperatively with Fort Carson personnel to assemble the data to develop these four management plans. The overall intent of these plans was to identify responsibilities and to guide Fort Carson personnel in the handling and management of these materials and wastes to ensure compliance with federal, state, and Army regulations (Regulation 200-1). Each plan was reviewed internally by all Fort Carson personnel who will be responsible for implementing them and comments were incorporated to expedite buy-in from all parties involved.
- **Project Manager, Hazardous Waste Management Plan - Martin Marietta, Waterton Facility.** Worked with regulated materials, compliance, and wastewater departments to design an implementable hazardous waste management plan that would eventually result in waste storage on site for less than 90 days. The primary hazardous wastes generated include hydrazine, hexavalent chromium, metals, and volatile organic compounds. Waste stream identification, waste management, and contingency planning were emphasized.
- **Project Manager, Resource Conservation and Recovery Act (RCRA) Part A/B Permit Application - Martin Marietta, Waterton Facility.** Worked with facility personnel to develop a Part A/B Permit Application to comply with RCRA requirements. The facility included a container storage unit for the storage of hazardous waste.
- **Project Manager, Annual Groundwater Quality Assessment Reports and Remediation Oversight for Regulated Facilities - Martin Marietta, Waterton Facility.** Developed hazardous waste contingency plan for RCRA-regulated facilities including two surface water impoundments that stored volatile organic compounds, chlorinated solvents, and metal wastes. Leaks from these facilities contaminated underlying groundwater downgradient of the facilities. The annual report addressed trends in groundwater quality and quantity downgradient of the facility. Both facilities have since been remediated and closed under RCRA.
- **Project Manager, Hazardous Waste Contingency Plan - Martin Marietta, Deer Creek Facility.** Developed a hazardous waste contingency plan for the Deer Creek facility.
- **Project Manager, RCRA Part A/B Permit Application - U.S. Air Force Plant PJKS.** Developed a Part A/B permit application. The facility included a hydrazine waste storage unit and an abandoned Open Burning/Open Detonation unit.
- **Project Manager, Hazardous Waste Management Plan - U.S. Air Force (USAF) Plant PJKS.** Worked with Martin Marietta and USAF to develop a hazardous waste management plan that concentrated on waste stream identification and contingency planning.

- **Project Manager, Closure Plans for Open Detonation/Open Burning and Hydrazine Storage Units - U.S. Air Force Plant PJKS.** Developed closure plans for two RCRA-regulated impoundments and facilities. The design emphasized the need for close health and safety supervision because of the potential explosive nature of the wastes.
- **Project Manager, Hazardous Waste Storage Unit Closure Plan - Martin Marietta, Waterton Facility.** Developed a closure plan to close and remediate a storage unit that did not fully meet RCRA requirements. Proposed new storage unit using existing on-site facilities.
- **Project Manager/Principal-In-Charge, RCRA Corrective Measures Remedial Action Plan Study - Eagle-Picher Industries, Inc., Colorado Springs, Colorado.** Project oversight of a remedial action plan to address groundwater and soils contamination. The groundwater plume consisted of caustics, metals, and nitrate contaminants. An overlapping tetrachloroethene (PCE) plume was considered in the remedial design. The project included groundwater modeling using MODFLOW, installing a groundwater pump and treat system, and negotiating with EPA and the Colorado Department of Public Health and Environment. Also provided assistance with soil sampling and negotiating soil cleanup standards (Ni and Cd) to achieve clean closure for siting the wastewater treatment system building. The groundwater discharges to a community drinking water supply.
- **Project Manager/Principal-In-Charge, Annual Groundwater Quality Assessment Plan - Eagle-Picher Industries, Inc., Colorado Springs, Colorado.** Project oversight of Annual Groundwater Quality Assessment Plan Reports for review by the State of Colorado and EPA. Project included evaluating the effectiveness of the remedial system to reverse groundwater gradients and extract groundwater for treatment.
- **Principal-In-Charge, Internal Laboratory Audit and Recommended Actions - Eagle-Picher Industries, Inc.** Project oversight of an internal laboratory audit at this Ni-Cd battery manufacturing facility to evaluate the potential to improve product quality and to assess the potential of using existing resources to analyze quarterly groundwater samples for RCRA compliance. Many of the recommendations are being implemented.
- **Project Manager, RCRA Part A/B Permit Applications - Safety Kleen.** Provided assistance and developed Part A/B permit applications in various states, particularly Missouri, for this hazardous waste recycling company.
- **Program Manager, Superfund Subcontractor to URS Consultants - EPA Region 8.** Acted as company liaison with URS for ARCS contract with EPA Region 8. Specific oversight was for Sand Creek Superfund Site soil vapor extraction (SVE), preliminary assessments (PA), site inspections (SIP), and hazard ranking system projects.
- **Task Manager, Closure Plan - Total Petroleum/Colorado Refining Company.** Developed a closure plan for existing wastewater treatment lagoons to avoid RCRA compliance. The plan included waste removal, storage, and treatment and conversion of the facility to a non-RCRA application. The lagoons treated facility wastewater and storm water runoff before discharging into Sand Creek.

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**REMEDICATION**

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- **Project Manager, Colorado Voluntary Cleanup Plan (VCUP) and Interim Groundwater Treatment Measures. Quadrant Properties.** Submitted a VCUP to the State of Colorado for the former Rocky Mountain News property near the Auraria campus in Denver, Colorado. Received approval of the VCUP in April 2007 and constructed an interim groundwater treatment in September 2007. The interim groundwater treatment selected was a permeable reactive barrier trench. BOS 100 carbon-impregnated iron was installed in the zone contaminated with PCE and TCE. Implemented groundwater monitoring to assess the reactive barriers ability to control the off-site release of shallow contaminated groundwater. The VCUP was approved and a No Further Action Determination letter received in 2009.
- **Project Manager, Dam Cutoff/Groundwater Compliance - City of Colorado Springs, Colorado, Subcontractor to Haley & Aldrich.** Managed the preliminary study, groundwater elements of the final design, and the compliance monitoring aspects for installation of a bentonite slurry to provide a barrier to groundwater flow off site. The slurry wall was constructed along the upstream face of a total containment dam structure. The area upgradient of the structure was designed to store fly ash and to provide a dedicated-land disposal site for sewage sludge injected into soils. The groundwater barrier was constructed to bedrock to prevent groundwater migration which contained elevated concentrations of nitrate and other constituents, off site.
- **Chief Hydrologist, Reclamation, Final Impoundment Design, Groundwater Interception/Control, and Groundwater Remediation - Big Horn Coal Company, Sheridan, Wyoming.** Managed reclamation and closure of the Big Horn Coal Mine in northeastern Wyoming. Unique features of reclamation included relocation of the Tongue River, a perennial tributary to the Yellowstone River, and the design of two large final impoundments that were to be hydraulically connected to the Tongue River (to be used as a future recreation site). Surface and groundwater were modeled, and groundwater through the spoils and into the final impoundments was controlled and studied to ensure adequate long-term water quality for the intended use. Reclamation also included terrace and diversion ditch design, contouring, soil replacement, and revegetation to minimize erosion. Also managed the design and construction of groundwater interception and control drains, sumps, and detention pond systems to control groundwater inflow during mining. Evaluated spoil quality using various paste and leaching column procedures to determine ultimate spoil water quality. These techniques were used to segregate unsuitable spoil to ensure adequate post-mining groundwater quality.
- **Chief Hydrologist, Reclamation, Final Impoundment Design and Groundwater Interception/Control - Black Butte Coal Company, Rock Springs, Wyoming.** Managed reclamation of several pits at the Black Butte Mine located in southwestern Wyoming. Reclamation of a groundwater regime that did not preclude groundwater flow was complicated by the nature and dip of the existing geologic formations. A surface impoundment was studied and designed to provide a water supply to support wildlife and domestic cattle grazing. These studies included modeling and prediction of long-term water quality to support the intended use.

- **Chief Hydrologist, Groundwater Interception/Control - Rosebud Coal Sales, Hanna, Wyoming.** Managed design and implementation of groundwater interception and control systems at this coal mining site in south-central Wyoming. Also evaluated the post-mining spoil water quantity and quality in relation to undisturbed groundwater to determine whether special mining and spoil handling procedures must be used.
- **Chief Hydrologist, Reclamation and Groundwater Interception/Control - Decker Coal Company, Decker, Montana.** Managed various reclamation activities at the Decker Mines in southeastern Montana. Evaluated spoil quality using paste and leaching column procedures to determine the potential post-mining quality of spoil groundwater and to assess the impact to off-site groundwater domestic water supplies. Worked with the Montana Geological Survey to evaluate the regional impacts of mining on groundwater. Also assisted with the design of reclamation, including surface configuration/contouring; spoil and soil replacement; revegetation; and erosion control systems. Installed and monitored erosion/sedimentation monitoring plots and watersheds to compare pre- and post-mining conditions. Assisted in the identification, design, and implementation of groundwater inflow control systems. This included the feasibility of grout curtains; French drains; pre-dewatering systems; and inflow control diversions, detainment, and pumping systems.
- **Project Manager, Interim Corrective Measures for Acid Mine Drainage, Groundwater Interception, and Heap leach Pump-Back System - Parcel, Mauro, Hultin & Spaanstra/ Confidential Gold Mining Client.** Managed design and implementation of interim corrective measures to contain, control, and treat acid mine drainage at this site in south central Colorado. The measures included the construction of a containment system and a lime storage and distribution system to increase the pH to acceptable levels. Studied and designed a groundwater interception system to intercept uncontaminated groundwater before it reached the site. The interceptor trench was backfilled with gravel, and the intercepted groundwater was pumped to a surface water diversion ditch systems. Also assisted with improvements to the heap leach pump back system. The liner of the heap leach was breached as a result of poor construction controls and the cyanide-laden water seeped to the underlying shallow groundwater system. The pump-back system was designed to pump intercepted groundwater to the wastewater treatment plant and included piping and pump improvements and the design of a secondary backup system in the event of system failure to prevent migration of pregnant water to the Whitman Fork drainage.
- **Hydrogeologist, Hydrocarbons Recovery and Groundwater Extraction/Treatment System Design - City of Colorado Springs, Colorado.** Assisted in design of the interceptor and groundwater extraction system at the City of Colorado Springs, Colorado, maintenance shop. The system was designed to deflect and change the direction of groundwater flow and to intercept contaminated groundwater before it discharged to Fountain Creek.
- **Project Manager/Principal-In-Charge, Groundwater Pump and Treatment System Design and Installation - Eagle-Picher Industries, Inc.** Managed the study, design, and implementation of a groundwater recovery system under an approved RCRA Remedial Action Plan. The caustic plume contains elevated levels of nitrate and pH in the range of 12 S.U., and the plume is commingled with an adjacent PCE plume. The adjacent site had installed a recovery and groundwater reinjection system; therefore, the groundwater regime was modeled (MODFLOW) to ensure proper location of the caustic plume recovery system. A

continuous recovery well was installed, and groundwater recovery could be intermittently augmented by a series of existing monitoring wells and dedicated pumping systems. Groundwater was pumped to a groundwater treatment system and discharged to the POTW under an NPDES permit. The impacts of the treated groundwater to the POTW and wastewater collection and sampling program, conforming to confined space regulations, influent to the POTW treatment were evaluated.

- **Project Manager, Pump and Treatment System Efficiency Evaluation/Reporting - Martin Marietta, Waterton Facility.** Two groundwater interception and pumping systems were installed at the Waterton Plant to intercept groundwater prior to discharge to the South Platte River. The effectiveness of this system to contain and control trichloroethene (TCE), trichloroethane (TCA), hydrazine, and metal-contaminated groundwater was conducted and reported to Colorado.
- **Principal-In-Charge, Process Pond Removal, Plant Modifications, and Reinstallation of a Fire Suppression Pond System - Essex Group, Inc., Hoisington, Kansas.** Provided oversight for removal of a process water pond liner and distribution system and installation of a new liner and fire suppression pond system. This project involved removal of the existing system, modifications of the plant to convert contact water quenching systems to internal systems, and the installation of a new noncontact fire suppression pond system. Wastewater and waste sludge were removed and disposed of. The old liner was removed, the new pond system regraded, and a new single pond liner installed. The project was done as a design-build in cooperation with a local contractor. Although soils under the existing liner appeared to be contaminated with barium and copper, negotiated with and convinced the agency (KDHE) that underlying groundwater was not significantly affected and that the risk to downgradient groundwater users was minor.
- **Program Manager, as a Subcontractor to URS Consultants, Sand Creek Superfund Soil Vapor Extraction System Design - ARCS Region VIII, Located Near Denver, Colorado.** Several concurrent tasks were on-going at the site and coordination of consulting and contracting activities was essential. Also provided the design services and letting of contracts for a soil vapor extraction system for Operating Unit 1.

#### **SOLID WASTE**

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- **Program Manager, Lime Waste Closure Plan and Reclamation Design - West Plains Energy.** Managed the evaluation and design of a closure plan for a lime waste storage facility. The lime waste sludge was generated from the treatment of groundwater which is used in electric generating boilers. The closure of the storage facility included an element of recycling for agricultural uses and grading and revegetation to stabilize the pile. Drainage was controlled with an existing storm water detention pond system.
- **Chief Hydrologist, Conversion of Gravel Quarry to Solid Waste Facility near Guernsey, Wyoming - Peter Kiewit Construction Company.** Evaluated and assisted with the design of a gravel quarry operations potential conversion to a solid waste facility at a site in southeastern Wyoming. The evaluation determined that the underlying geology would prevent the migration of contaminants to groundwater.

- **Chief Hydrologist, Permit and Design of Mine Solid Waste Facilities - Big Horn, Decker, Black Butte, and Rosebud Coal.** Managed and provided technical assistance in design and permitting of various solid waste facilities located at active mine sites. The designs generally included clay liners and caps and were located to prevent migration of potential contaminants to groundwater.
- **Project Manager, Design of RCRA Subtitle D Burnt Mill Solid Waste Facility - City and County of Pueblo, Colorado.** Managed the investigations and design of the proposed Burnt Mill City and County Landfill south of Pueblo, Colorado. The groundwater investigation indicated no or minimal impacts were anticipated. Liner and caps were designed in conformance with Subtitle D requirements. A leachate collection and extraction system was designed for maximum efficiency. Storm water diversion and detention systems were designed to control runoff. Included HELP model simulations. Periodic meetings with the city council and county commissioners were held and public comments were addressed.

#### **Safe Drinking Water Act**

- **Principal-In-Charge, Assistance with Testimony Before the Water Quality Control Commission for Groundwater Protection Area - Eagle-Picher Industries, Inc.** Assisted with testimony before the Colorado Water Quality Control Commission. The commission was considering establishing a groundwater protection zone in the Widefield Aquifer south of Colorado Springs, Colorado. We provided client advocacy by asserting the state had used improper methods to define the limits of the protected groundwater resource and overestimated the impact of groundwater discharges to the Widefield.
- **Technical Resource and Committee Participant, Evaluation of Treatment / Distribution of Drinking Water System, Sheridan County, Wyoming - Joint Powers Water Board.** Appointed by the mayor of Sheridan to the Technical Resource Committee of the Joint Powers Water Board. The existing treatment and distribution systems were not in compliance with EPA regulations due to a potential source of giardia contamination. In order to obtain property easements, the county had provided free water taps to landowners along the pipeline system prior to the installation of a treatment system. The technical task was to oversee the design of a new mini-treatment and city/county distribution system that would benefit the residents of Sheridan County. The committee also solicited public comments and provided assistance with the procurement of grants and loans to complete the system. The committee also provided technical support during meetings with the EPA.
- **Chief Hydrologist, Design and Installation of Groundwater Drinking Water System, Heat Sump, and Safe Drinking Water Act (SDWA) Compliance - Decker Coal Company, Decker, Montana.** Designed and installed a groundwater well field that was used for drinking water and a heat pump to cool facility buildings at a mine site in southeastern Montana. The wells were completed with stainless steel casing and screen, pumps installed, and water discharged to a reverse osmosis treatment system. Brine water was treated and discharged to a containment/evaporation lagoon. Established a Safe Drinking Water Compliance System for sampling and reporting and interfacing with union representatives to explain the work force that the supply was safe for consumption.

- **Chief Hydrologist, Drinking System Compliance for Several Mines - Peter Kiewit Sons' Company.** Provided Safe Drinking Water Act compliance and technical support for remote mine sites in the western United States. This effort ranged from the study and installation of wells and pumps to the establishment of sampling and reporting systems to comply with SDWA. Installed water supply wells; and obtained permits and water appropriations for the groundwater water supply for domestic and/or production.

#### ***REGISTRATIONS/CERTIFICATIONS***

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- AHERA and State of Colorado Asbestos Building Inspector/Management Planner: Colorado Certification 6604
- National Association of Environmental Professionals
- Home Builders Association Storm water Committee and Education Chair
- International Council of Shopping Centers
- OSHA 40 hour Hazardous Materials Training
- OSHA Site Safety Officer Training
- OSHA Confined Space Training
- National Pork Producers Association EAP Program: Certified Assessor
- Colorado Association of Commerce and Industry: Technical Committee Support
- State of Colorado, Division of Oil and Public Safety: Assessor

**APPENDIX B**

**PHOTOGRAPHIC LOGS**

**B1 PHOTOGRAPHIC LOG OF THE WINDBREAKS**

Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

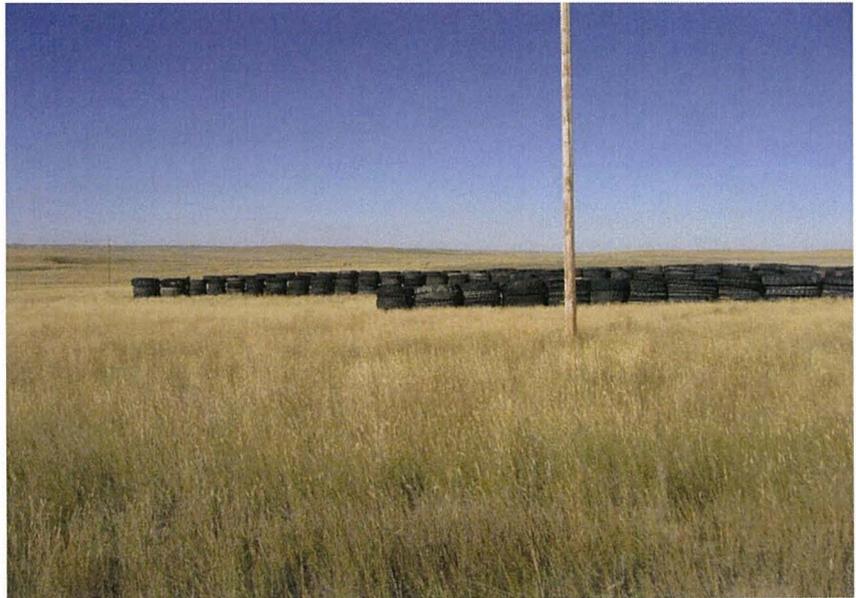
Site Location: South of Gillette, Wyoming

Photograph 1

Date: 9/30/11

Direction: West

Comments: Windbreak  
location #1 from inside  
the ROW fence



Photograph 2

Date: 9/30/11

Direction: NA

Comments: Looking  
down into interior of tire  
pile at Windbreak  
location #1



Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

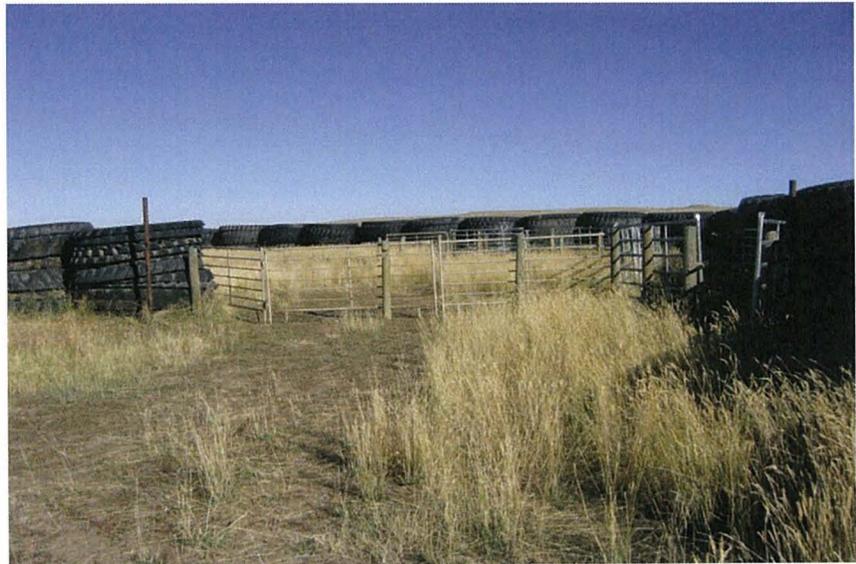
Site Location: South of Gillette, Wyoming

Photograph 3

Date: 9/30/11

Direction: North

Comments:



Photograph 4

Date: 9/30/11

Direction: West

Comments: Ranchers  
using windbreak location  
#1 and corral



Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 5

Date: 9/30/11

Direction: North

Comments: Windbreak  
location #2 from ranch  
access road



Photograph 6

Date: 9/30/11

Direction: West

Comments: Windbreak  
location #2



Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 7

Date: 9/30/11

Direction: Northwest

Comments: Windbreak  
location #3



Photograph 8

Date:

Direction: Southwest

Comments: Windbreak  
location #3 toward  
closest residence  
(Walker)



Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 9

Date: 9/30/11

Direction: North-  
Northwest

Comments: Windbreak  
location #3 from inside  
the fence ROW



Photograph 10

Date: 9/30/11

Direction: North

Comments: Windbreak  
location #4 close-up



Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 11

Date: 9/30/11

Direction: East

Comments: Windbreak  
#4 looking back at the  
Bell Road



Photograph 12

Date: 9/30/11

Direction: West

Comments: Windbreak  
#4 from inside the fence  
ROW

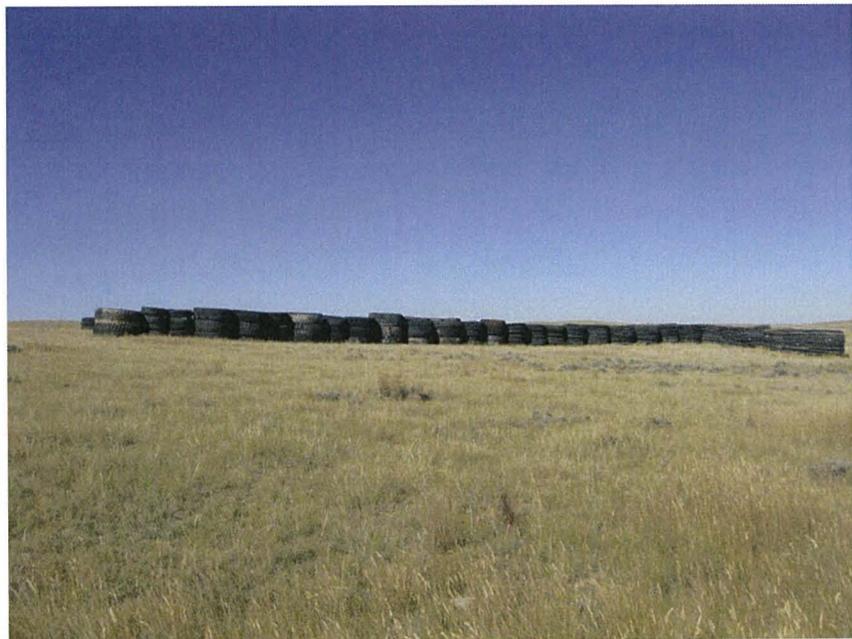


Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 13

Date: 9/30/11

Direction: West

Comments: Tire piles at  
Windbreak location #5



Photograph 14

Date: 9/30/11

Direction: N

Comments: Looking at  
stacked and unstacked  
tires at Windbreak  
location #5

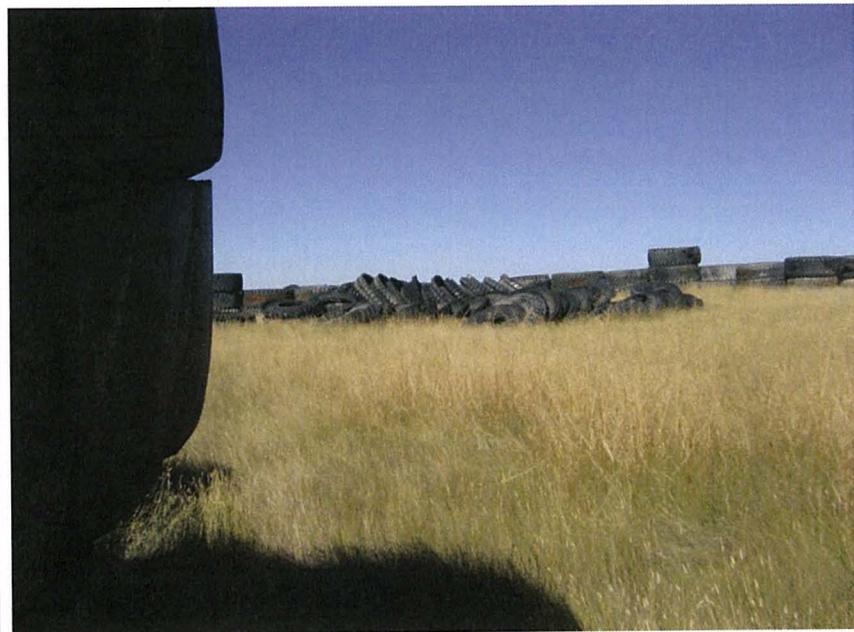


Photo Log B-1 Windbreaks and Corrals  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 15

Date: 9/30/11

Direction: NA

Comments: Close-up of  
damaged tire

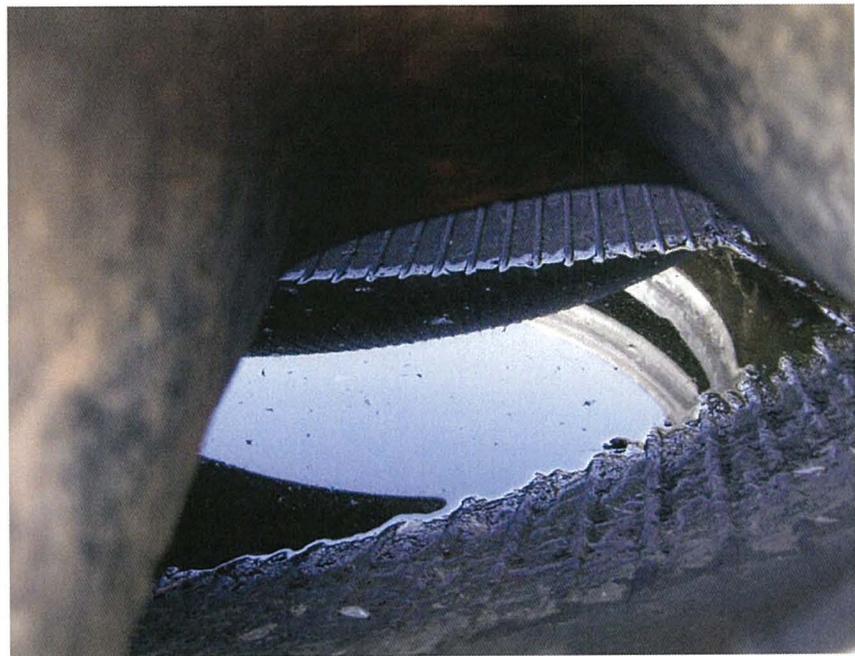


Photograph 16

Date: 9/30/11

Direction: NA

Comments: Standing  
water in one whole tire



**APPENDIX B**

**PHOTOGRAPHIC LOGS**

**B2 PHOTOGRAPHIC LOG OF OTHER REUSES OF TIRES IN THIS AREA OF  
WYOMING**

Photo Log B-2  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: Hwy 59 Gillette to Bill, Wyoming

Photograph 1

Date: 9/30/11

Direction: West

Comments: Typical tin  
windbreak in the area



Photograph 2

Date: 9/30/11

Direction: West

Comments: Windbreak  
location #1 used by  
ranchers

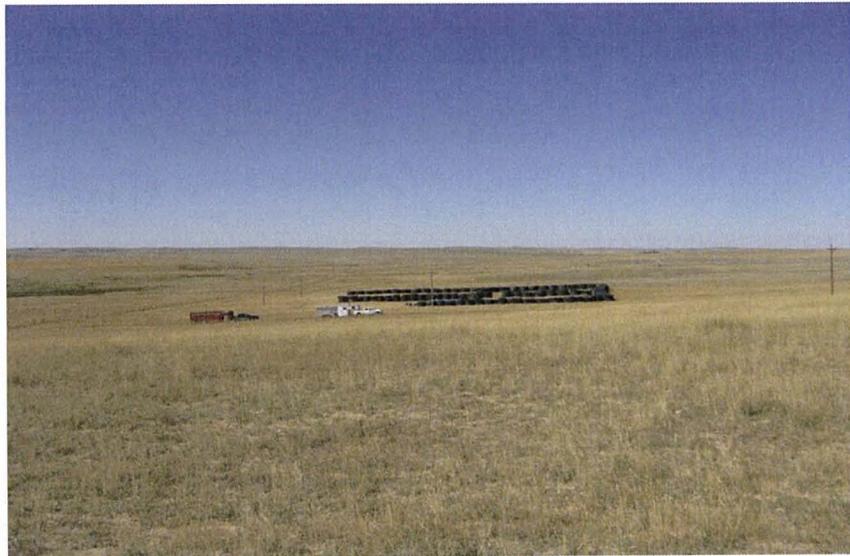


Photo Log B-2  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

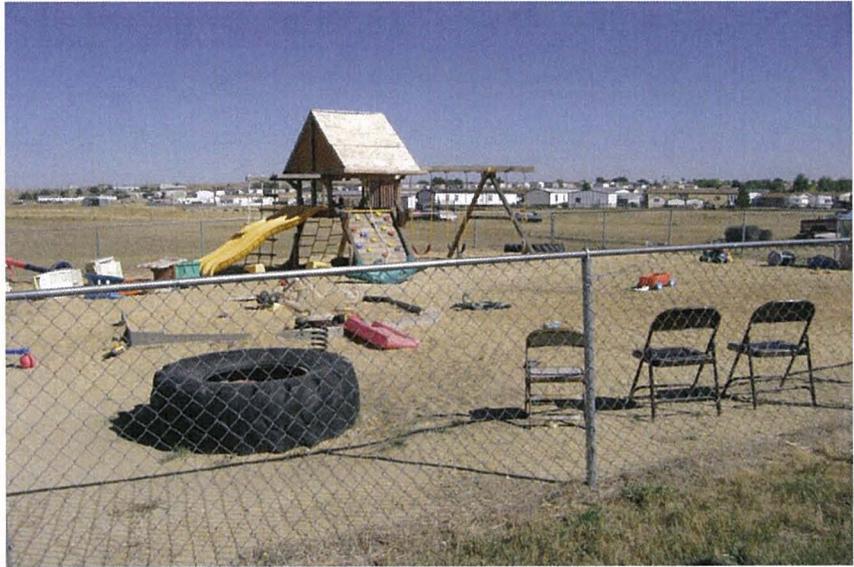
Site Location: South of Gillette, Wyoming

Photograph 3

Date: 9/30/11

Direction: East

Comments: Whole tires used at Wright Day Care Center



Photograph 4

Date: 9/30/11

Direction: Southwest

Comments: Whole tire used as protection (possible well head) south of Wright



Photo Log B-2  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 5

Date: 9/30/11

Direction: North

Comments: Whole tires used as stock watering or feeders Road 450 toward Thunder Basin Coal Company



Photograph 6

Date: 9/30/11

Direction: West

Comments: Whole tires used to protect gas pipeline



Photo Log B-2  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 7

Date: 9/30/11

Direction: East

Comments: Whole tire used for stock watering 8 miles north of Bill along State Highway 59



Photograph 8

Date: Northeast

Direction: Northeast

Comments: Tire top used as stock water for multiple livestock grazing fields 1 mile south of Bill, Wyoming



Photo Log B-2  
Photographic Record

Client: Throne Law, P.C.

Project Number: 04992.10

Site Name: Expert Witness Testimony

Site Location: South of Gillette, Wyoming

Photograph 9

Date: 9/30/11

Direction: West

Comments: Whole tires used at children's playground at Bill, Wyoming

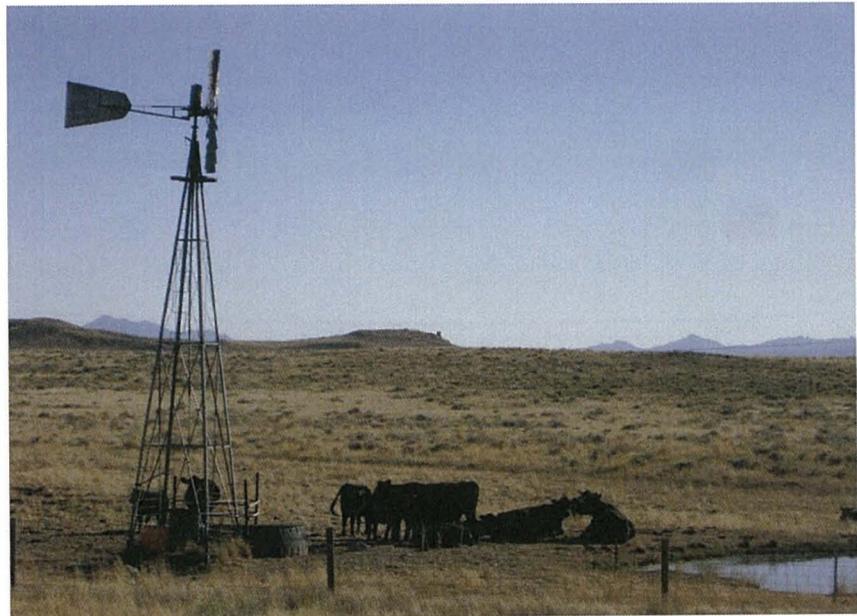


Photograph 10

Date: 9/30/11

Direction: Southwest

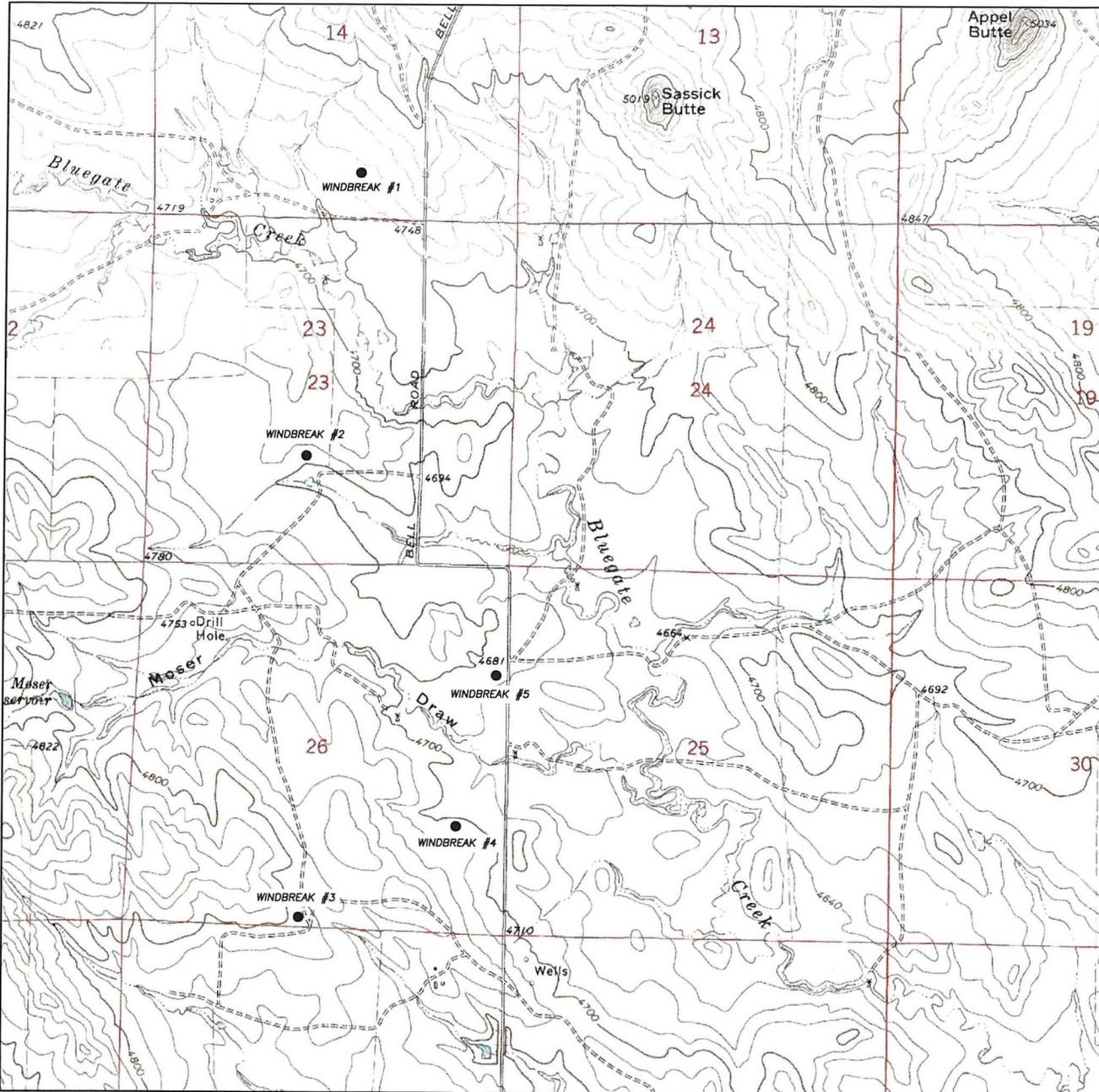
Comments: Whole tires used for stock watering 1 mile south of Bill, Wyoming



**FIGURE 1:**

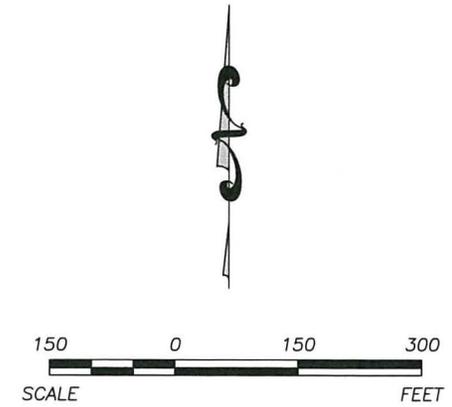
**TOPOGRAPHIC MAP**

L:\THINKING\GASB\GASB\_LOCATIONS.MXD



**NOTE**

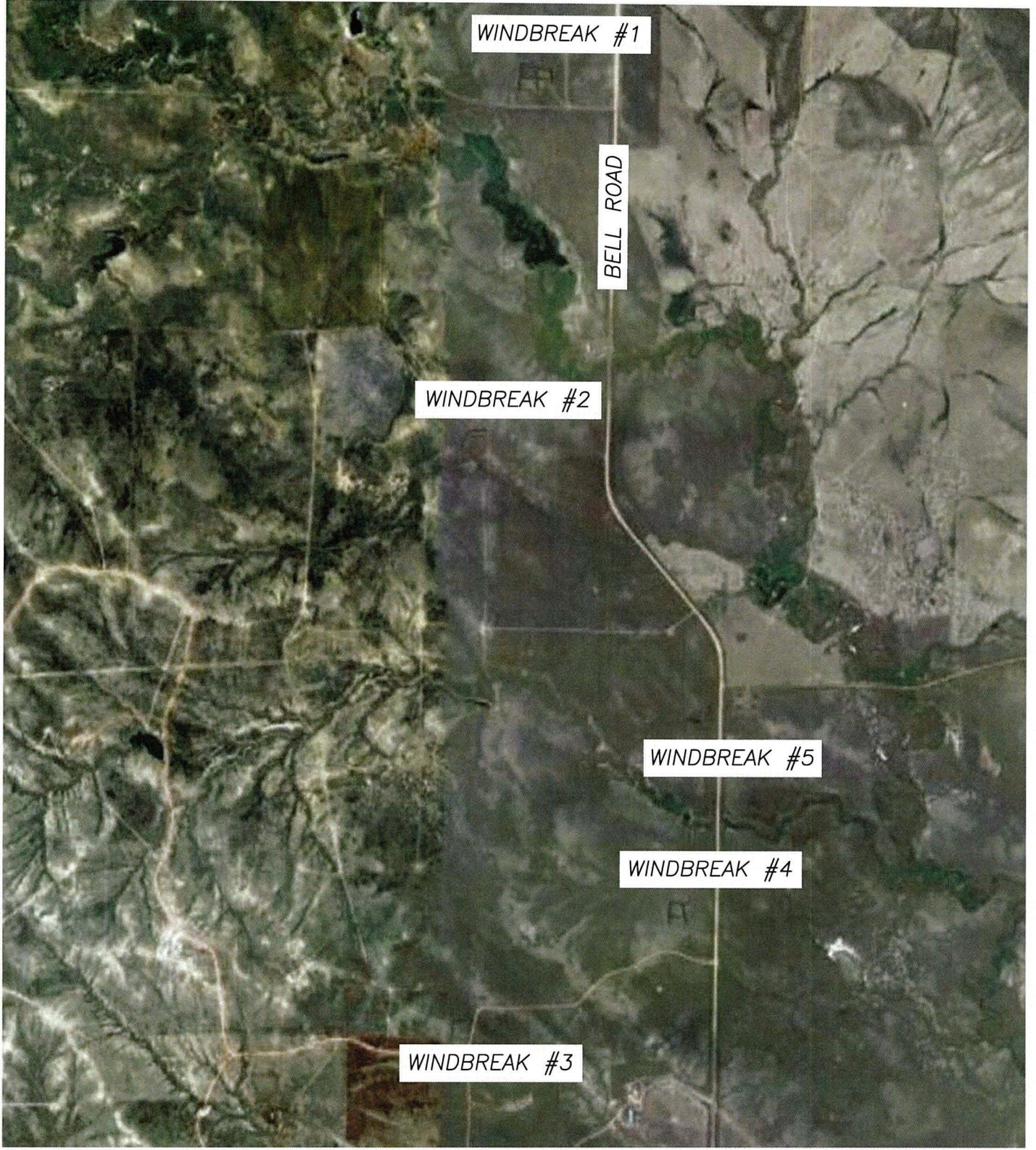
1. THE WINDBREAKS ARE LOCATED IN TOWNSHIP 48N AND RANGE 73W.



<p><b>TOPOGRAPHIC MAP EXPERT WITNESS REPORT</b></p>	<p>CLIENT: ENVROTANK, INC. EXPERT WITNESS REPORT THRONE LAW OFFICE, P.C. SOUTH OF GILLETTE, WYOMING</p>	<p>DATE: 10/21/11</p>
	<p>PROJECT NUMBER: 49922.10</p> <p>SHEET: 1 OF 2</p>	<p>PROJECT NO. JTB</p> <p>DATE: 10/21/11</p>
<p>NO. 0</p>	<p>NO. 1</p>	<p>NO. 2</p>
<p>NO. 3</p>	<p>NO. 4</p>	<p>NO. 5</p>
<p>NO. 6</p>	<p>NO. 7</p>	<p>NO. 8</p>
<p>NO. 9</p>	<p>NO. 10</p>	<p>NO. 11</p>
<p>NO. 12</p>	<p>NO. 13</p>	<p>NO. 14</p>
<p>NO. 15</p>	<p>NO. 16</p>	<p>NO. 17</p>
<p>NO. 18</p>	<p>NO. 19</p>	<p>NO. 20</p>
<p>NO. 21</p>	<p>NO. 22</p>	<p>NO. 23</p>
<p>NO. 24</p>	<p>NO. 25</p>	<p>NO. 26</p>
<p>NO. 27</p>	<p>NO. 28</p>	<p>NO. 29</p>
<p>NO. 30</p>	<p>NO. 31</p>	<p>NO. 32</p>
<p>NO. 33</p>	<p>NO. 34</p>	<p>NO. 35</p>
<p>NO. 36</p>	<p>NO. 37</p>	<p>NO. 38</p>
<p>NO. 39</p>	<p>NO. 40</p>	<p>NO. 41</p>
<p>NO. 42</p>	<p>NO. 43</p>	<p>NO. 44</p>
<p>NO. 45</p>	<p>NO. 46</p>	<p>NO. 47</p>
<p>NO. 48</p>	<p>NO. 49</p>	<p>NO. 50</p>
<p>NO. 51</p>	<p>NO. 52</p>	<p>NO. 53</p>
<p>NO. 54</p>	<p>NO. 55</p>	<p>NO. 56</p>
<p>NO. 57</p>	<p>NO. 58</p>	<p>NO. 59</p>
<p>NO. 60</p>	<p>NO. 61</p>	<p>NO. 62</p>
<p>NO. 63</p>	<p>NO. 64</p>	<p>NO. 65</p>
<p>NO. 66</p>	<p>NO. 67</p>	<p>NO. 68</p>
<p>NO. 69</p>	<p>NO. 70</p>	<p>NO. 71</p>
<p>NO. 72</p>	<p>NO. 73</p>	<p>NO. 74</p>
<p>NO. 75</p>	<p>NO. 76</p>	<p>NO. 77</p>
<p>NO. 78</p>	<p>NO. 79</p>	<p>NO. 80</p>
<p>NO. 81</p>	<p>NO. 82</p>	<p>NO. 83</p>
<p>NO. 84</p>	<p>NO. 85</p>	<p>NO. 86</p>
<p>NO. 87</p>	<p>NO. 88</p>	<p>NO. 89</p>
<p>NO. 90</p>	<p>NO. 91</p>	<p>NO. 92</p>
<p>NO. 93</p>	<p>NO. 94</p>	<p>NO. 95</p>
<p>NO. 96</p>	<p>NO. 97</p>	<p>NO. 98</p>
<p>NO. 99</p>	<p>NO. 100</p>	<p>NO. 101</p>
<p>NO. 102</p>	<p>NO. 103</p>	<p>NO. 104</p>
<p>NO. 105</p>	<p>NO. 106</p>	<p>NO. 107</p>
<p>NO. 108</p>	<p>NO. 109</p>	<p>NO. 110</p>
<p>NO. 111</p>	<p>NO. 112</p>	<p>NO. 113</p>
<p>NO. 114</p>	<p>NO. 115</p>	<p>NO. 116</p>
<p>NO. 117</p>	<p>NO. 118</p>	<p>NO. 119</p>
<p>NO. 120</p>	<p>NO. 121</p>	<p>NO. 122</p>
<p>NO. 123</p>	<p>NO. 124</p>	<p>NO. 125</p>
<p>NO. 126</p>	<p>NO. 127</p>	<p>NO. 128</p>
<p>NO. 129</p>	<p>NO. 130</p>	<p>NO. 131</p>
<p>NO. 132</p>	<p>NO. 133</p>	<p>NO. 134</p>
<p>NO. 135</p>	<p>NO. 136</p>	<p>NO. 137</p>
<p>NO. 138</p>	<p>NO. 139</p>	<p>NO. 140</p>
<p>NO. 141</p>	<p>NO. 142</p>	<p>NO. 143</p>
<p>NO. 144</p>	<p>NO. 145</p>	<p>NO. 146</p>
<p>NO. 147</p>	<p>NO. 148</p>	<p>NO. 149</p>
<p>NO. 150</p>	<p>NO. 151</p>	<p>NO. 152</p>
<p>NO. 153</p>	<p>NO. 154</p>	<p>NO. 155</p>
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<p>NO. 162</p>	<p>NO. 163</p>	<p>NO. 164</p>
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<p>NO. 171</p>	<p>NO. 172</p>	<p>NO. 173</p>
<p>NO. 174</p>	<p>NO. 175</p>	<p>NO. 176</p>
<p>NO. 177</p>	<p>NO. 178</p>	<p>NO. 179</p>
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<p>NO. 282</p>	<p>NO. 283</p>	<p>NO. 284</p>
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<p>NO. 288</p>	<p>NO. 289</p>	<p>NO. 290</p>
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<p>NO. 369</p>	<p>NO. 370</p>	<p>NO. 371</p>
<p>NO. 372</p>	<p>NO. 373</p>	<p>NO. 374</p>
<p>NO. 375</p>	<p>NO. 376</p>	<p>NO. 377</p>
<p>NO. 378</p>	<p>NO. 379</p>	<p>NO. 380</p>
<p>NO. 381</p>	<p>NO. 382</p>	<p>NO. 383</p>
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<p>NO. 426</p>	<p>NO. 427</p>	<p>NO. 428</p>
<p>NO. 429</p>	<p>NO. 430</p>	<p>NO. 431</p>
<p>NO. 432</p>	<p>NO. 433</p>	<p>NO. 434</p>
<p>NO. 435</p>	<p>NO. 436</p>	<p>NO. 437</p>
<p>NO. 438</p>	<p>NO. 439</p>	<p>NO. 440</p>
<p>NO. 441</p>	<p>NO. 442</p>	<p>NO. 443</p>
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<p>NO. 453</p>	<p>NO. 454</p>	<p>NO. 455</p>
<p>NO. 456</p>	<p>NO. 457</p>	<p>NO. 458</p>
<p>NO. 459</p>	<p>NO. 460</p>	<p>NO. 461</p>
<p>NO. 462</p>	<p>NO. 463</p>	<p>NO. 464</p>
<p>NO. 465</p>	<p>NO. 466</p>	<p>NO. 467</p>
<p>NO. 468</p>	<p>NO. 469</p>	<p>NO. 470</p>
<p>NO. 471</p>	<p>NO. 472</p>	<p>NO. 473</p>
<p>NO. 474</p>	<p>NO. 475</p>	<p>NO. 476</p>
<p>NO. 477</p>	<p>NO. 478</p>	<p>NO. 479</p>
<p>NO. 480</p>	<p>NO. 481</p>	<p>NO. 482</p>
<p>NO. 483</p>	<p>NO. 484</p>	<p>NO. 485</p>
<p>NO. 486</p>	<p>NO. 487</p>	<p>NO. 488</p>
<p>NO. 489</p>	<p>NO. 490</p>	<p>NO. 491</p>
<p>NO. 492</p>	<p>NO. 493</p>	<p>NO. 494</p>
<p>NO. 495</p>	<p>NO. 496</p>	<p>NO. 497</p>
<p>NO. 498</p>	<p>NO. 499</p>	<p>NO. 500</p>
<p>NO. 501</p>	<p>NO. 502</p>	<p>NO. 503</p>
<p>NO. 504</p>	<p>NO. 505</p>	<p>NO. 506</p>
<p>NO. 507</p>	<p>NO. 508</p>	<p>NO. 509</p>
<p>NO. 510</p>	<p>NO. 511</p>	<p>NO. 512</p>
<p>NO. 513</p>	<p>NO. 514</p>	<p>NO. 515</p>
<p>NO. 516</p>	<p>NO. 517</p>	<p>NO. 518</p>
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<p>NO. 552</p>	<p>NO. 553</p>	<p>NO. 554</p>
<p>NO. 555</p>		

**FIGURE 2:**

**AERIAL PHOTOGRAPH**



WINDBREAK #1

BELL ROAD

WINDBREAK #2

WINDBREAK #5

WINDBREAK #4

WINDBREAK #3

L:\Throne\Aerial Photo.dwg October 21, 2011 8:49:21 am (mar)



**AQUATERRA**

ENVIRONMENTAL SOLUTIONS, INC.  
 4643 South Ulster Street, Suite 800  
 Denver, Colorado 80237

**ENVIROTANK, INC.**  
**EXPERT WITNESS REPORT**  
 SOUTH OF GILLETTE, WYOMING  
 THRONE LAW OFFICE, P.C.

Project Mgr.	JFB	Drawn By	MJC	Designed By	MJC	Project No.	4992.10
Scale	No Scale	Date	10/21/11	File Name	4992.10_F2_AERIAL.dwg	Figure No.	2