

Seismic Reflection Survey: Health and Safety Plan

Kansas Geological Survey
Exploration Services Section

Northeast Geophysical Services
McIntosh, Alabama
March 2011

**KANSAS GEOLOGICAL SURVEY EXPLORATION SERVICES
ACCIDENT PREVENTION PLAN**

I. PROJECT DESCRIPTION

Project Name: High Frequency Potential of Downhole 30.06 Seismic Source at an Industrial site in McIntosh, Alabama

Location: McIntosh, Alabama

KGS Site Safety Officer: Richard D. Miller

Plan Prepared by: Richard D. Miller

Estimated Duration of Field Work: 2 days

II. STATEMENT OF WORK

Mapping confining layers is a key part of any hydrogeophysical evaluation. With the wide range of near-surface materials and hydrologies observed in unlithified settings, defining parameters and determining optimum equipment for a geophysical survey targeting near-surface layers are critical to success or failure. Seismic reflection imaging of shallow (>30 m) interfaces continues to be a challenge after more than 35 years of research (Schepers, 1975). Significant advances have been made (Baker et al., 2000; Miller et al., 2007; Sloan et al., 2010) over the last 15 years, but most targets influencing contaminant transport problems still fall within the loosely classified domain of applied research. This is especially true for reflectors of less than 30 ms where confirmation is necessary when interpreted on CMP reflection images (Steeple et al., 1996).

A Miocene clay acting as the upper confining unit in McIntosh, Alabama, provides the perfect depth range (20 m to 35 m) to evaluate the feasibility of current research technologies for addressing obstacles routinely encountered when only widely spaced drill control points are available to map shallow layers. Knowledge and associated confidence about the continuity (or lack of) of a confining layer is critical to groundwater models and therefore the entire investigation. Use of seismic reflection imaging in industrial areas where this kind of mapping problem is common requires resolution (both vertical and horizontal) as well as signal-to-noise ratios to be well defined and consistent with method, equipment, and objectives.

Confining units like those present at the McIntosh, Alabama, site have been targeted by high-resolution seismic-reflection surveys in the past (Merey et al., 1992; Miller et al., 1995; Miller et al., 1996). Previous applications have shown the feasibility of the method to be very site dependent. Recent advances in acquisition equipment and processing techniques need continuous evaluation to determine their effectiveness and applicability to various site geologies and noise conditions.

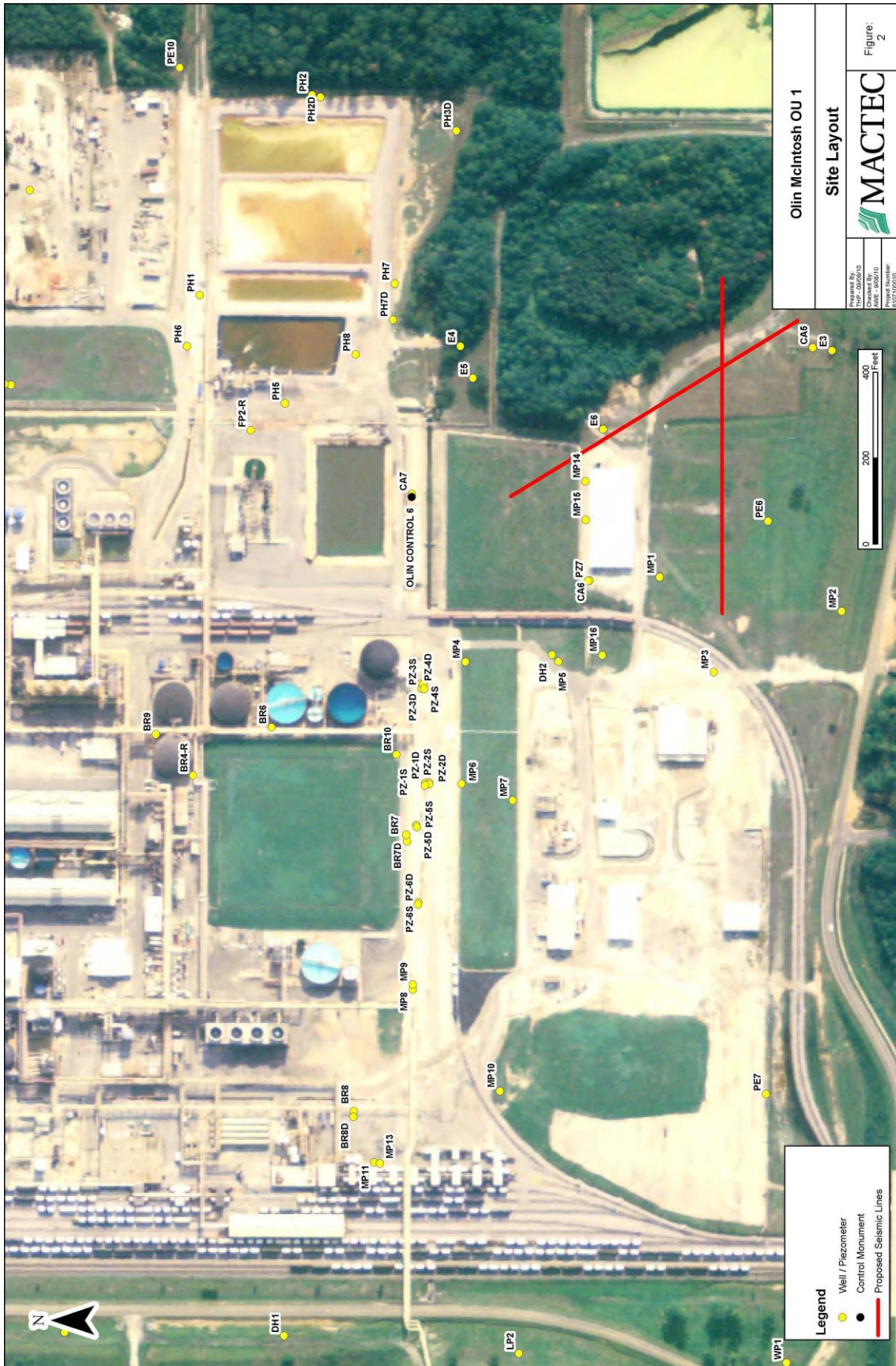


Figure 1. Site map showing proposed seismic lines for this study.

The feasibility of the method, and especially the downhole 30.06, can be reasonably evaluated at this site with a couple test lines, run at near right angles to each other (Figure 1). Key to the research objective of this study is the ground truth that can be provided by boreholes located along the profiles. With a 10 m to 20 m target depth, the need for high frequency and attention to detail cannot be overstated. Tests in the past at controlled sites (e.g., GEMS in the Kansas River Valley) have lacked the geologic and hydrogeologic setting to confidently correlate reflections to lithologic contacts. This project of opportunity has a simplistic yet variable geology that can help determine the current state of the art and state of the practice simultaneously.

Scope of Work

An opportunity has been provided by Northeast Geophysical to piggyback onto their study of shallow Miocene clays at an industrial site that strongly influences groundwater flow within the unconfined portion of that site's hydrogeologic setting. The KGS will bring decades of experience with high-resolution seismic reflection and specially adapted seismic equipment to test and optimize for the site. Across these two short lines, reflections from the clay and any other reflection of opportunity will be mapped with elevation, thickness, and continuity being the key characteristics.

KGS researchers will test a downhole 30.06 seismic source. Two 800 ft profiles will be acquired with this source. The two profiles will intersect and will use geophones spaced at around 2 ft. On-site testing will include comparisons of the downhole 30.06 and a more standard sledge hammer. Key seismic characteristics to be evaluated include frequency content (upper corner, bandwidth, and uniformity of amplitude), signal-to-noise ratio (source noise to signal, background/cultural noise to signal), and efficiency.

Outcomes

Findings of this applied research project will address source improvements and data evaluations based on the current potential of the equipment combination used for this study (96-channel Geometric Geodes, 40 Hz geophones, 2 ft receiver spacing, 4 ft source spacing, and downhole 30.06 seismic source). From a source perspective it will be important to quantify the effects of source coupling and downhole conditioning and operational difficulties inherent to this and other similar industrial sites.

References

- Baker, G.S., C.A. McIntyre, L.A. Walczak, and D.W. Steeples, 2000, Improving ultrashallow seismic reflection data by reducing source energy [Exp. Abs.]: Annual Meeting of the Soc. Explor. Geophys., Calgary, Alberta, Canada, August 6-11, p. 1267-1270.
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- Miller, R.D., J. Xia, C.D. Daniel III, F.P. Haeni, and A. Cardinell, 1995, Delineation of near-surface paleochannel using shallow seismic reflection techniques [Exp. Abs.]: Annual Meeting of the Soc. Explor. Geophys., Houston, Texas, October 8-13, p. 394-397.
- Schepers, R., 1975, A seismic reflection method for solving engineering problems: *J. Geophysics*, v. 41, p. 367-384.
- Sloan, S.D., G.P. Tsoflias, D.W. Steeples, and J.R. McKenna, 2010, Ultra-shallow seismic imaging of the top of the saturated zone [Exp. Abs.]: Annual Meeting of the Soc. of Expl. Geophys., Denver, Colorado, October 17-21, p. 1960-1964
- Steeple, Don W., Alan G. Green, Thomas V. McEvelly, Richard D. Miller, William E. Doll, and James W. Rector, 1997, A workshop examination of shallow seismic reflection surveying: *The Leading Edge*, v. 16, n. 11, p. 1641-1647.

III. RESPONSIBILITIES

The responsibility for providing each employee a safe working environment rests with each employee's respective employer. This plan, therefore, applies only to KGS for the survey activities. Each employee of KGS will strive to identify and mitigate any safety hazards encountered. All parties will cooperate in working as safely as possible and will comply with all applicable safety requirements as set forth by Northeast Geophysical as well as those included in this document.

In addition to the safety procedures indicated herein, we will adhere to the following:

1. In the event of electrical storms in the vicinity, all surface operations will cease if lightning strikes are closer than three miles (determined by 15 second count between lightning and thunder and/or by lightning detector).
2. If conditions become excessive (i.e., temperature $> 100^{\circ} < 30^{\circ}$ F), continuous day operations may be modified to minimize chances for heat- or cold-related medical problems. Breaks of up to one hour after every hour of work might be necessary in extreme situations (i.e., temperature $> 110^{\circ} < 0^{\circ}$ F). Maximum hydration of staff will be strived for at all times.
3. Appropriate field boots will be worn and due caution will be exercised with respect to snakes, ditches, swampy areas, and ground debris. Steel toes will be worn by all field crew members.
4. Safety glasses will be worn by crew members when operating open-air vehicles or sources. Safety glasses are recommended when planting geophones.
5. At least one gallon of fresh water will be on hand at the beginning of each day for each crew member. An ice chest for keeping foodstuff cold and an ice chest for medical use in case of injury or overheating will be available on-site.
6. In the case of excessive cold weather, a sheltered area will be available with inside temperatures above 32° F.
7. The seismic crew will operate with an established protocol for initiating seismic sources. The safety plan will be approved by the Northeast Geophysical Representative prior to initiation of field operations.
8. Appropriate drivers licenses will be held by operators of vehicles at all times (KDOT regulations). All KGS staff will have appropriate utility vehicle (UTV) training. All vehicles will be operated in accordance with manufacturer's documented procedures.
9. All explosive or flammable materials will be properly stored in vehicles and labeled in accordance with KDOT regulations during transport. MSDSs will be in this safety plan for all regulated, controlled, or potentially hazardous materials.
10. High pressure systems will be identified and will be maintained to meet or exceed manufacturer's specifications.

11. Work along roads will comply with regulations as established by KDOT (in Kansas) or local department of transportation (for out-of-state).

12. Proper work gloves and clothing for site conditions will be worn by all KGS staff.

IV. FIRE PREVENTION AND PROTECTION PROGRAM

The overall objective of the KGS field fire prevention and protection program is to maintain a consistent awareness of fire potential in our various areas of responsibility. It is imperative to be ever vigilant in identifying ignition sources and potential spark-advancing fuels. These concerns span not only flammable materials brought on-site by the KGS, but also any combustible or explosive materials already on the site or naturally present within the study area.

Seismic operations involve the controlled release of large quantities of energy. Some sources of that energy require explosions that are an ignition source, while others generate sufficient heat in the presence of flammable liquids to potentially exceed the ignition point of many combustible materials. Therefore, when site conditions are conducive to sustaining combustion, extreme caution is required when operating seismic sources.

All gasoline engines have spark arrest exhausts to reduce the threat of igniting any combustible or flammable materials.

Smoking is only allowed in designated areas and all cigarette butts and ashes are disposed of in sand-filled cans provided in smoking areas. Under no circumstances are lit cigarettes discarded on the ground in work areas.

Several areas of specific concern and operational awareness are:

- a) handling and storage of flammable materials
No flammable solids will be transported or used during normal seismic surveying. Flammable liquids will be limited to petroleum products such as diesel, gasoline, lubricating oils, etc.
- b) containment of flammable liquids
Flammable liquids will be transported to the site in steel, U.S. Government approved nurse tanks, mounted in the bed of a truck, and labeled appropriately (and a single 5-gal. can to allow fill-up remote from nurse tanks). These flammable liquids include diesel and gasoline used for fuel in the seismic vibrator and support UTVs. Quantities transported in nurse tanks will not exceed 100 gallons of either type. Petroleum operated engines will have fuel supplied via manufacture provided and certified fuel tanks. Transfer pumps will be installed and maintained in accordance with manufacturer specifications.
- c) fire protection at storage locations
The nature of seismic work prohibits effective use of fixed storage locations. All mobile facilities (trailers) will have fire extinguishers at or near doors. Vehicles will have fire extinguishers located in accord with KDOT regulations.
- d) how fires shall be handled on project
All personnel will be educated on the fire triangle and matching extinguisher types with fires. All on-site KGS staff will have been instructed, prior to arrival on site, to the appropriate procedures for fire containment and extinguishing, making the removal of any one side of the fire triangle the principal objective.
- e) fire watch or hot work permits
No hot work will be undertaken on-site. Fire watch will be a supplemental task of every member of the seismic crew.

V. SAFETY PERSONNEL

Safety Personnel and Emergency Contacts

1. Rick Miller (KGS)—Site Safety Officer
2. Brett Wedel (KGS)—Operations
3. Rudy Rawcliffe (Northeast Geophysical)—Technical Representative
4. Tony Englund (MACTEC Engineering and Consulting)—Site Representative
5. Andy Kennedy (Olin)—Local Contact

VI. EMERGENCY INFORMATION

Alabama Highway Patrol	<u>General Information 334-242-4371</u> <u>Highway Emergencies Cellular *47 (*HP)</u>
Police/Ambulance:	<u>911; police/fire dispatch</u>
McIntosh Police Department	<u>251-944-2973</u> <u>206 Commerce Street, McIntosh, AL 36553</u>
McIntosh Volunteer Fire Department	<u>291-944-2000</u> <u>Commerce Street, McIntosh, IL 36553</u>
Searcy Hospital	<u>251-662-6700</u> <u>725 E Coy Smith Hwy, Mt Vernon, AL</u>

Northeast Geophysical Contacts

Randy Rawcliffe	Northeast Geophysical Services, Bangor, ME Ph 207-942-2700
Tony Englund	MACTEC Engineering and Consulting, Kennesaw, GA Ph 770-421-3460

Local Contact

Andy Kennedy	Olin Ph 251-944-3237 Cell 251-895-3735
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KGS Emergency Contacts

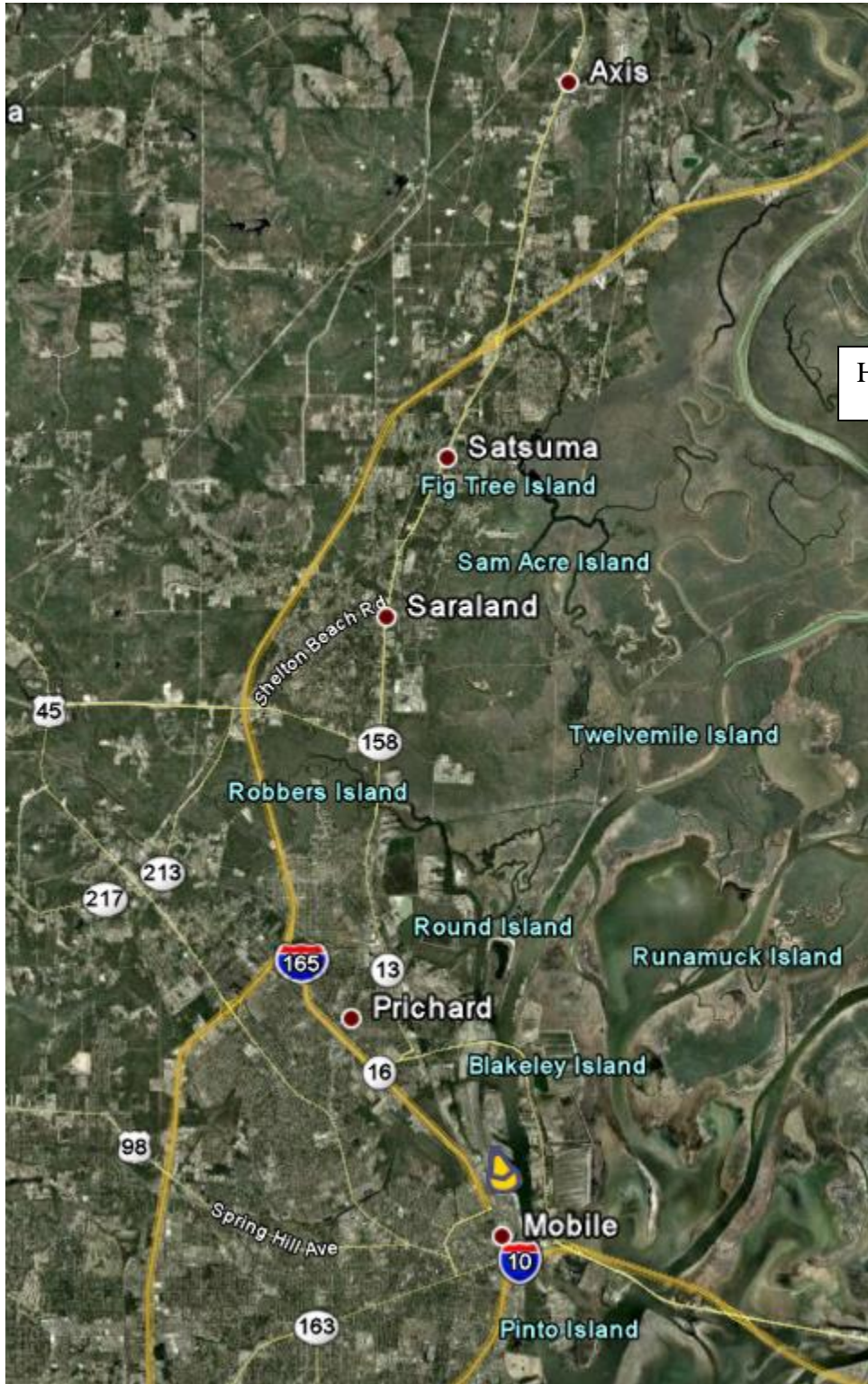
Safety Coordinator and Project Manager
Rick Miller, Kansas Geological Survey, 785-864-2091
Cellular (in the field): 785-766-8638

KGS Safety Officer
Kathy Sheldon, Kansas Geological Survey
Office: 785-864-2109

Lodging

LaQuinta Inn & Suites
6104 Hwy 43
Satsuma, AL 36572 (251) 675-5977 / Fax (251) 279-1646

General Maps



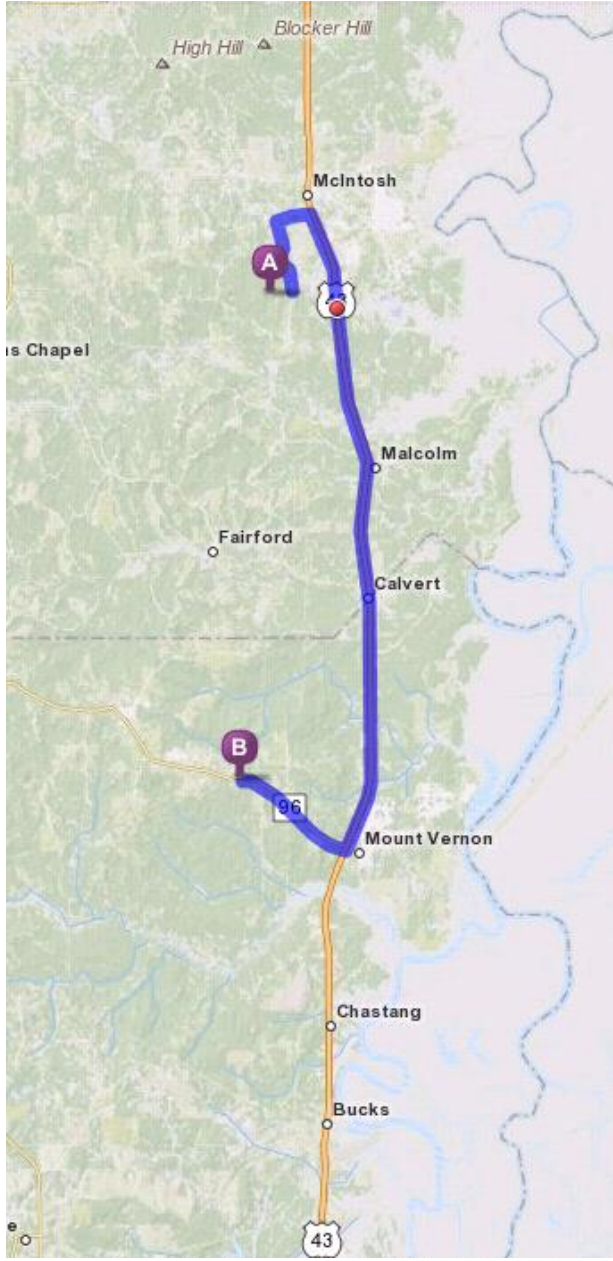
Hotel is in Satsuma

Note Mobile, AL, at the bottom of this map. The hotel is in Satsuma, toward the middle-top of the map. The field site is off this map to the north, in/near McIntosh, AL

Emergency Route to Hospital

McIntosh to Searcy Hospital in Mt Vernon

Searcy Hospital Ph. 251-662-6700
725 E Coy Smith Hwy
Mt. Vernon, AL 36560



**Directions from
(A) McIntosh, AL
to
(B) Searcy Hospital in Mt. Vernon, AL**

AL-13 S / US-43 S / Co Rd 35 is the main north-south road through McIntosh.

From McIntosh, head south on AL-13 S / US-43 S / Co Rd 35 (approx 10 miles).

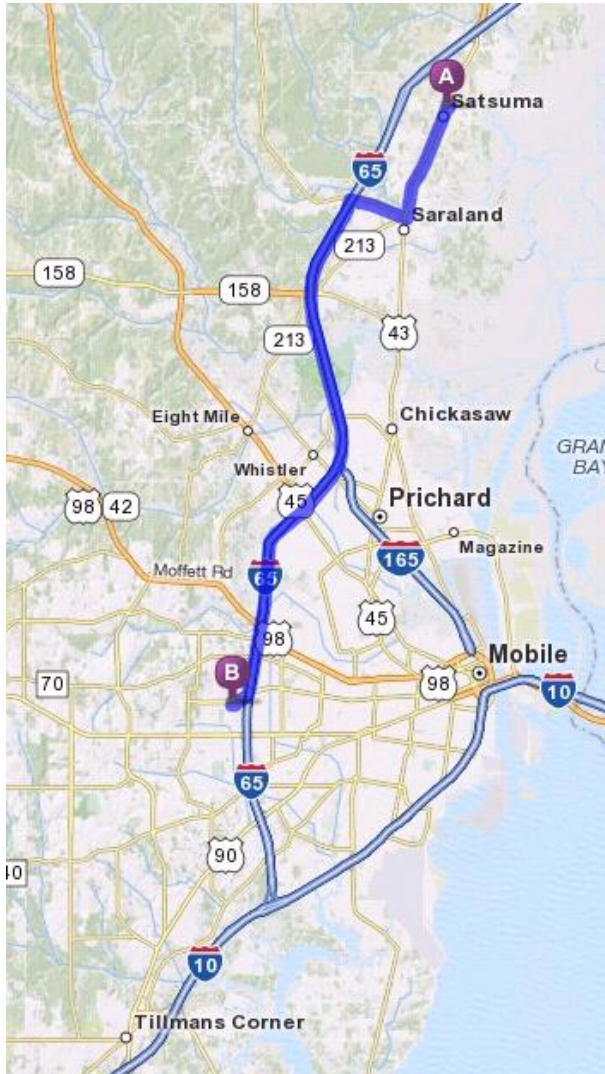
Turn right onto CR-96 / East Coy Smith Hwy. [CR-96 is 0.3 miles past Unruh Street.]

It is 2.6 miles from US-43 to Searcy Hospital.

It is 20-25 minutes from McIntosh proper to Searcy Hospital.

Emergency Route to Hospital Satsuma to Mobile

Springhill Medical Center Ph. 251-344-9630
3719 Dauphin Street
Mobile, AL 36680



**Directions from
(A) Satsuma, AL
to
(B) Springhill Medical Center in Mobile**

In Satsuma start out going northeast on Old Hwy 43 toward Plateau Ave E. 0.7 mi

Take the first left onto Plateau Ave E 0.4 mi

Take first left onto US-43 S / AL-13 S 2.4 mi

Turn right onto Celeste Rd / CR-41 1.3 mi

Merge onto I-65 S via ramp on the left toward Mobile 10.5 mi

Take the Dauphin St exit, Exit 4 0.3 mi

Turn right onto Dauphin St 0.4 mi

Turn left to stay on Dauphin St 0.8 mi

Springhill Medical Center [3719 Dauphin St] is on the right.

Total distance 15.1 miles / 20 minutes.

Procedures

Accidents/Injury: If any serious injury does occur, the appropriate authorities shall be notified immediately. All accidents will also be reported.

Several members of the KGS crew have certification in CPR/First Aid. This certification was received through participation in the “First Aid Basics” and “Adult CPR” programs presented by the Red Cross of Lawrence, Kansas. These classes are approved by the U.S. Department of Labor, Mine Safety, and Health Administration and meet or exceed OSHA requirements. OSHA certifications are provided by Genesis Environmental (formerly EPIC Training) and meet or exceed 29 CFR 1910.120.

The following persons are certified as indicated (strikethrough denotes no current certification):

Certified in: First Aid CPR 40hr OSHA 10hr OSHA Rick Miller

Certified in: First Aid ~~CPR~~ 40hr OSHA 10hr OSHA Brett Wedel

Fire/Explosion: Upon notification of a fire or accidental explosion on site, the fire department or appropriate first responders shall be notified and all personnel shall leave the area. Since only Class “C” shotgun ammunition will be used as part of the program, local fire, police, and other governing authorities will not be contacted prior to the use of such devices on-site. On-site Northeast Geophysical demolitions personnel will manage and respond to any situation. If Class “A” explosives were used, prior consultation and contact would be made with the appropriate emergency response groups.

At least one KGS (owned or rented) vehicle will be on-site during the performance of all work. This vehicle will be used for medical evacuation of project personnel, if necessary.

Permits: All necessary and appropriate permits, fees, and licenses will be obtained by Northeast Geophysical, with copies available on-site for inspection by local authorities.

VII. ALCOHOL AND DRUG POLICY

The University of Kansas (of which the KGS is a part) is a drug and alcohol free workplace with stringent controls and penalties associated with the use and distribution of controlled substances and alcohol in the workplace regardless of whether it is at a remote field location or on campus. The University of Kansas and Kansas Geological Survey consider alcohol and drug use (non-doctor prescribed) while “on-duty” a health and safety risk. The following section details the University and Survey policy as it relates to drug and alcohol abuse and misuse, enforcement of policies, and penalties for violating those policies.

Policy on Prevention of Illegal Drug and Alcohol Use on Campus and in the Workplace

The University of Kansas prohibits the unlawful possession, use, manufacture, or distribution of alcohol or drugs by students and employees on its property or as part of its activities. The University is committed to a program to prevent the illegal use of drugs and alcohol by students and employees. Any student or employee found to be using, possessing, manufacturing, or distributing controlled substances or alcohol in violation of the law on University property or at University events shall be subject to disciplinary action in accordance with applicable policies of the State of Kansas, the Board of Regents, and the University of Kansas. For employees, the University will take appropriate personnel action for such infractions, up to and including termination. Students who violate this policy will be subject to sanctions, which include suspension and expulsion from the University.

As a condition of employment, all employees of the University of Kansas shall abide by the terms of this policy statement and will notify the University of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction. The University will, in turn, notify as appropriate, the applicable federal agency of the conviction within ten days of receipt of notification of the conviction. The University will initiate personnel action, up to and including termination, within thirty days of receiving notice of such conviction. Employees may also be required to satisfactorily participate, at their own expense, in a drug abuse assistance or rehabilitation program before being allowed to return to work. For purposes of this policy, “conviction” means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the federal or state criminal drug statutes.

Kansas Law

Students and employees are reminded that illegal possession or use of drugs or alcohol may also subject individuals to criminal prosecution. The University will refer violations or proscribed conduct to appropriate authorities for prosecution. Kansas law provides that any person who violates the criminal statutes on controlled substances by possessing, offering for sale, distributing, or manufacturing opiates and narcotics, such as cocaine and heroin, shall be guilty of a drug severity Level 3 felony. For a conviction of such a felony, the court may sentence a person to a term of imprisonment in accordance with the Kansas Sentencing Guidelines Act and a fine of up to \$300,000. Unlawful possession of a depressant, stimulant or hallucinogenic drug is punishable as a Class A nonperson misdemeanor, with a penalty of imprisonment and a fine of \$2,500. Depressants include barbiturates, Valium, and barbitol. Hallucinogens include LSD, marijuana, and psilocybin. State law classifies amphetamines and methamphetamines as stimulants. Kansas statutes also provide for criminal penalties for conviction of certain alcohol-related offenses. These penalties include imprisonment of up to six months and fines of up to \$1,000.

Federal Law

The Federal Controlled Substances Act provides penalties of up to life imprisonment and fines up to \$4,000 for intentional unlawful distribution or possession with intent to distribute controlled substances. For unlawful possession of a controlled substance, a person is subject to up to twenty years of imprisonment and fines up to \$5,000. Any person who unlawfully distributes a controlled substance to a person under twenty-one years of age or who distributes a controlled substance on or within 1,000 feet of the University may be punished by up to twice the term of imprisonment and fine otherwise authorized by law.

Health Risks

Accidents and injuries are more likely to occur if alcohol and drugs are used on University property or as part of University activities. Every year in the United States, over 200,000 people are treated in hospitals for drug-related accidents and mental and physical illness; another 25,000 die every year from drug-related accidents or health problems. Drug users can lose resistance to disease and destroy their health. Drug tolerance and psychological dependence can develop after sustained use of drugs. More specifically, physical dependency, heart problems, infections, malnutrition, and death may result from continued high doses of amphetamines. Chronic use of narcotics can cause lung damage, convulsions, respiratory paralysis and death. Depressants such as tranquilizers and alcohol can produce slowed reactions, a slowed heart rate, damage to liver and heart, respiratory arrest, convulsions, and accidental overdoses, because the abuser is unaware of how much the drug or alcohol has been taken. Use of hallucinogens may cause psychosis, convulsions, coma, and psychological dependency.

Alcoholism is the number one drug problem in the United States. Alcoholism takes a toll on personal lives by affecting finances, health, social relationships, and families. It can have significant legal consequences. Abuse of alcohol or use of drugs may cause an individual driving a motor vehicle to injure others and may subject the abuser to criminal prosecution. Drunk drivers are responsible for more than half of all traffic fatalities.

Counseling & Treatment Resources

At the University of Kansas, alcohol and drug counseling and treatment are available to students at the University Counseling and Psychological Services, Watkins Health Center, and the Psychological Clinic. The Student Assistance Center and the University Information Center are excellent sources for information about University and community resources for counseling and treatment. The Health Education Department of Watkins Health Center can provide further information about health problems and treatment related to alcohol and drug problems.

University employees may contact the Counseling and Psychological Services and the Psychological Clinic for counseling and treatment. Faculty and staff members may also contact the State LIFeline, a 24-hour toll-free assistance line (1-800-284-7575) for a referral. If referred through the LIFeline program, the first counseling session is paid by the State. Please refer to page 63 for additional resources.

Definitions

The term "controlled substance" as used in this policy means those substances included in Schedules I through V as defined by Section 812 of Title 21 of the United States Code and as further defined by the Code of Federal Regulations, 21 C.F.R. 1300.11 through 1300.15. The term does not include the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

The term “alcohol” as used in this policy means any product of distillation or a fermented liquid which is intended for human consumption and which is more than 3.2% alcohol by weight as defined in Chapter 41 of the Kansas statutes.

Policy on Substance Abuse

The University recognizes that problems related to the abuse of substances such as alcohol and drugs may be resolved through cooperation between the employer and the affected employee. The policy set forth here for handling substance-abuse problems is intended to enhance cooperation and to protect both the individual and the University.

The University has a right to expect that employees will perform their jobs appropriately and to insist that job-performance standards be met. The University may properly intervene only when impairment affects job performance.

- These problems are defined as those in which an employee’s use of alcohol or drugs has become part of a pattern of deteriorating job performance.
- This policy does not supersede any regulations or standard administrative practices applicable to job performance requirements.
- It is the employee’s right and responsibility to seek professional assistance for a substance-abuse problem.
- All employees, especially department chairpersons and supervisors, should work to engender an enlightened attitude toward and a realistic recognition of the nature of substance abuse and to encourage employees to take advantage of available treatments whenever needed.
- Responsibility for implementing this policy rests with all department chairpersons and supervisory personnel. Procedures must be followed to assure that no employee with a substance-abuse problem will have his or her job security or promotional opportunities jeopardized by a request for diagnosis and treatment.
- A chairperson or supervisor may wish to consult with a professional in the treatment of substance-abuse *WITHOUT IDENTIFYING THE CONCERNED EMPLOYEE* before attempting intervention with the employee.
- Before attempting intervention, a supervisor of classified staff should discuss with his or her own supervisor and the Department of Human Resources the rules and requirements protecting the rights of the person believed to be suffering from alcoholism or drug abuse.
- Departmental chairpersons and supervisors should not attempt diagnosis. When an employee’s job performance is deteriorating and there is reason to suspect that the source may be the use of alcohol or drugs, the chairperson or supervisor will meet informally with the employee, make an appropriate referral to a professional agency and encourage him or her to seek help for the problem. At this meeting, a date will be set by which improvement in job performance will be assessed.
- The employee is responsible for complying with the referral for diagnosis and for cooperating in any prescribed treatment. He or she should be assured that the referral agency will treat all discussions with strict confidentiality. (Most agencies will, with the consent of their client, report to a supervisor that the client has followed up on a referral.)
- Between the time of the meeting and the date set for assessing improvement in job performance, the chairperson or supervisor will continue to monitor the performance but will in all other respects leave the initiative for further discussions to the employee.

- If, by the date set at the first meeting, the employee's job performance has improved to an acceptable level, no further official action is required.
- The University expects that employees with a possible problem of substance abuse, even in its early stages, will be encouraged to seek diagnosis and treatment. The employee should be assured that seeking help will not interfere with job status, promotional opportunities or other privileges.
- If the job performance remains below accepted standards and the employee has refused to accept diagnosis and treatment, or has failed to respond to treatment, the chairperson or supervisor should suggest that he or she use one of the options available to any employee with an illness that interferes with job performance:
 - a. Being placed on sick leave. This option is for those with accrued leave. It would allow the employee to enter an inpatient treatment center and adopt a treatment program. Under this option, a written plan should be developed between the staff member and the University and properly executed by the chairperson or supervisor in consultation with Human Resources. The plan will spell out specifically the terms of the employee's return to his or her duties at the end of treatment (e.g., how the University is to be informed of the progress made in treatment and the appropriateness of a return to duty and how job performance is to be assessed).
 - b. Being granted a leave of absence without pay for up to twelve months. This option is for classified employees, upon approval of the Department of Human Resources.
 - c. Taking early retirement. This option is for those otherwise eligible. It is, of course, a drastic solution for both the individual and the University.
 - d. Resigning. If a classified employee can make no progress, recommendations to demote or dismiss are to be submitted to the Department of Human Resources for review and action.

Information revealed by the employee while receiving professional services will remain confidential and separate from University employee records. All record-keeping and access procedures will meet the federal regulations governing the confidentiality of patient records and the state law protecting treatment records.

VIII. TASK SPECIFIC HAZARDS

The purpose of the geophysical investigation is to acquire seismic data that can be used to extract key physical properties of the near surface.

30.06 Downhole Projectile Source

Experiments will be carried out with a downhole projectile source. This source is a specially modified 30.06 rifle designed to be loaded and fired while secured to the ground in a downward direction. The firing tube is lowered about one foot into a 1" hole. A standard 30.06 rifle shell is loaded in the above-ground breech and then detonated so that air coupled wave (blast), gas, projectile, and shrapnel are contained within the 1" hole. The procedure calls for 1) drilling a 1" x 1' hole, 2) placing the firing tube in the hole (covering the end of the tube with a finger cot), 3) loading a 30.06 round into the above-ground breech, 4) locking the bolt in place, 5) assuming the firing position, 6) detonation, and 7) removal from the hole. The device has successfully and safely fired over 30,000 rounds since 1985. All rounds are stored in a secure steel box.



General

Field operations will consist of geophysical investigations to determine the effectiveness of shallow seismic survey methods at this site to delineate the structures and stratigraphy. The introduction of acoustic energy into the ground in a controlled fashion involves equipment or material with the potential to do harm if not properly handled and operated. Good common sense, training, and experience are the rule for seismic field operations. These can usually be easily accomplished if manufacturers' operating and use instructions are followed.

The field investigations will involve project personnel performing geophysical surveys of the study area utilizing the aforementioned pressure pulse, impacting, and vibratory seismic sources. The principal hazards associated with the use of sources mentioned here consist of handling or moving the equipment, improper use, fragments from high pressure impacts, and elevated sound levels.

IX. ACTIVITY HAZARD ANALYSIS

A. Work Item: Traffic Control

All regulation concerning right-of-way and traffic directions will be observed.

Specific Hazards–The specific hazard involves accidents with vehicular traffic within the survey area.

Control Measures–All personnel will minimize activity along trafficked roadways to the extent possible. Traffic cones will be used to identify and buffer the work area with respect to on-coming traffic. Care will be used while working on or around driveways. If appropriate, signs and/or flagmen will be used to alert and slow traffic through the survey area. Flagmen will be used along roadways with limited sight areas or speed limits exceeding 45 mph. For sites with traffic speeds above 45 mph and work requiring shoulder access, lane closure must be considered.

B. Work Item: Use of Class “C” Shotgun Ammunition (Auger gun / Buffalo gun / 50 cal. / 30.06)



Specific Hazards–The specific hazards involve injuries to persons or property damage arising from normal or accidental detonation or improper handling of the shotgun ammunition.

Control Measures–All project personnel working with or around the shotgun ammunition, seismic guns, and associated equipment will exercise all appropriate and reasonable precautions to prevent or limit accidents arising from use of explosives. All explosive devices

will be Class “C,” consisting of fully containerized smokeless black powder in the form of shotgun ammunition. Site work will conform with appropriate and reasonable Class “C” explosives handling, storage, communication, and detonation procedures. All seismic shots will occur in shallow boreholes 2 to 4 feet below ground level.

Rick Miller of the Kansas Geological Survey will be responsible for the safe use of the shotgun ammunition to be used. He will review the blasting communications and safety procedures at the initial site safety meeting and again prior to the initiation of the first seismic shots. All project personnel must become familiar with and abide by these protocols.

Specific ammunition safety measures when KGS is managing ammo are as follows:

- Storage: All ammunition will be stored in a locked container. The storage container will have proper DOT labels for Class “C” ammunition.
- Transportation: The ammunition vehicle will be operated by Rick Miller or Brett Wedel on or near site. The vehicle will contain a fire extinguisher, First Aid kit, and will be parked far enough off any road to minimize the potential for a collision with other vehicles.

- **Handling:** Only Rick Miller or Brett Wedel, KGS, will be allowed to access, handle, and load the 30.06 seismic source. Source loading and firing will be conducted in accordance with the Operations/Safety Rules and Regulations.
- **Firing Communication:** Rick Miller or Brett Wedel shall establish a series of warning signals to be used prior to and following each shot. An audio signal/or voice command will indicate the beginning of a shot (or prior site specified requirements). He will review the precise warning procedures with all project participants at the initial site safety meeting, and will monitor compliance with these procedures.
- **Safe Distances:** All project personnel not authorized to handle the ammunition and source must stay a distance of 10 feet away from the source and shot locations. Non-project personnel will not be allowed in the work area.

Blasting shall not commence if any of these protocols is not met.

The previous protocols are KGS minimums and can serve as fall-back measures if site staff do not have more stringent requirements.

Transportation. Transportation of the source and ammunition is in a standard passenger vehicle. The ammunition is carried in rugged tool box. The ammo box will be locked and stored on site when not in use. The ammunition is classified as “Class C Explosive” by the U.S. Department of Transportation. No more than 600 rounds of ammunition will be transported to this project, packed in quantities of around 20 per container.

C. **Work Item: Geophones**

Geophones are electromechanical devices that respond to earth movement, producing an electric pulse representative of the ground motion. They are coupled to the ground with 3-5 inch spikes.



Specific Hazards

Geophone spikes can puncture the skin and string or groups of geophones can be excessively heavy and represent a lifting hazard.

Control Measures

- 1) Keep geophone strings away from legs while walking and carrying.
- 2) Never carry more than one hasp of geophones per arm.
- 3) Wear gloves and safety shoes to protect extremities from smash or crush hazards.

X. TRAINING

At least one KGS personnel working at the site in connection with the project shall have received hazardous waste worker training in accordance with 29 CFR 1910.120(e), be certified in First Aid, and CRP trained. This includes 40-hour initial training and yearly 8-hour refresher training. All KGS personnel will have appropriate experience and training with each source, vehicle, and method used.

XI. PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) protects employees from the hazards and potential hazards they are likely to encounter as identified during previous site characterization activities. PPE consists of a combination of protective clothing and respiratory protection equipment. Selection of PPE is based on an evaluation of the performance characteristics of the PPE relative to the requirements of the site and the task specific conditions and duration. The level of protection is upgraded when site monitoring or conditions indicate that increased protection is necessary to reduce employee potential for exposure.

Based on the available information assessing the current condition of the sites, minimal skin protection is required for general access. The prescribed working uniform for all personnel engaged in activities related to the project is a modified EPA level D and shall consist of:

- Long-sleeved shirts and full-length pants
- Leather steel toed safety boots
- Hard hat* (only necessary for certain operations)
- Eye protection*
- Hearing protection as required by OSHA for certain tasks (identified by work item)
- Orange vests along roadways (unlikely necessary for this project)

No respiratory protection equipment is required. At the present time based on all available information, the atmosphere contains no known hazards. There is no expected potential for inhalation or contact with hazardous levels of any chemical.

Added protection from the sun and insects might be necessary. All workers will be encouraged, but not required, to use sunscreen and insect repellent. These protective chemicals will be available for use on-site.

*When operating sledgehammer, slide hammer, 30.06 projectile, and auger gun.

XII. SAFETY ANALYSIS

The following analysis list postulates hazards, consequences of those hazards, and the means of prevention or mitigation of each hazard associated with this survey activity.

A. Mobilization – Loading & Unloading

<i>Potential Hazards</i>	<i>Recommended Safe Procedures</i>
Sprained back	Use proper lifting technique, get help
Backing vehicle into equipment or personnel	Use spotter, back-up alarms on vehicles. Driver to insure that rear-view mirrors are adjusted properly.

B. Mobilization – Travel To / From Site

<i>Potential Hazards</i>	<i>Recommended Safe Procedures</i>
Traffic accidents	Use proper defensive driving technique.
Livestock or other animals on road	Watch sides of the road, especially at dawn & dusk; try to avoid larger animals.
Equipment falling off of trucks	Check load before leaving shop or overnight lodging, after first 25 miles, then after every 150 miles.
Losing control or falling asleep at the wheel	Watch driving speed versus road condition and posted legal limits. Get good rest, use buddy system on long drives, pull over if necessary.

C. Working Along Highways – This section highlights some of the more common issues. It is not meant to be a guide to traffic control, which should be conducted only by qualified personnel.

Traffic signs, cones, and flaggers should be used as appropriate when working on road shoulders. Signs, cones, and flaggers must be used when working in a closed traffic lane.

<i>Potential Hazards</i>	<i>Recommended Safe Procedures</i>
Pedestrian / Automobile accident	Wear high-visibility vests. Watch traffic. Don't assume traffic control will keep cars & trucks out of area. Work <u>facing</u> traffic, <u>not</u> back to traffic. If traffic drifts into the lane you are working in, <i>drop what you are doing and get away to safety.</i>
Slips, trips, falls	Clear work area of obstacles, be sure of your footing.

D. Laying Out and Picking Up Seismic Cables and Geophones

<i>Potential Hazards</i>	<i>Recommended Safe Procedures</i>
Slips, trips, falls	Clear work area of obstacles, be sure of your footing.
Back or neck injury	Get assistance with heavy cables, use proper lifting technique.
Tangled cables	Use proper winding / unwinding technique, get help with untangling heavy cable or untangling cable where footing is slippery or steep.
Lightning in area	If thunder is within 5 seconds of lightning, get away from cables, shut down operations, disconnect cables from any recording equipment mounted in truck, get

	into truck cab. Keep an eye on the weather if thunder storms are forecast.
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E. Environmental Concerns

<i>Potential Hazards</i>	<i>Recommended Safe Procedures</i>
Fuel & hydraulic fluid leaks	Check equipment for leaks and repair as needed. Use absorbent materials, clean up any spills.

XIII. ENVIRONMENTAL IMPACT ANALYSIS

The environmental impact of this activity has been evaluated and determined minimal (“small footprint”) at more than six U.S. Government facilities (Y-12 ORNL, Oak Ridge, TN; WAG-10, ORNL, Oak Ridge, TN; Paducah Gaseous Diffusion Plant, Paducah, KY; Nevada Test Site, Las Vegas, NV; Fort Ord, CA; Berkeley Nat’l Lab, Berkeley, CA; INEL, Idaho Falls, ID) as well as multiple BLM and DOD sites.

XIV. HANDLING AND DISPOSAL OF UNEXPLODED ROUNDS

The handling of live ammunition will be in complete compliance with sections VIII.A and B and seismic gun operation procedures (both sections of this report). In the event a round does not detonate using standard operating procedures, the seismic source will be left in place undisturbed for a minimum of 3 minutes. After this initial 3 minutes, the shell will be extracted to insure minimal contact with operators. The unexploded round will be placed in the metal container used for the storage of spent rounds. If the round is an 8-gauge it will remain in the sleeve for a minimum of 20 minutes after placement in the metal can prior to being placed in a metal can and locked in the steel containers attached to the truck. If it is a 50-cal. round it will remain in the can for 20 minutes before it will be removed and re-stored in a metal can in the metal transport boxes attached to the truck. The unexploded rounds will then be delivered to Northeast Geophysical demolitions staff for disposal by Northeast Geophysical.

XV. REFERENCES

Applicable portions of the following documents form the basis for this safety plan.

From the United States Department of Energy:

DOE Order 5480.16, *Firearms Safety*.

DOE Report DOE/EV/06194-3, *DOE Explosives Safety Manual*.

ID Appendix 0550, *Standard Operational Safety Requirements*, Part III, Subpart I, “Explosives”

From the United States Department of Defense:

DOD 6055.9-STD, *Ammunition and High Explosive Safety Standards*

AR-385-63, *Safety Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat*