30-025-41152

Hydrogen Sulfide (H_2S) Contingency Plan

Cooper Jal Unit #129

Section 19, T. 24 S., R. 37 E.

Lea County, New Mexico

Prepared for

RESACA

Prepared by

PERMITS WEST, INC.

PROVIDING PERMITS for LAND USERS

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Checklist for Drilling, Work Over, and Maintenance in H_2S Environment

1. All personnel will receive proper H_2S training in accordance with Onshore Order 6, Section III.C.3.a.
2. Two safety-briefing areas will be established at least 100 yards from the wellhead. At least one briefing area will be upwind at all times. These sites should be located uphill whenever possible. (see Appendix 3.1)
3. Identify direction of prevailing winds (see Appendix 3.1)
4. At least two wind socks will be installed at all times
5. Primary and secondary emergency escape routes (flagged trail minimum)
6. Number, types, and storage location of H_2S emergency respirators for personnel, and number of personnel to be present onsite at any one time.
7. H_2S detector locations (3 minimum to include cellar or bell nipple and mud tanks at shale shaker). Type and location of visual and audible alarms to be used.
8. H_2S evacuation and emergency training procedures and schedule (i.e. Contingency Plan)
9. List of area residents within a two-mile radius, evacuation plan, and contact list (including agencies and individuals)
10. Types and quantities of mud additives and scavengers to be available at location for H_2S operations
11. Design features and operational procedures to be used to provide safe working environment (all equipment meets standards for H_2S service)
12. Appropriate warning signs and flags on all access roads
13. Provisions for blocking and monitoring access to location during critical incident
14. Ventilation fan under rig floor
15. In event of uncontrolled blowout, designation of local official who has authority to ignite flow
16. Swabbing or drill stem fluids containing H_2S should be put through a separator to permit flaring of gas. Flare should have a continuous pilot light to ensure ignition of all such gas.

1.0 General

1.1 Description of Hydrogen Sulfide Gas

Hydrogen Sulfide (H_2S) is a colorless, transparent gas with a distinct and characteristic rotten-egg odor at low concentrations. It is not detectable by odor at high concentrations. H_2S at higher concentrations and/or over longer periods of exposure paralyzes the olfactory sense for that specific odor. The gas is extremely toxic to humans and can easily become dangerous and lethal. Extreme care and caution is needed to prevent injury and/or death. H_2S has a specific gravity of 1.192 that is heavier than air. It tends, therefore, to accumulate in low places. This collection of gas can lead to dangerous concentrations in areas such as arroyos and drainages. H_2S from "down hole" is often warmer than surface air and will therefore tend to rise and therefore affect workers above the escaping source. Hydrogen Sulfide is explosive and water-soluble.

1.2 Toxicity

American National Standards Institute standard: Z37.2-1972 Acceptable Concentrations of Hydrogen Sulfide describes H_2S toxicity in this way: Hydrogen Sulfide is an extremely toxic and irritating gas. Free hydrogen sulfide in the blood reduces its oxygen-carrying capacity, thereby depressing the nervous system. Hydrogen sulfide is oxidized quite rapidly to sulfates in the body, therefore no permanent aftereffects occur in cases of recovery from acute exposures unless oxygen deprivation of the nervous system is prolonged. There is no evidence that repeated exposures to hydrogen sulfide result in accumulative or systemic poisoning. Effects such as eye irritation, respiratory tract irritation, slow pulse rate, lassitude, digestive disturbances, and cold sweats may occur but these symptoms disappear in a relatively short time after removal from the exposure. Odors become detectable in concentrations as low as .008 parts per million (ppm) (California studies), but the sense of smell is lost after 2-15 minutes at 100 ppm.

1.3 H_2S First Aid and Treatment Procedures

- Victim should be removed to fresh air immediately**
- If victim is not breathing, rescue breathing or artificial breathing should be started immediately
- Treat for shock; keep victim warm and comfortable
- Call an ambulance and/or doctor, take victim immediately to emergency room or other health care facility

****The rescuer(s) should always wear personal protective equipment when attempting to rescue an H_2S victim. Never increase the number of victims unnecessarily during an H_2S emergency.**

2.0 Hydrogen Sulfide (H_2S) Contingency Plan

2.1 Introduction

This plan provides required procedures to be followed to provide for a safe H_2S working environment. These required procedures include safety procedures, precautionary measures, and training for emergency and standard procedures. This document sets forth the responsibilities of the operator and all individuals and entities under employment or contract with the operator working in a sour oil or gas (H_2S) area.

To make this contingency plan effective and in order to provide a safe working environment, cooperation from all individuals is a necessity. Each person on site must understand normal and emergency operating procedures for this site. Each individual on site must have adequate information, training, and practice with the specific procedures described in this Contingency Plan. It is the responsibility of both the operator to provide adequate equipment, training, and procedures, as well as the individual worker's responsibility to participate fully in all H_2S procedures, to familiarize themselves with the location of all safety equipment and features, and to keep equipment and procedures in working order and up to date.

In order for Resaca Operating Company to provide a safe working environment for all workers and individuals in the vicinity of the well the safeguards are put in place. **Initiative lies with each and every individual for the safety of all. To this end, the drilling foreman is required to and will enforce all safety procedures, for the benefit of all involved.**

2.2 Purpose

Resaca Operating Company will provide a safe working environment for all neighbors, employees, contractors, and others involved with the drilling of its well. There exists the possibility of encountering toxic H_2S gas during the drilling, completion, maintenance, and production of the well. This H_2S contingency plan will be put into effect after surface casing is drilled or when it is deemed necessary by the BLM in consultation with Resaca Operating Company.

Safety procedures are established for each person's safety connected with the operation and for the safety of the residents of the local area. One house is within 2 miles.

An intermittently occupied house is in the northeast quarter of Section 23 and west of the Jal Cooper Cemetery. Norma Crawford is one of the owners and can be called at (575) 441-2600. She does not live at the house. The occasional occupants are ranch hands. This house is >7,500' northwest.

The Texas-New Mexico Railroad (888 783-4316) is ≈1,000' east.

The Resaca Operating Company foreman will strictly enforce these procedures. Noncompliance may result in loss of pay or dismissal from the site, job, or employment.

2.3 Operating Procedures

Before this H_2S contingency plan is operational, all personnel that are to be involved with operation will be thoroughly trained* in the proper use of breathing apparatus (i. e. Self Contained Breathing Apparatus and Escape Units), emergency procedures, and H_2S first aid and rescue methods. Training will include means of communication when wearing breathing apparatus. An approved list of trained personnel will be supplied by the safety company and stored with the drilling foreman.**

*Required training for operation personnel will include, but not be limited to, an H_2S safety course from an approved training company, safety briefing at the drill site on all safety equipment use and locations before the start of work for each and every person on site, safety related training in place on site 1,000 feet before drilling the first H_2S formation.

**Throughout this contingency plan breathing apparatus shall be understood as

a) A Self-Contained Breathing Apparatus (SCBA) manufactured such as Scott Industrial C100 or similar.
b) Or an emergency Escape Unit such as the Scott SCRAM or Elsa (or similar) often referred to as hip packs, hoods, or pony bottles.

The two types of breathing apparatus will be differentiated as a SCBA or as an Escape Unit as required.

2.3.1 Safety Equipment

Personal H_2S & SO_4 monitors - Every person on site will be required to wear a personal H_2S & SO_4 monitor at all times while onsite. Monitors will not be worn on hard hats, but should be worn on the waist belt or preferably near the chest in-front.

Breathing Apparatus - All personnel on the drill site will be assigned an individual breathing apparatus unit. This may be either an escape unit or a SCBA unit. A minimum of two SCBA type units will be onsite. These units will be used by the team whose duty it is to serve as the onsite rescue team.

Monitoring and Recording Devices - An experienced safety company (such as Total Safety U. S., Inc., Artesia, NM or Safety Solutions, LLC of Midland, TX) will responsible for the installation and monitoring of H_2S detectors placed on site. These units will be tested and recalibrated as the safety company requires. If H_2S is detected, the monitors will be tested and recalibrated at least every 12 hours. This monitoring system may or may not be integral to the required two stage alarm system on site. This two stage system (visual and audio) will have a minimum of three H_2S detector locations. Monitors will be located: 1) in the cellar or on the bell nipple, 2), at the mud tanks' shale shaker, and 3), to be determined by the safety company. Visual (light) and audio (siren) alarms will activate when H_2S concentrations reach 10 ppm.

First-Aid and rescue equipment - Stored on-site, but ideally uphill and upwind from H_2S sources a minimum of one "rescue pack" will contain at least:

- 1 backboard, straps, head blocks
- a set of cervical collars (s-xl)
- 1 bag valve mask
- 1 bottle of oxygen
- gauze and other standard first-aid items

--Suggested - 1 AED (automatic external defibrillator)

Gas Monitor - An appropriate monitor should be on-site that can measure for LLE, VOC, and other explosive or hazardous gasses.

2.3.2 Safety Procedures

Cascade System - Every person required to perform duties within "safety zones" (see list below) will be provided with breathing equipment attached to a cascade air system. These areas are as follows

- rig floor
- mud pit
- derrick
- shale shaker
- mud hopper and bulk hopper
- all hazardous locations will be accessible by hose and work pack (SCBA)

Escape Routes - Two escape routes will be at a minimum flagged and kept clear at all times.

Safety Briefing Areas - Two safety-briefing areas will be located at the end of escape routes (see above). The briefing areas will be clearly marked, at least one up-hill, and

located so that one site is always up wind. Please see attached site map for safety briefing areas in Appendix.

Safety, first-aid, and rescue equipment - Will be stored on site using best practices. This will include proper maintenance and scheduled testing, inspection, and training/practice.

Service companies - All service companies will be briefed regarding potential hazards of the well site including the presence (or potential for) H_2S. These companies will be required to provide breathing apparatus and training to their employees. No service company personnel will be allowed onsite without meeting these requirements. In addition a safety briefing under the direction of the drill foreman regarding site specific H_2S procedures will be provided to each new personnel member reporting on-site.

Drills and practice - Drills reviewing all and any safety procedures including evacuation, rescue, and proper procedures to shut-in a well, and identify source of H_2S in instance of a leak will be practiced under the supervision of the safety company representative and company foreman. Proper use of breathing apparatus will be instructed during such drills. Drill schedule will be designed to familiarize new personnel with all safety procedures. Each crew should also be familiar with all operations. Drills should include a short work period in safety equipment.

Warning Signs - Warning signs will be posted on all access roads. "No smoking" signs will be posted at access points as well. Signs will be posted at least 200 feet and no more that 500 from well pad. When H_2S is present at 10 ppm or greater a red flag shall be displayed on the warning sign. Gates, road barricades, and/or gate guards will be used if necessary to prevent access during critical or hazardous situations.

Wind Socks - A minimum of two windsocks should be installed at locations easily observable from all work areas. If more than two windsocks are needed in order to allow workers at all times to easily identify the wind direction; then more windsocks will be installed.

Vehicle Parking - Vehicles should be parked 200 feet from the well site with their fronts pointing away from the well site. Preferably vehicles will be located up hill and up wind from the well along the escape route.

Testing Fluids - Swabbing and testing fluids containing H_2S will be pass through a separator to permit flaring of the gas. There will be a pilot light in such instances.

Bug Blowers - Circulation will be provided by explosion proof electric fans at all critical locations when necessary.

Drills - Reviewing any and all safety procedures including evacuation, rescue, proper procedures to shut-in a well, and how to identify the source of H_2S if a leak occurs will

be practiced under the supervision of the safety company representative and company foreman. Proper use of breathing apparatus will be taught during such drills. The drill schedule will be designed to familiarize new personnel with all safety procedures. Each crewmember will be familiar with all operations. Drills should include a short work period in safety equipment.

2.3.3 Working Conditions

The Occupational Safety and Health Administration (OSHA) has set guidelines for Permissible Exposure Limits (PEL). The standard is to be considered the threshold **never to be exceeded** for the health and safety of all workers on this site. Ideally, exposure would never be this high.

2.3.3.1 Exposure Limits

OSHA Permissible Exposure Limit (PEL) for General Industry: 29 CFR 1910.1000 Z-2 Table -- Exposures shall not exceed 20 ppm (ceiling) with the following exception: if no other measurable exposure occurs during the 8-hour work shift, exposures may exceed 20 ppm, but not more than 50 ppm (peak), for a single time period up to 10 minutes.

OSHA Permissible Exposure Limit (PEL) for Construction Industry: 29 CFR 1926.55 Appendix A -- 10 ppm, 15 mg/m^3 TWA (accessed via the internet at: http://www.osha.gov/dts/chemicalsampling/data/CH_246800.html#exposure on 19 July 2007)

The maximum exposure limit for an 8 hour day is less than 10 ppm.

2.4 H_2S Emergency Procedures

2.4.1 Incident

H_2S alarm system activation. Light and siren warnings or personal H_2S monitor activation for any one "worker."

2.4.2 Primary Emergency Procedure

i. All rig crew personnel and all auxiliary personnel must **DON BREATHING APPARATUS IMMEDIATELY.**

ii. Rig crew should mask up with SCBA type work packs preferentially

iii. All auxiliary crew should move to safety briefing area, uphill and upwind.

iv. All non-essential personal should continue to evacuate site.

2.4.3 Secondary Emergency Procedure

I. Supervisory Personnel

i. Company Foreman

a. Proceed to cascade trailer and check for safe operation of the cascade system.

b. Proceed to active safety briefing areas and account for all personnel. If all personnel are not accounted, then initiate an appropriate search.

c. Return to the drilling floor and supervise operations.

ii. Tool Pusher

a. Proceed to cascade trailer and check if Company Foreman is operating cascade system safely. If NOT ensure safe operations of the cascade system.

b. Proceed to drilling floor and supervise operations. Make sure all crewmembers are accounted for and institute buddy system. If all personnel are not accounted for, initiate appropriate search.

II. Rig Crew

i. Driller

a. if drilling

1. after donning breathing apparatus proceed to console and raise kelly to slip set position

2. shut down mud pumps

3. monitor well flow, remain at console

4. use hand signals to verify all personnel are at stations, verify company man and tool pusher's positions, initiate search if well is not flowing

b. If tripping

1. after donning breathing apparatus put pipe in the slip-set position

2. stab safety valve, close safety valve

3. monitor well flow-remain at console

4. watch derrick man descend from derrick, verify all personnel locations, verify company man and tool pusher's position, initiate search if well is not flowing

c. if well is flowing

1. after donning breathing apparatus, shut well in HARD

2. verify all personnel locations, verify company man and tool pusher's position, initiate search if necessary

3. obtain necessary pressures for well control

4. proceed to safety briefing area with crew, plan well control operations with all personnel

ii. Derrick Man

a. after donning breathing apparatus, go to pit side window on the floor whether drilling or tripping.(descend derrick)

b. maintain visual contact with driller and monitor flow

c. if mud properties are needed, then proceed to the shaker with "buddy"

d. monitor other hands on pit side of rig visually

e. proceed to open manual well-head if necessary (with "buddy")

iii. Motorman

a. after donning breathing apparatus, go to the cascade system and ensure safe operation

b. maintain visual contact with chain hand on doghouse side of floor

iv. Chain Hand

a. after donning breathing apparatus, stab safety valve if tripping

b. go to doghouse/pipe-rack and maintain visual contact with driller and motorman

v. Floor man

a. after donning breathing apparatus, stab safety valve if tripping

b. aid driller while maintaining visual contact with driller, derrick man, and chain hand

III. Auxiliary Personnel

i. Mud engineer and Company man or geologist will act as wardens. Wardens must account for all other auxiliary crew.

ii. All auxiliary crew will remain in safety briefing areas unless evacuated by wardens.

iii. Wardens organize search with notification from company. All searches will be done with a "buddy". Warden should remain in safety briefing area.

2.4.4 Igniting the Well

I. Decision

i. The Company Foreman is responsible for the decision to ignite a well. If he is incapacitated or absent, then authority passes to the tool pusher, and then the contract driller

ii. the decision to ignite the well is only to be made as a last resort safety measure if:

a. there is threat human life and grave threat to public safety and equipment

b. there is no alternative way of containing the well given the emergency faced.

c. an attempt was made to contact area office (circumstances permitting)*

***When human life is threatened, there can be no delay in making a decision.**

I. Instructions for Igniting the Well

i. Two individuals are required for ignition

ii. Both individuals will wear SCBAs & have 200-foot retrieval ropes tied to their waists

iii. One individual will measure the atmosphere for explosive gasses with appropriate meter.

iv. The other individual will remain in the safety briefing area

v. Others in the briefing area will remain aware of both individuals and aid as able. If either tethered individual is overcome by gas, he should be pulled to safety.

vi. The well should be lit with a 25 mm meteor type flare gun when well conditions allow. The safest method of igniting the well should always be used.

vii. Burning H_2S will produce sulfur dioxide which is poisonous. The area therefore is not safe once the well has ignited. Continue to observe all emergency procedures and follow orders from supervisors and the area office. Notice of incident must be reported to all appropriate authorities.

3.0 Appendices

3.1 Check List for Safety Equipment (designed for a maximum of 11 people)

- ☐ Safety Trailer housing cascade system at least ten 300 cu. ft. bottles of compressed air
- ☐ 7 SCBA type breathing apparatus with 45 cu. ft. bottles
- ☐ 5 breathing masks connected to the cascade system with 7 cu. ft. pony bottles
- ☐ 2 extra 300 cu. ft. bottles able to refill SCBA bottles will be placed at the safety briefing areas
- ☐ 2 Wind socks
- ☐ 1 Flare gun and flares
- ☐ 1 rescue pack (as described in section 2.3.1)
- ☐ Warning signs for access (flags for marking conditions)
- ☐ "Safety Briefing Area" signs, evacuation route flags
- ☐ H_2S monitors (personnel and stationary)
- ☐ Alarm system (audio and visual—explosion proof)
- ☐ Gas Monitor

3.2 Emergency Phone Numbers

Resaca Operating Company Personnel to be Notified

Marc Netherlin, Operations Manager	Office: (432) 580-8500
	Mobile: (432) 557-9430
Or	
Randy McInally, Assistant Operations Manager	Office: (432) 580-8500
	Mobile: (432) 634-4717
Or	
Bob Porter, Vice President of Engineering	Office: (713) 756-1685
Or	
Keith Masters, Engineer	Office: (512) 906-2016
	Mobile: (512) 517-9180

Safety Company Personnel

(Name)	(Position)	(Number work)
		(Number home)
(Name)	(Position)	(Number work)
		(Number home)

Local & County Agencies

Jal Fire Department	911 or (575) 395-2221
Lea County Sheriff (Lovington)	911 (575) 396-3611
Lea County Emergency Management (Lovington)	(575) 396-8602
Lea Regional Medical Center Hospital 5419 North Lovington Highway, Hobbs, NM	(575) 492-5000

State Agencies

NM State Police (Hobbs)	(575) 392-5580
NM Oil Conservation (Hobbs)	(575) 370-3186
NM Oil Conservation (Santa Fe)	(505) 476-3440
NM Dept. of Transportation (Roswell)	(575) 637-7201

Federal Agencies

BLM Carlsbad Field Office	(575) 234-5972
BLM Hobbs Field Station	(575) 393-3612
National Response Center	(800) 424-8802
US EPA Region 6 (Dallas)	(800) 887-6063 or (214) 665-6444

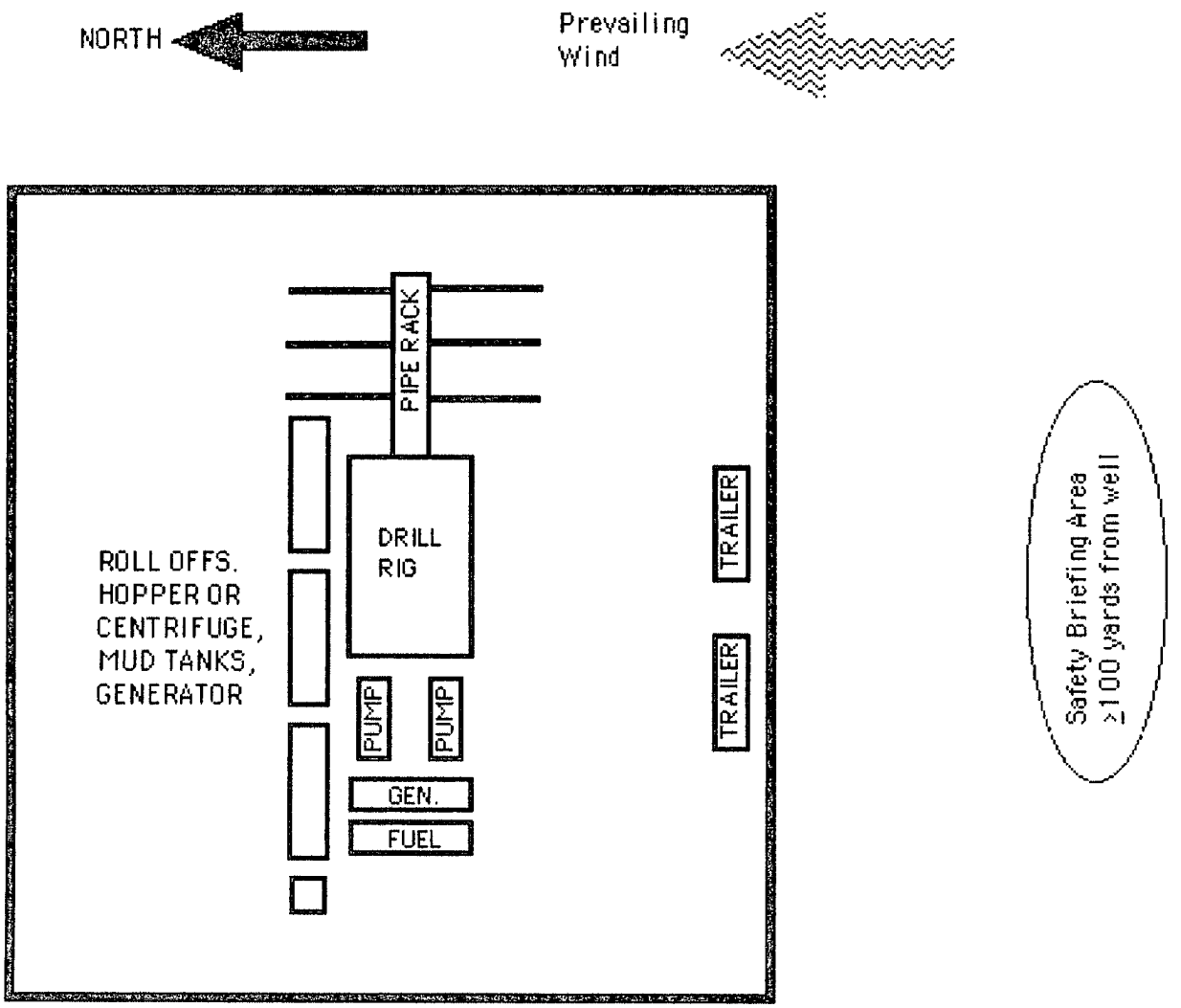
Veterinarians

Dal Paso Animal Hospital (Hobbs)	(575) 397-2286
Hobbs Animal Clinic & Pet Care (Hobbs)	(575) 392-5563
Great Plains Veterinary Clinic & Hospital (Hobbs)	(575) 392-5513

Residents within 2 miles

An intermittently occupied house is in the northeast quarter of Section 23 and west of the Jal Cooper Cemetery. Norma Crawford is one the owners and can be called at (575) 441-2600. She does not live at the house. The occasional occupants are ranch hands. This house is >7,500' northwest.

The Texas-New México Railroad (888 783-4316) is within 2 miles of all wells.



Safety Briefing Area
≥100 yards from well

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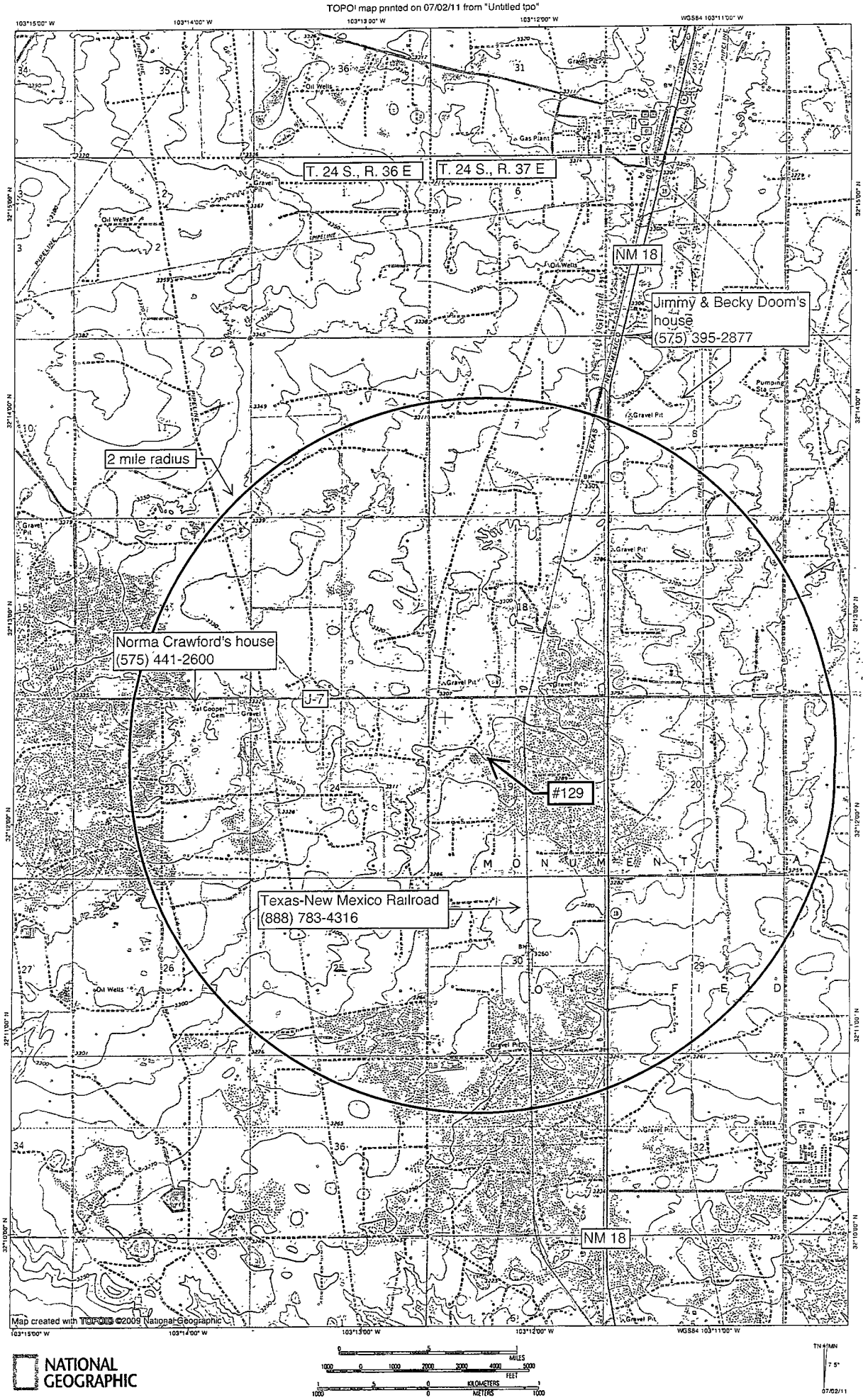
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T. 24 S., R. 36 E
T. 24 S., R. 37 E
NM 18
Jimmy & Becky Doom's house
(575) 395-2877
2 mile radius
Norma Crawford's house
(575) 441-2600
J-7
#129
Texas-New Mexico Railroad
(888) 783-4316
NM 18
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