WOOLSEY OPERATING COMPANY, LLC

125 N. MARKET STREET, SUITE 1000, WICHITA, KANSAS 67202-1729 (316) 267-4379
FAX (316) 267-4383
woolsey@woolseyco.com

August 24, 2017

Mr. Doug Shutt
Office of Oil and Gas Resource Management
One Natural Resources Way
Springfield, IL 62702

Re: Response to Deficiency Letter Dated August 14, 2017
HVHHF Application for Woodrow #1H-310408-193 (Review #HVHHF-000001)

Dear Mr. Shutt:

In regards to the above mentioned letter and application, please find attached revised plans in response to the deficiencies and other issues as a result of the initial public comment period. We have also enclosed the plans in a digital format.

Also, included in this submittal are revised plans that were not requested in your letter. Those plans are the Additional Required Maps, Chemical Disclosure Report and Well Site Safety Plan. The only revised portion of the Well Site Safety Plan is updated Safety Data Sheets in attachment A.

Please contact me with any questions or comments.

Thanks

[redacted]

Mark L. Sooter
Vice President Business Development
Woolsey Companies, Inc.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

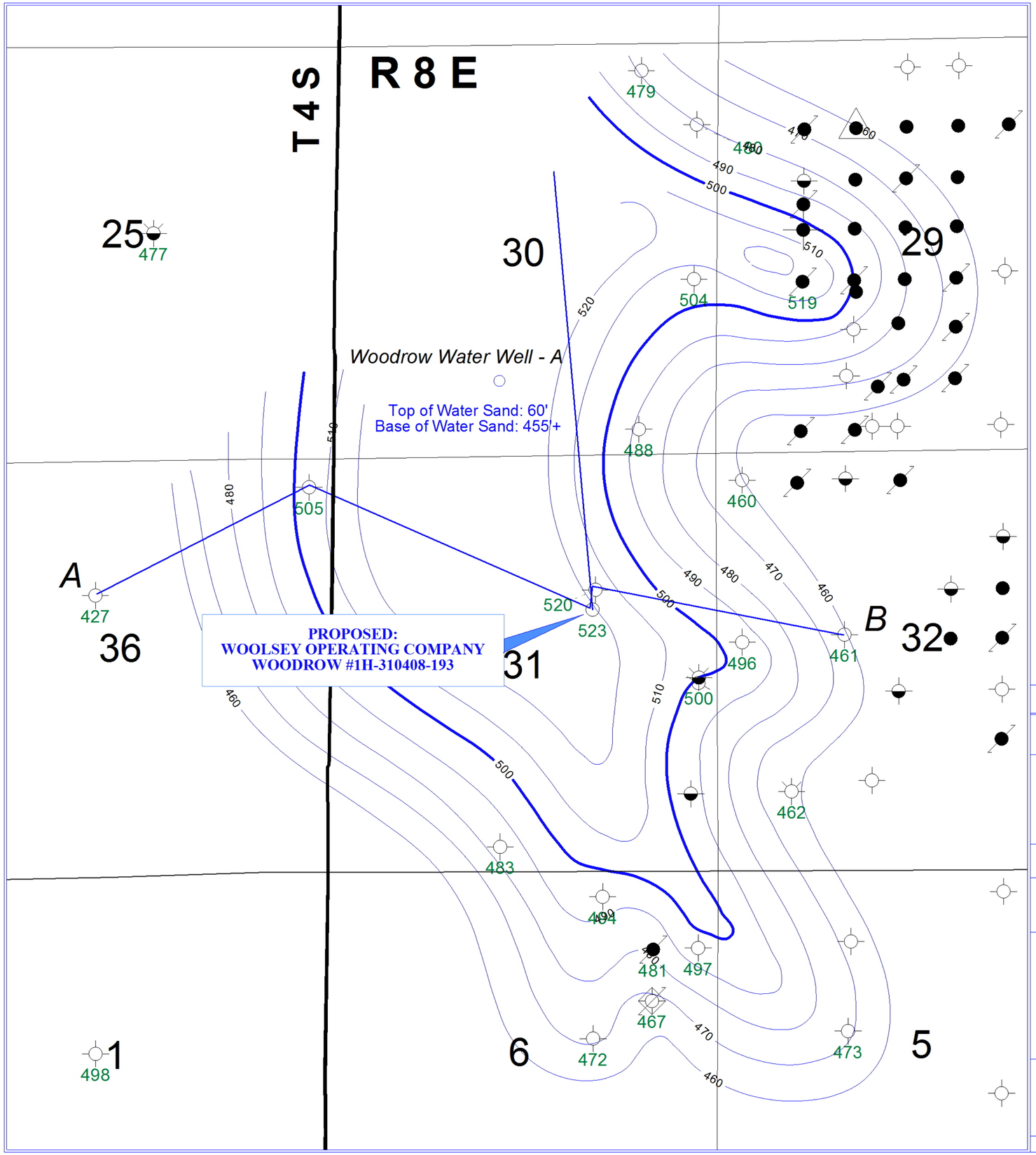
HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: UndergroundFreshWaterInformation

Please save attachment and use the file name above

Underground Fresh Water Information Section 1-35(b)(5); 245.210(a)(5).
Please provide the estimated depth and elevation of the lowest potential fresh water along the entire length of the proposed well according to the most recent publication of the Illinois State Geological Survey of Groundwater or any other relevant information you have. **Show on attached diagram.**
Depth: 510 to 530' Elevation: -24 to-90'



Woolsey Operating Company, LLC

FRONTIER PROJECT

WOODROW PROSPECT

Woodrow #1H-310408-193

Depth to Base of Fresh Water. C.I.=10 Ft

0 688 1,376 2,064
FEET

POSTED WELL DATA

Shallow water source (FEET)

WELL SYMBOLS
- Dry & Abandoned
- Dry Hole, With Show of Gas
- Dry Hole, With Show of Oil & Gas
- Dry Hole, With Show of Oil
- Dry Hole
- Location Only
- Oil Well/SWD
- Oil Well
- Oil Plugged & Abandoned
- SWD Plugged
- T&A-Oil Show Plugged
- Temporarily Abandoned

REMARKS

Exhibt to:
Underground Fresh Water Information

By: DLP

A

B

SMOKEY YORK 1

SOHIO A TODD 1

WOOLSEY OPERATING COMPANY
WOODROW #1H-310408-193

RK PET YOUNG 1

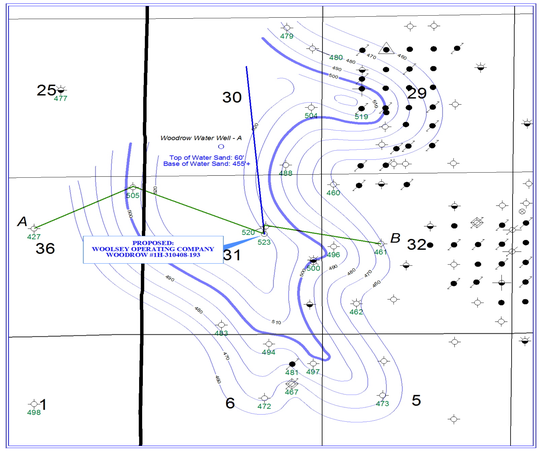
WAUSAU PARKER HEIRS 1

Top of Aquifer: 303'

Basal Aquifer

Base of Lowest Fresh Water: 527'

Planned Depth of Surface Casing: 800'



WOOLSEY OPERATING CO.

FRONTIER PROJECT

WOODROW PROSPECT

Woodrow #1H-310408-193

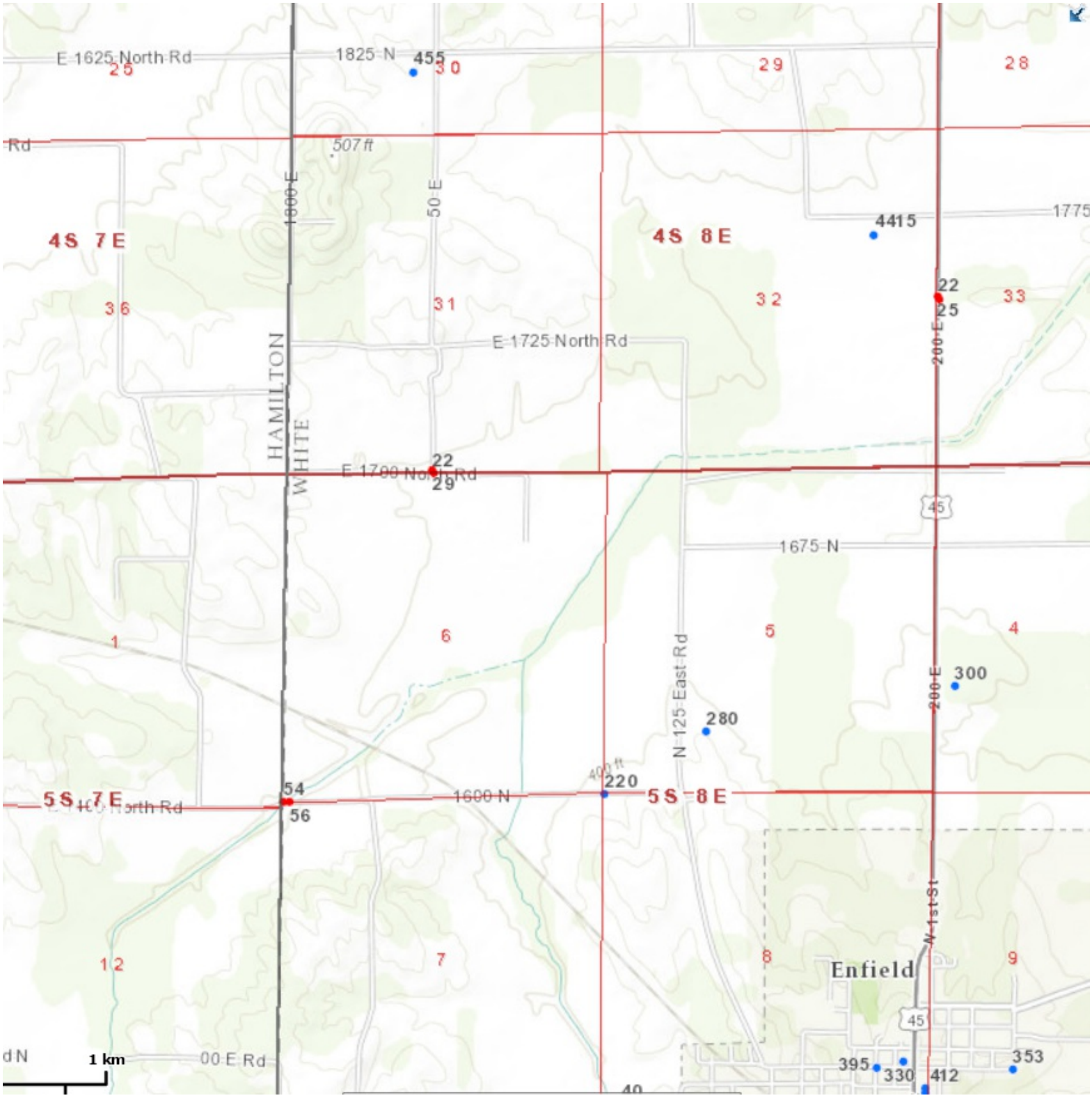
Structural XS of Fresh Water Aquifer

Horizontal Scale = 245.8
Vertical Scale = 20.0
Vertical Exaggeration = 12.3x

WELL CANCEL
Operator
Well Name
Well Number
ProdFM ◯ WELL - IP_OIL [WEC]

HVHHF-10 Underground Fresh Water Information

By: DLP


E 1625 North Rd
1825 N
455
25
30
29
28
Rd
507 ft
1800 E
50 E
4S 7E
4S 8E
4415
1775
36
31
32
33
22
25
200 E
E 1725 North Rd
HAMILTON
WHITE
22
29
E 1700 North Rd
45
1675 N
1
6
5
4
N 125 East Rd
200 E
300
280
54
56
1600 N
220
5S 7E
5S 8E
12
7
8
9
Enfield
N 1st St
45
1 km
00 E Rd
395
330
412
353
40

ILLINOIS STATE GEOLOGICAL SURVEY

Household - Livestock Watering Well	Top	Bottom
yellow clay	0	15
gray shale	15	20
shale & coal	20	25
dark shale	25	60
sand & lime	60	100
sand	100	135
sand & shale	135	250
lime & shale	250	353
white sand (water)	353	455
Total Depth		**455**

Casing: 5" PVC SCH 40 from 1' to 355'

Grout: SAND & CUTTINGS from 0 to 355.

Size hole below casing: 4.869999885559082"

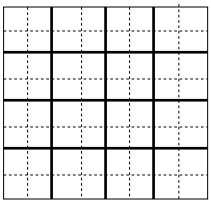
Water from penn sand at 355' to 455'.
Static level 130' below casing top which is 1' above GL
Pumping level 240' when pumping at 40 gpm for 3 hours

Permanent pump installed at 240'
on April 27, 1981, with a capacity of 10 gpm

Owner Address: [redacted] [redacted]
Location source: Location from permit

Permit Date: April 22, 1981 **Permit #:** [redacted]

COMPANY Keen, George
FARM [redacted]
DATE DRILLED April 27, 1981 **NO.** 1
ELEVATION 0 **COUNTY NO.** 30882
LOCATION NE SE SW
LATITUDE 38.142496 **LONGITUDE** -88.365277
COUNTY White **API** 121933088200 **30 - 4S - 8E**



ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
yellow clay	0	15
yellow sandstone	15	23
white sandstone, hard	23	60
shale	60	135
dark shale	135	143
dark shale, hard	143	180
shale	180	230
light sandy shale	230	235
sandstone	235	280
Total Depth		**280**

Casing: 6" PVC from -1' to 240'

Grout: BENTONITE from 0 to 240.

Water from sandstone at 240' to 280'.
Static level 40' below casing top which is 1' above GL

Permanent pump installed at 240'
on August 27, 2010, with a capacity of 10 gpm

Remarks: Driller's Estimated Well Yield 20 gpm

Owner Address: [redacted] [redacted]

Address of well: same as above

Location source: Location from permit

Permit Date: August 16, 2010 **Permit #:** [redacted]

COMPANY Wilson, DeNeal

FARM [redacted]

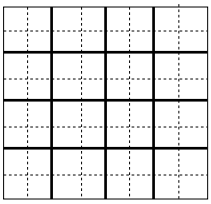
DATE DRILLED August 24, 2010 **NO.** 1

ELEVATION **COUNTY NO.** 32547

LOCATION NW SE SW

LATITUDE 38.114026 **LONGITUDE** -88.349175

COUNTY White **API** 121933254700 **5 - 5S - 8E**



ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	23
shale	23	40
sand	40	57
shale	57	225
hard gray sand	225	250
water sand	250	300
Total Depth		**300**

Casing: 5" SDR 21 from -1' to 10'
5" SDR 20 from 10' to 270'
5" SLOTTED from 270' to 290'

Screen: 20' of 5" diameter .02 slot

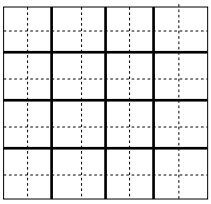
Grout: CEMENT from 3 to 250.

Water from Mt. Carlmel sand at 250' to 300'.
Static level 110' below casing top which is 1' above GL
Permanent pump installed at 200'
on October 31, 1991, with a capacity of 10 gpm

Owner Address: [redacted]
Location source: Location from permit

Permit Date: October 16, 1991 **Permit #:** [redacted]

COMPANY Lamp, Robert Wayne
FARM [redacted]
DATE DRILLED October 29, 1991 **NO.** 1
ELEVATION 0 **COUNTY NO.** 31371
LOCATION SW NW SW
LATITUDE 38.115983 **LONGITUDE** -88.335586
COUNTY White **API** 121933137100 **4 - 5S - 8E**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well Test Hole	Top	Bottom
till, very silty, brown, weak micaceous	0	10
same	10	20
sh, sty, dk gry, wk, mic, carb	20	25
sh as above; sh light gray, weak	25	30
shale as above	30	40
sh, sty, gry, wk, mic, slightly carb	40	45
same	45	70
sh, sty, lt gry-wh, wk, frag ls, lt brn	70	80
sh & ls as above	80	85
ss, sty, lt gry, vy f-f, cmpt, mic, pyrc	85	90
same	90	95
ss as abv, ss vy sty, gry, vy f-f, cmpt	95	100
sh v sty dk gry wk-f mic frag ss v sty	100	105
shale as above	105	110
same	110	115
ss sty arg gry vy f cmpt mic	115	120
ss as abv sh vy sty gry f-wk mic pyr	120	125
shale as above	125	135
same	135	160
shale as above, frag coal	160	165
same	165	170
same si arg gry cmpt mic pyr	170	175
same	175	185
sh as abv	185	190

Permit Date: **Permit #:**

COMPANY Schell, Sidney

FARM [redacted]

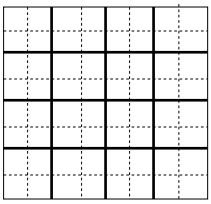
DATE DRILLED October 20, 1947 **NO.** 1

ELEVATION 485GL **COUNTY NO.** 04951

LOCATION 600'S line, 40'E line of SE SE

LATITUDE 38.098644 **LONGITUDE** -88.33716

COUNTY White **API** 121930495100 **8 - 5S - 8E**



ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Water Supply	Top	Bottom
yellow clay	0	8
yellow sandstone	8	20
sandy shale	20	45
dark shale	45	55
shaley coal	55	60
shaley lime	60	90
sandy shale	90	240
dark shale	240	255
sandstone water	255	348
sandy shale & lime	348	353
Total Depth		**353**

Casing: 6.62" BLACK 2/80 WALL from -2' to 266'

Size hole below casing: 9"

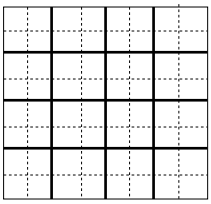
Water from sandstone at 260' to 353'.
Static level 165' below casing top which is 2' above GL
Pumping level 260' when pumping at 30 gpm for 4 hours

Driller's Log filed

Owner Address: [redacted]
Location source: Location from permit

Permit Date: April 14, 1970 **Permit #:** [redacted]

COMPANY Wilson, Olen L.
FARM [redacted]
DATE DRILLED June 19, 1970 **NO.** 4
ELEVATION 0 **COUNTY NO.** 08259
LOCATION 420'N line, 5'E line of SW SW
LATITUDE 38.099427 **LONGITUDE** -88.33241
COUNTY White **API** 121930825900 **9 - 5S - 8E**



ILLINOIS STATE GEOLOGICAL SURVEY

same	190	200
sh as abv	200	205
sh as abv si arg gry cmpt mic	205	210
si as abv sh caved	210	215
same	215	235
sh sty gry f-wk mic slgtly pyr ptly carb	235	240
same	240	260
sh as abv ss sty gry vy f cmpt pyr mic	260	265
sh vy sty gry fr-wk mic slgtly carb ss	265	270
ss slgtly calc vy sty arg gry vy f cmpt	270	280
same	280	295
ss as abv cmpt to f	295	300
same	300	305
same some mud	305	310
same	310	330
ss slgtly calc f-crs f-inco ptly mic pyr	330	335
same	335	365
ss slgtly calc lt gry vy f-med f-inco	365	370
same	370	410
Total Depth		**412**

Electric Log filed
Driller's Log filed
Survey Sample Study filed
Sample set # 17426 (1' - 410') Received: January 1, 1947
Owner Address: [redacted]
Location source: Location from the driller

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: HVHHFOperationsPlan
Please save attachment and use the file name above.

High Volume Horizontal Hydraulic Fracturing Operations Plan §1-35(b)(6), 245.210(a)(6)

Geological description.

Please list and describe in this attachment all formation(s) affected by the high volume horizontal hydraulic fracturing operation, including (but not limited to) the formation(s) to be stimulated and the formations constituting or contributing to the confining zone. For each such formation, please describe the lithology, extent, thickness, permeability, porosity, transmissive faults, fractures, water or water source content, and susceptibility to vertical propagation of fractures. For each formation, state if any of these features are unknown.

a) what is the anticipated surface treating pressure range?
b) what is the maximum anticipated injection treating pressure?
c) what is the estimated or calculated fracture pressure of the producing zone?
d) what is the estimated or calculated fracture pressure of the confining zones?
e) what is the planned depth of all proposed perforations?
f) what is the planned depth to the top of the open hole section?
g) what is the type, source and volume of base fluid anticipated to be used?

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Operations Plan

Geologic Formations Affected:
New Albany Gp. (Target)
Compton / Chouteau
Borden / Springville
Ft. Payne
Lingle

Herein are listed the geologic descriptions of all formations that near the target zone that *may be* affected by the HVHHFO of the proposed, permitted well. As requested, the lithology, extent, thickness, permeability/porosity, water or water source content and susceptibility to vertical propagation of fractures will be discussed for each of the formations referenced below. In regard to transmissive faults and large through-going fractures, it can be stated that according to a 3-D seismic survey, see attached seismic map, collected over the proposed location / prospect area, there are none that exist anywhere near the proposed wellbore, and specifically that part of the well bore that will be in the reservoir zone, the New Albany Shale (herein referenced as 'NAS').

*The drilling objective is the NAS; this shale is of Group status and actually is composed of 3 Formations, in ascending order from the base to the top, is the Blocher Shale Formation, the Selmier Shale Formation and the Grassy Creek Shale Formation. They are described below.

Blocher Shale: olive black, organic-rich, massive appearing to faintly laminated, slightly calcareous silty shale with common thin gray, sharply bedded traction deposits composed of silty calcarenites and calcisiltites. Average core measured porosity is 3 to 4% and has permeability in the nanodarcy range, and thus, is extremely tight. Some fractures are recognized in this section but are not large or long and typically mineralized. With the exception of saturation measurements, no information was collected or tested in regard to water from this formation.

Selmier Shale: olive gray, organic rich, but lesser so than the Blocher below and Grassy Creek above, pyritic, burrowed and bioturbated silty shale that represents more oxic deposition. Average core measured porosity is 5 to 6% and has permeability in the nanodarcy range, and thus is extremely tight. Some fractures are recognized in this section but are not large or long and typically mineralized. With the exception of saturation measurements, no information was collected or tested in regard to water from this formation.

Grassy Creek Shale *(horizontal target Formation)*: dark gray to black, pyritic, organic-rich, faintly laminated and locally burrowed and bioturbated, slightly silty shale / mudrock that possesses thin light gray beds composed of quartz grains; algal cysts (*tasmanites*) express laminations. Average core measured porosity is 5 to 7% and, although the most permeably of the three NAS formations is also in the nanodarcy range, and is extremely tight. Natural fractures do exist in this section, especially in the lower 50', and are up to a foot or two long, vertically; most are mineralized but some open fractures do exist. Horizontal, healed, fractures associated with prior oil generation also exist. With the exception of saturation measurements, no information was collected or tested in regard to water from this formation.

*The potential formations that may be affected by the HVHHFO ***above*** the NAS, in *ascending* order are as follows: Compton Limestone, Borden Shale (a.k.a., Springville Shale), and the Fort Payne Limestone. All three formations are lower Mississippian in age. They are described below.

Compton Limestone: light grey to green mottled crinoid wackestone to sparse packstone with thin shale wisps, 8-10' thick throughout the prospect area. No measured porosity or permeability for this formation exists in or near the prospect area however, from cores in the basin these rocks visually are extremely tight and non-permeable (all logs in a 5 mile radius corroborate these visual observations). Fractures are at a minimum as small, healed (mineralized) microfractures. No information exists on water from the formation.

Borden Shale (a.k.a., Springville Shale): dark greenish gray, flaggy to slightly laminated, burrowed shale, 40-50'thick throughout the prospect area. No measured porosity or permeability for this formation exists in or near the prospect area however, from cores in the basin these rocks visually are extremely tight and non-permeable, and due to the layering specifically non-permeable vertically (all logs in a 5 mile radius corroborate these visual observations). Very few fractures exist in this formation and, when present, are small, healed (mineralized) microfractures. No information exists on water from this formation.

Fort Payne Limestone: very dark gray to black, extremely dense siliceous lime mudstone; the unit is slightly silty and spiculitic in the lower half and grades

upward into a lighter colored lime mudstone that becomes increasingly cherty upward; the chert is dark to light gray mottled and burrowed. This formation is ~500' thick in the prospect area. No measured porosity or permeability for this formation exists in or near the prospect area however, from cores in the basin these rocks visually are extremely tight and non-permeable (all logs in a 5 mile radius corroborate these visual observations). As stated previous, the limestone is extremely dense, particularly in the lower half and not fractured; fractures do occur upward in the section but are restricted to the small chert nodules and are mineralized. No information exists on water from this formation.

*The potential formations that may be affected by the HVHHFO ***below*** the NAS, in *descending* order are as follows: the Devonian, Lingle Limestone Formation. This formation is described below.

Lingle Limestone: light to medium and dark gray, crinoidal wackestone to packstone, with some rugose and button (*M. discus*) corals; this unit is argillaceous and in places, cherty. The chert occurs as 1 to 3" nodules and is medium to dark gray mottled with crinoid fragments. The formation in the prospect area is 75 to 85' thick. This unit in places throughout the Illinois Basin is porous near the top (typically 3 to 8%), near an intraformational unconformity, and does produce oil however, examination of all logs within a 5 mile radius of the proposed location show the Lingle to be extremely tight throughout. No measured porosity or permeability for this formation exists in or near the prospect area. Some fracturing was noted in collected cores, largely in the sections that contained chert but they were small fractures and most typically mineralized. No information exists on water from this formation.

Based on the lithology and gross petrophysics of the under and overlying units, it is not anticipated that the aforementioned units will be susceptible to vertical fracture propagation during completion of the NAS, Grassy Creek Shale Formation.

a) 1,000 psi – 7,900 psi
b) 7,900 psi **This number should actually be the downhole, in reservoir formation "injection pressue"; i.e. the Pnet value (see below for explanation and discussion) of 3,480 psi.*
c) 2,875 psi
d) 4,000 psi
e) Between 5,275' TVD and 5,245' TVD
f) N/A
g) Slickwater (3% KCl), Local well(s), Approx. 7,000,000 gal.

Woolsey Operating Company, LLC (WOC) states in HVHHF-10: Operations Plan that the Maximum Anticipated Surface Pressure will be 7,900 psi. and the Calculated Pressure of the Producing Zone is 2,875 psi. To understand the

apparent discrepancy between the two the following variables (from measured data) need to be addressed:

Friction Pressure of the Frac Fluid moving in the Casing (P_f)

Friction Pressure of the Perforations (P_{pf})

Hydrostatic Pressure of the Frac Fluid (P_h)

Effect of Tortuosity (P_t)

Regional Stress ($P_{Sh min}$)

When the Fracture Stimulation ("Frac") is initiated, pressure is applied to effectively a closed container. The treatment pressure must increase to overcome a number of well bore and near well bore restrictions before fracturing of the shale can begin. The initial rate is low and not all perforations will be open to accept fluid. As fluid moves through the perforation it encounters the near well bore. This is the area which includes the perforation gun debris along with cement and drilling fluids invasion. Many times the near well bore damage will require much higher pressures than the virgin shale zone to initiate a fracture through it. As frac fluid makes its way into the shale it encounters a highly tortuous path through the anisotropic medium. In addition it must overcome the regional stress. All of which increases the surface treatment pressure. Eventually, the frac fluid creates enough pathways (induced fractures) through the shale that fluid is able to move away from the well bore avoiding the tortuosity which is seen in the lower surface treating pressure with time and volume. The pressure envelope around the treatment stage rapidly decreases with distance so that the actual pressure at the confining zone interface is much lower than the treating pressure at the well bore. The interrelations of the aforementioned variables and discussion are expressed numerically, based on measured and collected data, in the attached supplementary diagram and associated discussion, below.

As mentioned, surface treating pressure does not equate to the actual pressure in the formation rather, that pressure is the 'net pressure' or P_{net}. P_{net} is the excess pressure, above all other pressure variables, of the fracturing fluid inside the fracture above that simply to keep the fracture open. To understand this, first the bottom-hole treating pressure (BHTP) at the perforations needs to be calculated; whereas the hydrostatic head adds more pressure to the system, much of it is lost due to pipe friction (P_f). As the fracturing fluid passes through the perforations, there are additional pressure drops due to pipe friction (P_f) and tortuosity (P_t) near well-bore, which further lowers the treating pressure; this value is the gross fracture pressure (P_{fc}). However, this is not the final pressure being put on the reservoir formation as the in-situ minimum horizontal principal stress (Sh_{min}), which is the stress within the formation that acts as

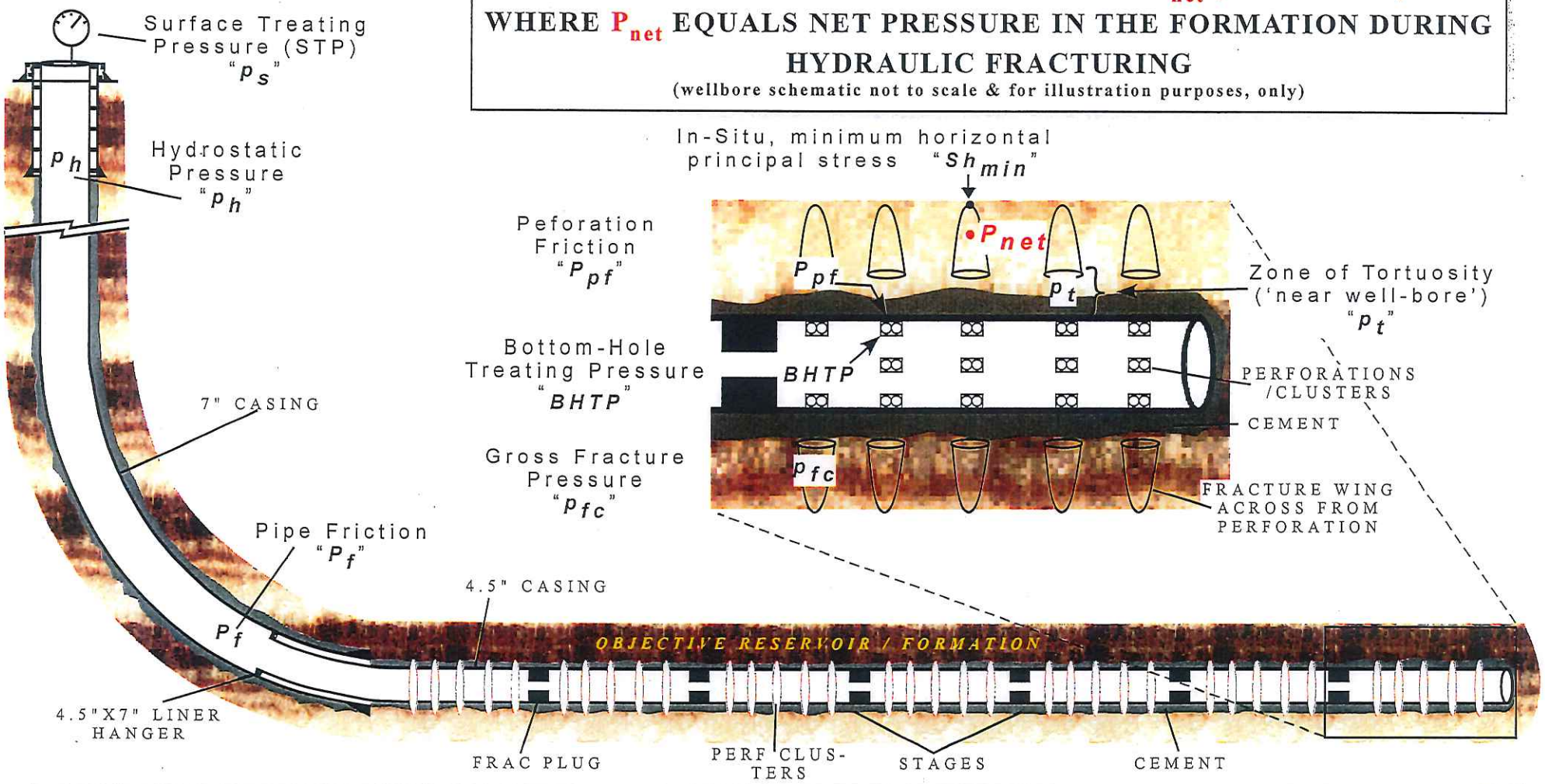
a load on the formation, counters this pressure. As illustrated in the diagram, now that the pressure drops due to friction, tortuosity and intra-formation stress have been accounted for, the P_{net}, or true pressure on the formation has been quantified. The calculated 3,480 psi for the P_{net} is above the fracture gradient ("fracture pressure", per the HVHHF-10, Operations Plan) of the formation at a 2,875 psi gradient and thus, will be enough pressure to breakdown the reservoir formation and facilitate artificial fracture propagation. *Therefore, the anticipated maximum surface treating pressure of 7900 psi equates to only 3,480 psi of pressure ("injection treating pressure", per the HVHHF-10, Operations Plan) within the reservoir objective.*

Furthermore, the P_{net} of 3,480 psi is substantially less than the over and underlying carbonate confining units (Compton/Ft. Payne & Lingle Limestones, respectively) of which have fracture gradients ("fracture pressure") of 4,000 psi. Considering that the pressure envelope around the treatment stage rapidly decreases with distance (~80 feet of vertical distance to the nearest confining zone, the Compton Limestone) *the P_{net} value will be even less than the 3,480 psi; therefore, fracturing will not propagate into or through the upper or lower confining unit and thus, not allow the transmission of fluids out of the producing zone.* The Compton/Ft. Payne upper confining unit, of which will not be fractured and breached during hydraulic fracturing operations, will be at a projected ~5100 TVD; the base of the deepest water aquifer is at ~700' TVD, a vertical distance of 4400 feet between the two. *Therefore, there will be no resultant contamination upward of surface aquifers or sources of drinking water (USDWs).* To do so would, literally, defy the laws of physics. From an operations standpoint, it would be an engineering impossibility.

In addition to measured rock mechanics and seismically defined stresses, from which the aforementioned was derived, microseismic studies of two wells completed in the New Albany Shale, Grassy Creek Formation, substantiate the data above in that those treatments did not fracture up into or past our confining zones of the Compton/Ft. Payne, or below the Lingle Limestone. In fact, in one instance, our fracture treatment did not penetrate past the Selmier Shale—the formation immediately below the reservoir objective, the Grassy Creek.

SIGNIFICANT PRESSURES AFFECTING P_{net} (Net Pressure): WHERE P_{net} EQUALS NET PRESSURE IN THE FORMATION DURING HYDRAULIC FRACTURING

(wellbore schematic not to scale & for illustration purposes, only)



KNOWNS

*Avg. Depth of Horiz: 5260 TVD
*Casing String: 5560' of 7"; 5050' of 4.5" (P-110)
*Stages: 39 @ ~110' (all not shown, here)
*Perforations: 5 clusters at 6 shots per cluster; 30 holes per stage @ 0.48" diameter
*Frac Rate: 80 BPM
*Frac Fluid: 3% KCl
*Frac Fluid Density, specific gravity: 8.54 ppg
*Frac Gradient of the NAS/G.C. Formation: *2875 psi*

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p_s - 7900 psi *(anticipated max.)*
p_h - 2335 psi
P_f - 2353 psi
P_{pf} - 555 psi
p_t - 2175 psi
Sh_{min} - 1672 psi

CALCULATIONS

1. $p_s - P_f + p_h = BHTP$

   7900 - 2353 + 2335 = **7882 psi**

2. $BHTP - P_{pf} - p_t = p_{fc}$

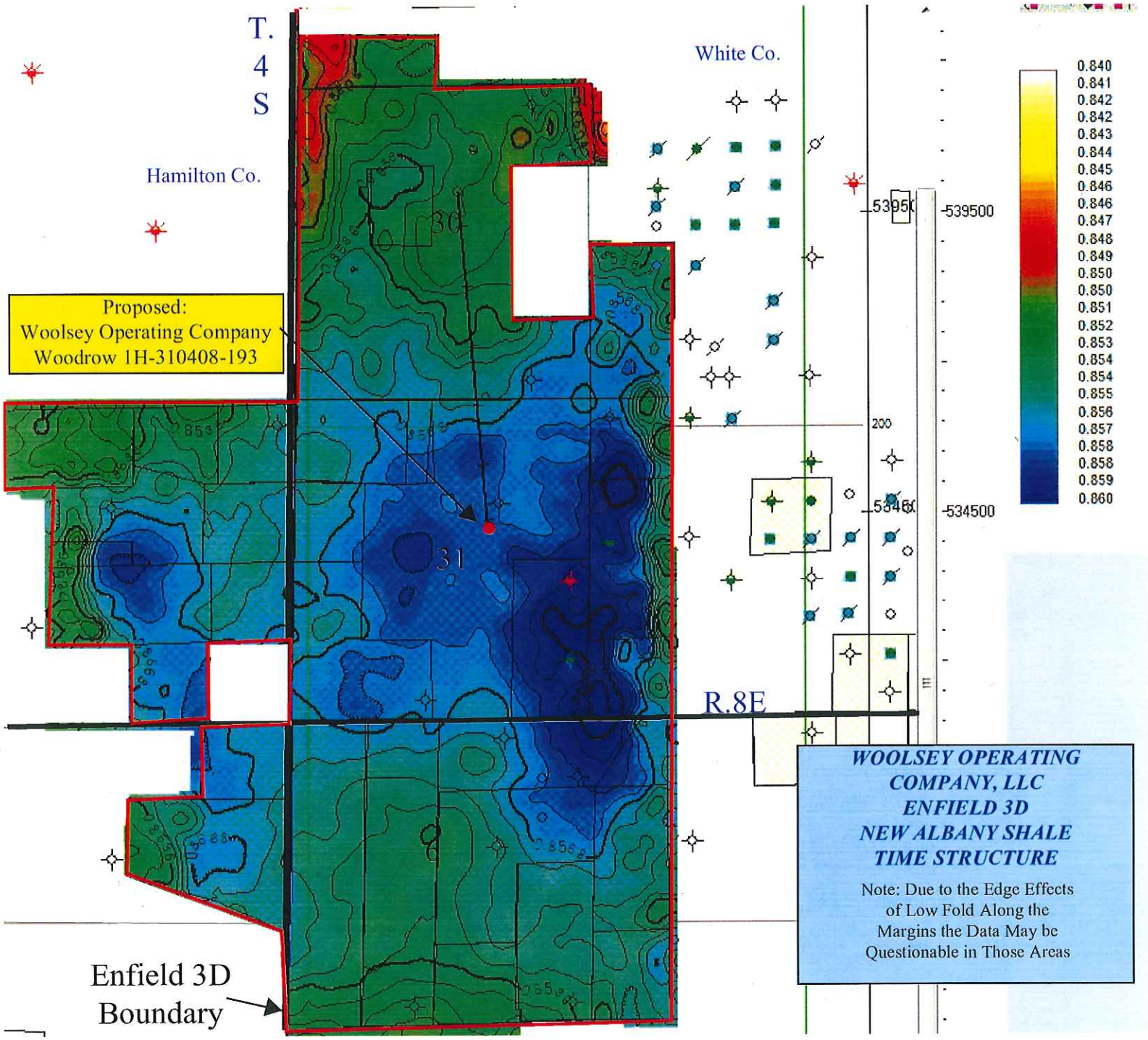
   7882 - 555 - 2175 = **5152 psi**

3. $p_{fc} - Sh_{min} = P_{net}$

   5152 - 1672 = **3480 psi**

SUMMARY

P_{net} i.e. net pressure is the *most crucial value* as it is the excess pressure of the fracturing fluid inside the fracture above that simply to keep the fracture open. This excess pressure provides the energy available at any given time to hold open the fracture and make it grow. The 3480 psi is above the formations fracture gradient of 2875 and will facilitate artificial fracture propagation. Equally as important, this pressure is below the fracture gradient of the over & underlying carbonate confining units, which have a 4000 psi fracture gradient. ***An anticipated maximum surface treating pressure of 7900 psi equates to only 3480 psi active net pressure in the reservoir objective.***


T.
4
S
White Co.
Hamilton Co.
30
31
6
Proposed:
Woolsey Operating Company
Woodrow 1H-310408-193
R.8E
539500
534500
200
0.840
0.841
0.842
0.842
0.843
0.844
0.845
0.846
0.846
0.847
0.848
0.849
0.850
0.850
0.851
0.852
0.853
0.854
0.854
0.855
0.856
0.857
0.858
0.858
0.859
0.860
Enfield 3D
Boundary
WOOLSEY OPERATING
COMPANY, LLC
ENFIELD 3D
NEW ALBANY SHALE
TIME STRUCTURE
Note: Due to the Edge Effects
of Low Fold Along the
Margins the Data May be
Questionable in Those Areas

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

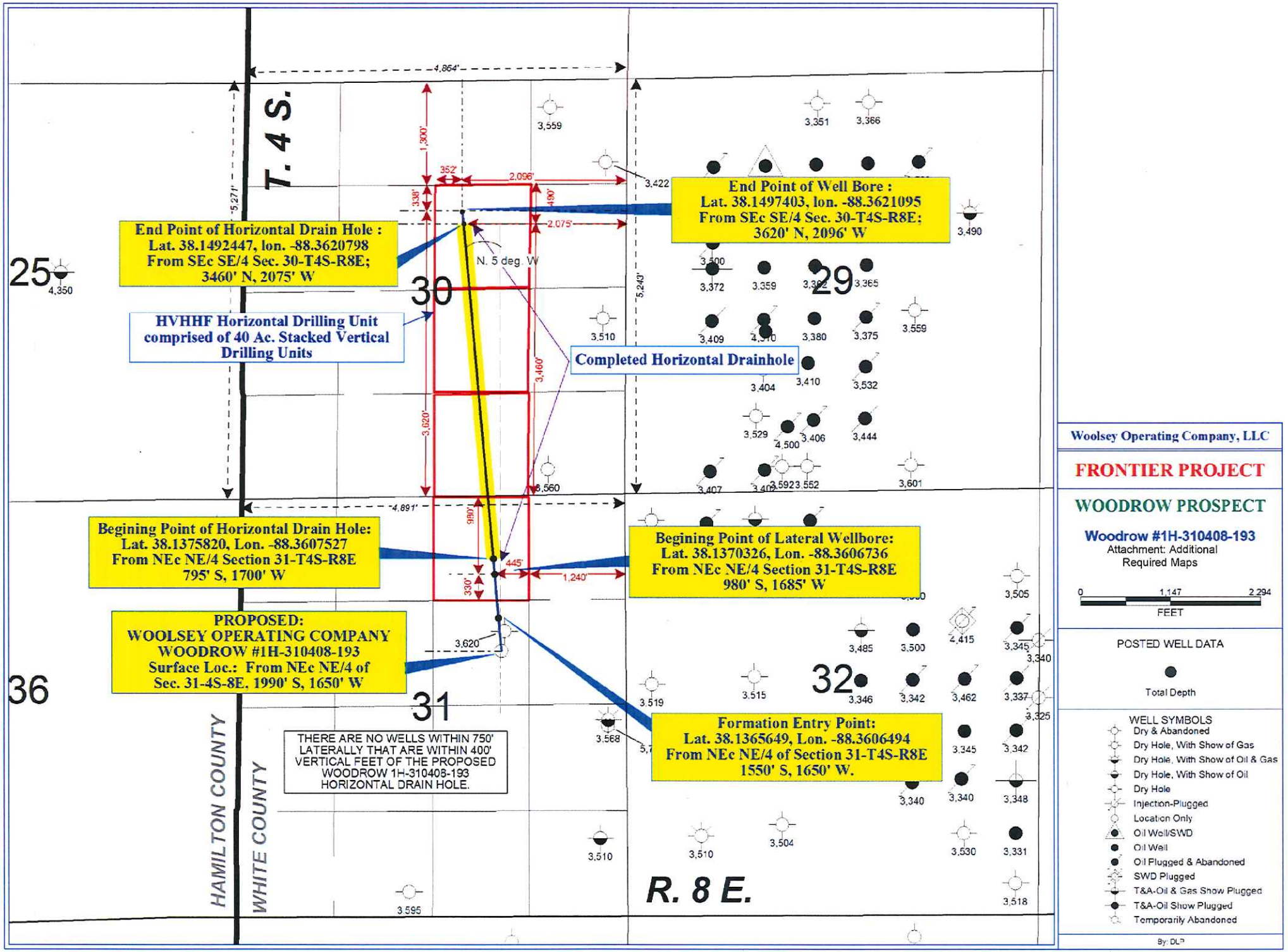
HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: AdditionalRequiredMaps

Please save attachment and use the file name above.

Additional Required Maps §1-35(b)(7); 245.210(a)(7). In addition to the scaled plat map referred to in the Well Site Setback Plan above, and the scaled cross section diagram referred to under the Directional Drilling Plan, please attach a **SCALED TOP VIEW DIAGRAM** showing the well location, direction of drilling (below surface entry to the intersection with target formation) and horizontal leg to total length. At the surface indicate all known previous well bores within 750 feet of the vertical plane above any part of the horizontal well bore that penetrated within 400 vertical feet of the formation that will be stimulated as part of the high volume horizontal hydraulic fracturing operations. If well bores are present, include the well name, location and permit and reference number for each.


T. 4 S.
R. 8 E.
HAMILTON COUNTY
WHITE COUNTY
25
30
29
31
32
36
End Point of Horizontal Drain Hole :
Lat. 38.1492447, lon. -88.3620798
From SEc SE/4 Sec. 30-T4S-R8E;
3460' N, 2075' W
End Point of Well Bore :
Lat. 38.1497403, lon. -88.3621095
From SEc SE/4 Sec. 30-T4S-R8E:
3620' N, 2096' W
HVHHF Horizontal Drilling Unit
comprised of 40 Ac. Stacked Vertical
Drilling Units
Completed Horizontal Drainhole
Begining Point of Horizontal Drain Hole:
Lat. 38.1375820, Lon. -88.3607527
From NEc NE/4 Section 31-T4S-R8E
795' S, 1700' W
Begining Point of Lateral Wellbore:
Lat. 38.1370326, Lon. -88.3606736
From NEc NE/4 Section 31-T4S-R8E
980' S, 1685' W
PROPOSED:
WOOLSEY OPERATING COMPANY
WOODROW #1H-310408-193
Surface Loc.: From NEc NE/4 of
Sec. 31-4S-8E, 1990' S, 1650' W
Formation Entry Point:
Lat. 38.1365649, Lon. -88.3606494
From NEc NE/4 of Section 31-T4S-R8E
1550' S, 1650' W.
THERE ARE NO WELLS WITHIN 750'
LATERALLY THAT ARE WITHIN 400'
VERTICAL FEET OF THE PROPOSED
WOODROW 1H-310408-193
HORIZONTAL DRAIN HOLE.
N. 5 deg. W
4,864'
4,891'
5,271'
5,243'
1,300'
352'
2,096'
338'
490'
2,075'
3,460'
3,620'
990'
445'
1,240'
330'
Woolsey Operating Company, LLC
FRONTIER PROJECT
WOODROW PROSPECT
Woodrow #1H-310408-193
Attachment: Additional
Required Maps
0
1,147
2,294
FEET
POSTED WELL DATA
Total Depth
WELL SYMBOLS
Dry & Abandoned
Dry Hole, With Show of Gas
Dry Hole, With Show of Oil & Gas
Dry Hole, With Show of Oil
Dry Hole
Injection-Plugged
Location Only
Oil Well/SWD
Oil Well
Oil Plugged & Abandoned
SWD Plugged
T&A-Oil & Gas Show Plugged
T&A-Oil Show Plugged
Temporarily Abandoned
By: DLP

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: ChemicalDisclosureReport

Please save attachment and use the file name above.

Chemical Disclosure Report §1-35(b)(8); 245.210(a)(8), 245.700, 245.720.

(a) Do you have on file with the Department a master list of chemicals, as required in §1-77 of the Act? ☐ YES ☑ NO If "NO" please attach a master list as "Attachment C(6)(a)." If you are claiming any trade secret under §§245.700, 245.720, you must attach redacted and un-redacted copies of the documents identifying the specific information on the master list of chemicals claimed to be protected as trade secrets. Also, if making a claim of trade secret please provide the Department with a telephone number and e-mail where the trade secret holder may be reached at any time (24 hours/day, 7 days/week).

(b) Please list each chemical and proppant anticipated to be used in hydraulic fracturing fluid for each stage of the high volume horizontal hydraulic fracturing operation:

(c) If using water in the high volume horizontal hydraulic fracturing treatment of the well, state the total volume of water anticipated to be used for each stage of the fracturing treatment. If using something other than water, state the type and total volume of base fluid anticipated to be used in the treatment. If the total volume is currently unknown, estimate the maximum volume anticipated to be used.

(d) Please identify each hydraulic fracturing additive you anticipate using, including:

1. Trade name
2. Vendor
3. Brief descriptor of the planned use or function of each additive
4. Attach a copy of the Material Safety Data Sheet (MSDS) if applicable.
   NOTE: if this information is unavailable, then list the chemical family and chemical effects of each. If the additives have not been determined at time of application, submit all possible additives that might be used. You may use the table below or provide your own.

TRADE NAME	VENDOR	PLANNED USE/FUNCTION
Hydrochloric Acid	Oxy - Chem	Acidize Formation
Cronox AK-50	Baker Hughes	Corrosion Inhibitor
NE-6 Surfactant	Chemplex	Surfactant
Plexgel Breaker XPA	Chemplex	Slickwater Gel Breaker
Plexslick 957 FR-7	Chemplex	Friction Reducer
Claymax	Chemplex	Clay Control
Ferriplex 66	Chemplex	Iron Control

(e) Please identify each chemical anticipated to be intentionally added to the base fluid, the anticipated concentration in the base fluid (in percent by mass) of each chemical, and the Chemical Abstracts Service number. If CAS is not available, then list the chemical family and effects of each chemical. If the chemicals to be used have not been determined at the time of filing of this application, identify all possible chemicals that may be used. You may use the table below or provide your own.

CHEMICAL NAME	CONCENTRATION [__/__]	CHEMICAL ABSTRACTS SERVICE NUMBER (or chemical family and effects)

NOTE: if the contents of the fluid are adjusted or altered during the treatment process, the Department MUST be notified within 24 hours of departure from the initial treatment design and include an explanation detailing the reason for the departure from the original formulation.
NOTE: no less than 21 days before performing the FIRST stimulation treatment, maintain and disclose to the Department separate and up-to-date master lists of:

1) the base fluid to be used during any high volume horizontal hydraulic fracturing operations,
2) all hydraulic fracturing additives to be used during any high volume horizontal hydraulic fracturing operations, and
3) all chemicals and associated Chemical Abstract Service numbers to be used in any high volume horizontal hydraulic fracturing operations.

(f) Please provide the name, telephone number and address of an employee, agent or contractor of the permittee having knowledge of the specific chemicals being used in the HVHHF operation at any given time.

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Chemical Disclosure Report

a) No
b) See Attached Schedule
c) 175,000 gal. per stage
d) See Attached Schedule
e) See Attached Schedule
f) Kevin Gordley
Area Manager, Basic Energy services, LP
10244 NE State Road 61, Pratt, KS
620-770-2191

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Chemical Disclosure Report

The Chemical Disclosure Report does not contain any trade secrets and therefore no redacted versions will be submitted.

WOOLSEY OPERATING COMPANY, LLC

125 North Market, Suite 1000, Wichita, Kansas 67202-1775
(316) -267-4379 fax (316) 267-4383

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION
CHEMICAL DISCLOSURE REPORT - PART b
CHECMICAL AND PROPPANT LIST EACH STAGE
WOODROW 1H-310408-193

Trade Name	Vendor	Purpose	Ingredient	Chemical Abstract Service Number (CAS #)	Mass per Component (LBS)	Maximum Ingredient Concentration in HF Fluid (% by mass)
Water	Groundwater	Carrier/Base Fluid	Water	7732-18-5	1,459,500.00	91.87158%
Sand (Proppant)	To be determined	Proppant	Crystalline Silica in the form of Quartz	14808-60-7	128,256.44	8.07340%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Oxyalkylated alkylphenol	68891-11-2	1.75	0.00011%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Heavy aromatic naphtha	64742-94-5	1.75	0.00011%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Isopropanol	67-63-0	1.75	0.00011%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Fatty acids	61790-12-3	1.17	0.00007%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Complex alkylaryl polyo-ester	68188-40-9	1.17	0.00007%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Tar bases, quinoline derivs., benzyl chloride-quaternized	72480-70-7	1.17	0.00007%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Formaldehyde	50-00-0	1.17	0.00007%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Acetylenic alcohol	5877-42-9	0.00	0.00001%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Propargyl Alcohol	107-19-7	0.00	0.00001%
Cronox AK-50 CIA-I	Baker Hughes	Acid Inhibitor	Naphthalene	91-20-3	0.00	0.00001%
Plexslick 957	Chemplex	Friction Reducer	Distillates (petroleum), hydrotreated light	64742-47-8	155.07	0.00976%
Plexgel Breaker XPA	Chemplex	Slickwater Gel Breaker	Hydrogen Peroxide	7722-87-1	13.99	0.00088%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	Light aromatic naphta	64745-95-6	103.77	0.00653%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	1,2,4 - Trimethylbenzene	95-63-6	34.40	0.00217%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	1,2,3 - Trimethylbenzene	526-73-8	3.50	0.00022%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	1,3,5 - Trimethylbenzene	108-67-8	17.49	0.00110%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	Xylene	1330-20-7	3.50	0.00022%
NE-6 Arbreak 8792 demulsifier	Chemplex	Non-emulsifier/Surfactant	2-Ethylhexanol	104-76-7	17.49	0.00110%
Claymax	Chemplex	Clay Control	Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	78.12	0.00492%
Claymax	Chemplex	Clay Control	Water	7732-18-5	56.55	0.00356%
Ferriplex 66	Chemplex	Iron Control	Acetic Acid	64-19-7	11.66	0.00073%
Ferriplex 66	Chemplex	Iron Control	Citirc Acid	77-92-9	11.66	0.00073%
Hydrochloric Acid	Oxy - Chem	Acidize Formation	Hydrogen Chloride	7647-01-0	356.79	0.02246%

SAFETY DATA SHEET

M34514 NA_EN

Occidental Chemical Corporation

A subsidiary of Occidental Petroleum Corporation

Responsible Care®

HYDROCHLORIC ACID (HCl) (ALL GRADES)

MSDS No.: M34514 **Rev. Date:** 09-Aug-2012 **Rev. Num.** 06

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification:	Occidental Chemical Corporation 5005 LBJ Freeway P.O. Box 809050 Dallas, TX 75380-9050
24 Hour Emergency Telephone Number:	1-800-733-3665 or 1-972-404-3228 (U.S.); CHEMTREC (U.S.): 1-800-424-9300; CHEMTREC (outside U.S.): +1 703-527-3887
To Request an SDS:	MSDS@oxy.com or 1-972-404-3245
Customer Service:	1-800-752-5151 or 1-972-404-3700
Trade Name:	Hydrochloric Acid (HCl) aqueous all grades
Synonyms:	Muriatic Acid, HCl Solution, Aqueous hydrogen chloride
Product Use:	Process chemical, Metal cleaning, Water purification, Petroleum Industry

2. HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW:

Color:	Colorless
Physical State:	Liquid
Appearance:	Clear
Odor:	Irritating, Pungent, Sharp
Signal Word:	**Danger**

MAJOR HEALTH HAZARDS: CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN AND EYES. CAUSES PERMANENT EYE DAMAGE. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

PHYSICAL HAZARDS: May spatter or generate heat when mixed with water. Contact with metals may evolve flammable hydrogen gas.

PRECAUTIONARY STATEMENTS: Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Wash thoroughly after handling. Use only with adequate ventilation.

****

POTENTIAL HEALTH EFFECTS:

Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema.

Skin contact: May cause irritation (possibly severe) and chemical burns.

Eye contact: May cause irritation (possibly severe), chemical burns, eye damage, and blindness.

Ingestion: Not a likely route of exposure.

Chronic Effects: Repeated or prolonged exposure to dilute solutions may result in dermatitis. Discoloration of the teeth may occur as a result of long term exposure.

Interaction with Other Chemicals Which Enhance Toxicity: None known.

Medical Conditions Aggravated by Exposure: None known.

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/ INFORMATION ON INGREDIENTS

Component	%	CAS Number
Hydrogen chloride	9 - 36	7647-01-0
Water	63 - 91	7732-18-5

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer basic life support (Cardio-Pulmonary Resuscitation and/or Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

SKIN CONTACT: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Not a likely route of exposure.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire.

Fire Fighting: Keep unnecessary people away, isolate hazard area and deny entry. Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in pressure demand mode. Move container from fire area if it can be done without risk. Cool non-leaking containers with water. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

Hazardous Combustion Products: Hydrogen chloride, Chlorine, Hydrogen gas

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Remove sources of ignition. Wear appropriate personal protective equipment recommended in Section 8 of the SDS. Stop leak if possible without personal risk. Consider evacuation of personnel located downwind if material is leaking. Shut off ventilation system if needed. Completely contain spilled material with dikes, sandbags, etc. Neutralize with soda ash or dilute caustic soda. Collect with appropriate absorbent and place into suitable container. Liquid material may be removed with a properly rated vacuum truck. Keep out of water supplies and sewers. This material is acidic and may lower the pH of the surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Storage Conditions: Store and handle in accordance with all current regulations and standards. Store in rubber-lined steel, acid-resistant plastic or glass containers. Keep container tightly closed. Store in a cool, dry area. Store in a well-ventilated area. Keep away from heat, sparks and open flames. Keep separated from incompatible substances (see Section 10 of SDS). Do not store in aluminum container or use aluminum fittings or transfer lines. Protect from physical damage. Dike and vent storage tanks.

Handling Procedures: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Regulatory Exposure Limit(s): As listed below

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrogen chloride 7647-01-0	-----	----------	5 ppm 7 mg/m^3

OEL: Occupational Exposure Limit; OSHA: United States Occupational Safety and Health Administration; PEL: Permissible Exposure Limit; TWA: Time Weighted Average; STEL: Short Term Exposure Limit

Non-Regulatory Exposure Limit(s): As listed below

Component	CAS Number	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Hydrogen chloride	7647-01-0	-----	-------	2 ppm	-------	-------	5 ppm 7 mg/m^3

- **The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.**

ENGINEERING CONTROLS: Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a face-shield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Always place pants legs over boots.

Hand Protection: Wear appropriate chemical resistant gloves. Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Nitrile, Neoprene, Butyl rubber, Polyvinyl chloride (PVC), Responder®, Trellchem® HPS, Tychem®

Component	Immediately Dangerous to Life/ Health (IDLH)
Hydrogen chloride	50 ppm IDLH

Respiratory Protection: A NIOSH approved full-face respirator equipped with acid gas cartridges (appropriate for hydrogen chloride) may be permissible when symptoms have been observed that are indicative of overexposure. When the level may be above the IDLH, use an SCBA or pressure-demand supplied air with an auxilliary self-contained escape pack. Pressure-demand SCBA (self-contained breathng apparatus) must be used when there is a potential for uncontrolled release or unknown concentrations. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear
Color:	Colorless
Odor:	Irritating, Pungent, Sharp
Odor Threshold:	0.3 ppm (causes olfactory fatigue)
Molecular Weight:	36.46
Molecular Formula:	HCl
Boiling Point/Range:	140 - 221°F (60 - 105 °C)
Freezing Point/Range:	-29 to 5 °F (-34 to -15 °C)
Vapor Pressure:	14.6 - 80 mmHg @ 20 °C
Vapor Density (air=1):	1.3 @ 20 °C
Specific Gravity (water=1):	1.05 - 1.18
Density:	8.75 - 9.83 lbs/gal
Water Solubility:	100%
pH:	2 @ (0.2% solution)
Volatility:	9 - 36% by volume
Evaporation Rate (ether=1):	< 1.00 (butyl acetate = 1)
Flash point:	Not flammable

10. STABILITY AND REACTIVITY

Reactivity/ Stability: Stable at normal temperatures and pressures.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Avoid contact with water. Will react with some metals forming flammable hydrogen gas. Hydrogen chloride may react with cyanide, forming lethal concentrations of hydrocyanic acid. Avoid contact with incompatible materials.

Incompatibilities/ Materials to Avoid: Metals, Alkalis, Oxidizing agents, Mercuric sulfate, Perchloric acid, Carbides of calcium, cesium, rubidium, Acetylides of cesium and rubidium, Phosphides of calcium and uranium, Lithium silicide

Hazardous Decomposition Products: chlorine, hydrogen chloride, hydrogen gas

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

IRRITATION DATA: As listed below

Standard Draize (Eye):	rabbit-eye mild
Standard Draize (Skin):	human-skin mild

TOXICITY DATA:

Component	LD50 Oral:	LC50 Inhalation:	LD50 Dermal:
Hydrogen chloride	700 mg/kg (Rat)	3124 ppm (1 hr-Rat)	5010 mg/kg (Rabbit)
Water	900 mg/kg (Rabbit)	1108 ppm (1hr-Rat)	

TOXICITY:
Inhalation will cause severe irritation and possible burns with coughing and choking. If inhaled deeply, edema and hemorrhage of the lungs may occur. Prolonged exposure may cause discoloration and/or erosion of teeth. Contact with eyes causes immediate severe irritation with possible burns, permanent visual impairment, or total loss of sight. Skin contact with this material may cause severe irritation and corrosion of tissue. Ingestion may cause immediate burns of the mouth, esophagus, and stomach. Ingestion may cause intense pain, nausea, vomiting, bleeding, circulating collapse, shock, and death.

CARCINOGENICITY: This product is not classified as a carcinogen by NTP, IARC or OSHA.

12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

- **Aquatic Toxicity:**
  LC50 Gambusia affinis: 282 mg/L 96 hr.
- **Fish Toxicity:**
  LC50 Goldfish: 178 mg/L (1 to 2 hour survival time)
- **Freshwater Fish Toxicity:**
  LC50 Bluegill: 3.6 mg/L 48 hr
- **Invertebrate Toxicity:**
  LC50 Shrimp: 100 - 330 mg/L

FATE AND TRANSPORT:

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is believed not to persist in the environment. This material is believed to exist in the disassociated state in the environment. If released to soil, hydrogen chloride will sink into the soil. The acid will dissolve some soil material (in particular, anything with a carbonate base) and will be somewhat neutralized. The remaining portion is thought to transport downward to the water table. If released to water, it dissociates almost completely and will be neutralized by natural alkalinity and carbon dioxide.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited toxicity to terrestrial organisms. May decrease pH of waterways and adversely affect aquatic life.

13. DISPOSAL CONSIDERATIONS

Reuse or reprocess, if possible. All disposals of this material must be done in accordance with local, state and federal regulations. Dispose in accordance with all applicable regulations. May be subject to disposal regulations: U.S. EPA 40 CFR 261.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

UN NUMBER:	UN1789
PROPER SHIPPING NAME:	Hydrochloric acid solution
HAZARD CLASS/ DIVISION:	8
PACKING GROUP:	II
LABELING REQUIREMENTS:	8
RQ (lbs):	RQ 5,000 Lbs. (Hydrochloric acid)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

UN NUMBER:	UN1789
SHIPPING NAME:	Hydrochloric acid solution
CLASS OR DIVISION:	8
PACKING/RISK GROUP:	II

15. REGULATORY INFORMATION

U.S. REGULATIONS

- **OSHA REGULATORY STATUS:**
  This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

- **CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):** If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Component	CERCLA Reportable Quantities:
Hydrogen chloride	5000 lb (final RQ)

- **EPCRA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**
  If a release is reportable under EPCRA, notify the state emergency response commission and local emergency planning committee. If the TPQ is met, facilities are subject to reporting requirements under EPCRA Sections 311 and 312.

Component	EPCRA RQs	Threshold Planning Quantity (TPQs)
Hydrogen chloride	5000 lb (EPCRA RQ)	500 lb (TPQ) gas only

- **EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.10):**
  Acute Health Hazard, Reactive Hazard

- **EPCRA SECTION 313 (40 CFR 372.65):**
  The following chemicals are listed in 40 CFR 372.65 and may be subject to Community Right-to Know Reporting requirements.

Component	Status:
Hydrogen chloride	Listed – Aerosol form only

- **OSHA PROCESS SAFETY (PSM) (29 CFR 1910.119):** Not regulated

NATIONAL INVENTORY STATUS

- **U.S. INVENTORY STATUS: Toxic Substance Control Act (TSCA):** All components are listed or exempt
- **TSCA 12(b):** This product is not subject to export notification
- **Canadian Chemical Inventory:** All components of this product are listed on either the DSL or the NDSL.

STATE REGULATIONS

California Proposition 65:
This product is not listed, but it may contain impurities/trace elements known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act.

Hydrogen chloride	
California Proposition 65 Cancer WARNING:	Not Listed
California Proposition 65 CRT List - Male reproductive toxin:	Not Listed
California Proposition 65 CRT List - Female reproductive toxin:	Not Listed
Massachusetts Right to Know Hazardous Substance List	Listed
New Jersey Right to Know Hazardous Substance List	sn 1012; sn 2909 (gas only)
New Jersey Special Health Hazards Substance List	corrosive
New Jersey - Environmental Hazardous Substance List	Listed
Pennsylvania Right to Know Hazardous Substance List	Listed
Pennsylvania Right to Know Special Hazardous Substances	Not Listed
Pennsylvania Right to Know Environmental Hazard List	Listed
Rhode Island Right to Know Hazardous Substance List	Listed

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

Canada - CEPA Schedule I: Toxic Substance list	Not Listed
WHMIS - Classifications of Substances:	• E - Corrosive material

16. OTHER INFORMATION

Prepared by: OxyChem Corporate HESS - Product Stewardship

Disclaimer:
This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)

Health:	3	**Flammability:**	0	**Reactivity:**	1

NFPA 704 - Hazard Identification Ratings (SCALE 0-4)

Health:	3	**Flammability:**	0	**Reactivity:**	1

Reason for Revision:
- Updated 24 Hour Emergency Telephone Number: SEE SECTION 1
- PPE recommendations have been modified: SEE SECTION 8
- Updated Transportation Information: SEE SECTION 14
- Revised California Proposition 65 Statement: SEE SECTION 15
- Revised Preparer Information: SEE SECTION 16
- Added "End of Safety Data Sheet" phrase

IMPORTANT:
The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTY OR GUARANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, SAFETY, SUITABILITY, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling, storage, disposal and other factors that may involve other or additional legal, environmental, safety or performance considerations, and OxyChem assumes no liability whatsoever for the use of or reliance upon this information. While our technical personnel will be happy to respond to questions, safe handling and use of the product remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State, local or foreign laws.

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees.

End of Safety Data Sheet

SAFETY DATA SHEET

Section 1. Identification

Product identifier : CRONOX™ AK-50 CORROSION INHIBITOR
™ a trademark of Baker Hughes Incorporated.

Product code : CROAK50

Relevant identified uses of the substance or mixture and uses advised against

Identified uses Acid Corrosion Inhibitor.

Uses advised against Not applicable.

Print date : 2/24/2017

Validation date : 2/24/2017

Version : 1

Supplier's details : Baker Hughes Canada Company
5050 47th Street S.E.
Calgary, Alberta, T2B 3S1
Canada
For Product Information: 281-276-5400
(8:00 a.m. - 5:00 p.m. CST, Monday - Friday

Emergency telephone number (with hours of operation) : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606 (North America 24 hour)
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887

Section 2. Hazard identification

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (dermal) - Category 3
ACUTE TOXICITY (inhalation) - Category 3
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SKIN SENSITIZATION - Category 1
GERM CELL MUTAGENICITY - Category 2
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (kidneys and liver) - Category 2
AQUATIC HAZARD (ACUTE) - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 2
Health Hazards Not Otherwise Classified - Category 1

GHS label elements

Hazard pictograms :

Section 2. Hazard identification

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Toxic in contact with skin or if inhaled.
Harmful if swallowed.
Causes serious eye irritation.
Causes skin irritation.
Prolonged or repeated contact may dry skin and cause irritation.
May cause an allergic skin reaction.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure. (kidneys, liver)
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace.

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF ON SKIN: Take off immediately all contaminated clothing and wash it before reuse. Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Avoid contact with skin and clothing. Wash thoroughly after handling.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
Oxyalkylated alkylphenol	10 - 20	68891-11-2
Heavy aromatic naphtha	10 - 20	64742-94-5
Isopropanol	10 - 20	67-63-0
Fatty acids	5 - 10	61790-12-3
Complex alkylaryl polyo-ester	5 - 10	68188-40-9
Tar bases, quinoline derivs., benzyl chloride-quaternized	5 - 10	72480-70-7
Formaldehyde	5 - 10	50-00-0
Acetylenic alcohol	1 - 5	5877-42-9
Propargyl alcohol	1 - 5	107-19-7
Naphthalene	1 - 5	91-20-3

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 15 minutes. Check for and remove any contact lenses. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 15 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Toxic if inhaled. Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Toxic in contact with skin. Causes skin irritation. Defatting to the skin. May cause an allergic skin reaction.

Ingestion : Harmful if swallowed. Can cause central nervous system (CNS) depression.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : respiratory tract irritation,coughing,nausea or vomiting,headache,drowsiness/fatigue, dizziness/vertigo,unconsciousness

Skin contact : irritation,redness,dryness,cracking

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides,sulfur oxides,halogenated compounds

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Section 6. Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isopropanol	**ACGIH TLV (United States, 4/2014).** STEL: 400 ppm, 0 times per shift, 15 minutes. TWA: 200 ppm, 0 times per shift, 8 hours.
Formaldehyde	**ACGIH TLV (United States, 3/2015). Skin sensitizer. Inhalation sensitizer.** C: 0.3 ppm C: 0.37 mg/m³
Propargyl alcohol	**ACGIH TLV (United States, 3/2015). Absorbed through skin.** TWA: 2.3 mg/m³, 0 times per shift, 8 hours.

Section 8. Exposure controls/personal protection

Naphthalene	TWA: 1 ppm, 0 times per shift, 8 hours. **ACGIH TLV (United States, 3/2015). Absorbed through skin.** TWA: 52 mg/m³, 0 times per shift, 8 hours. TWA: 10 ppm, 0 times per shift, 8 hours.

Consult local authorities for acceptable exposure limits.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Hand protection : Chemical-resistant gloves.

Skin protection : Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory protection : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Amber.

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Melting/freezing point : Not available.

Boiling point : Not available.

Initial Boiling Point : Not available.

Flash point : Closed cup: 37.8°C (100°F) [SFCC]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : 5 kPa (37.2 mm Hg) @ 37.8°C

Section 9. Physical and chemical properties

Vapor density : >1 [Air = 1]

Relative density : 0.9664 (15.6°C)

Density : 8.05 (lbs/gal)

Solubility in water : Insoluble

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Dynamic (15.6°C): 38 cP

VOC : Not available.

Pour Point : -23.3°C (-9.9°F)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Isopropanol is incompatible with acrylaldehyde, aluminum powder, and potassium tert-butoxide.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Heavy aromatic naphtha	LC50 Inhalation Vapor	Rat	>11.4 mg/l	6 hours
	LD50 Oral	Rat	3200 mg/kg	-
	LD50 Oral	Rat	>2000 mg/kg	-
Isopropanol	LC50 Inhalation Vapor	Rat	>10000 ppm	6 hours
	LD50 Dermal	Rabbit	6.29 g/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
Fatty acids	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>10000 mg/kg	-
Formaldehyde	LD50 Dermal	Rabbit	270 mg/kg	-
	LD50 Oral	Rat	640 mg/kg	-
	LD50 Oral	Rat	800 mg/kg	-
Acetylenic alcohol	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	4100 mg/kg	-
Propargyl alcohol	LC50 Inhalation Vapor	Rat	2000 mg/m³	2 hours
	LD50 Oral	Rat	55 mg/kg	-

Section 11. Toxicological information

Naphthalene	LD50 Dermal	Rabbit	>20 g/kg	-
CRONOX™ AK-50 CORROSION INHIBITOR	LD50 Dermal	Rabbit	630 mg/kg	-
	LD50 Oral	Rat	1400 mg/kg	-

Irritation/Corrosion

No applicable toxicity data

Sensitization

No applicable toxicity data

Mutagenicity

No applicable toxicity data

Carcinogenicity

Product/ingredient name	OSHA	IARC	NTP
Isopropanol	-	3	-
Formaldehyde	+	1	Known to be a human carcinogen.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

No applicable toxicity data

Teratogenicity

No applicable toxicity data

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Heavy aromatic naphtha	Category 3	Not applicable.	Narcotic effects
Isopropanol	Category 3	Not applicable.	Narcotic effects
Formaldehyde	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Propargyl alcohol	Category 2	Inhalation	kidneys and liver

Aspiration hazard

Name	Result
Heavy aromatic naphtha	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Section 11. Toxicological information

General : May cause damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Suspected of causing genetic defects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (vapors)	8.145 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Isopropanol	Acute LC50 1400000 µg/l Marine water	Crustaceans - Crangon crangon	48 hours
	Acute LC50 1400000 µg/l	Fish - Gambusia affinis	96 hours
Formaldehyde	Acute EC50 0.788 mg/l Marine water	Algae - Ulva pertusa	96 hours
	Acute EC50 12.98 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute EC50 14000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 1.41 ppm Fresh water	Fish - Oncorhynchus mykiss	96 hours
	Chronic NOEC 100 µg/l Marine water	Algae - Phyllospora comosa	96 hours
Propargyl alcohol	EC50 98.1 mg/l	Algae	72 hours
	Acute EC50 3.36 mg/l	Daphnia	48 hours
	Acute LC50 4.64 mg/l	Fish	96 hours
Naphthalene	Acute EC50 1.6 ppm Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours
	Chronic NOEC 0.67 ppm Fresh water	Fish - Oncorhynchus kisutch	40 days

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Propargyl alcohol	-	-	Readily

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	UN1992	UN1992	UN1992	UN1992
UN proper shipping name	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)
Transport hazard class(es)	3 (6.1) 	3 (6.1) 	3 (6.1) 	3 (6.1) 
Packing group	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3), 2.26-2.36 (Class 6)	**Emergency schedules (EmS)** F-E S-E	-

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

DOT Reportable Quantity Formaldehyde, 167 gal of this product.
Propargyl alcohol, 2535 gal of this product.
Naphthalene, 837 gal of this product.

Section 14. Transport information

Marine pollutant Heavy aromatic naphtha
Acetylenic alcohol

North-America NAERG : 131

Section 15. Regulatory information

Canadian lists

Canadian NPRI : The following components are listed: Formaldehyde; Heavy aromatic solvent naphtha; Naphthalene; Isopropyl alcohol; Propargyl alcohol

CEPA Toxic substances : The following components are listed: Formaldehyde; Naphthalene

Canada (CEPA DSL): : At least one component is not listed in DSL but all such components are listed in NDSL.

Inventory list

United States : All components are listed or exempted.

Additional information

This product contains a chemical (CAS No. 72480-70-7 - tar bases, quinoline derivatives, benzyl chloride-quaternized) that has not been placed on the DSL due to a suspicion of being toxic. Environment Canada has imposed a condition which allows the importation of this substance for the purpose of use as an acid corrosion inhibitor employed in the stimulation of oil and gas wells. This substance should not be discharged into water and disposal is limited to deep-well injection. All users must be notified of these conditions in writing.

Section 16. Other information

National Fire Protection Association (U.S.A.)

History

Date of printing : 2/24/2017

Notice to reader

NOTE: The information on this SDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This SDS was prepared and is to be used for this product. If the product is used as a component in another product, this SDS information may not be applicable.

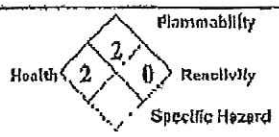
NC 1

NE-6 Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	ARBREAK 8792 DEMULSIFIER	Code	ARB8792
Supplier	Aquaness Chemical A Division Of Baker Petrolite Corporation A Baker Hughes company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday)	Version	1.0
Material Uses	Demulsifier.	Effective Date	12/14/2004
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (North America 24 hour) CANUTEC 613-996-6666 (Canada 24 hours)	Print Date	12/14/2004

National Fire Protection Association (U.S.A.)



Section 2. Composition and Information on Ingredients

Name	CAS #	% by Weight	Exposure Limits
Light aromatic naphtha	64742-95-6	30-60	Not available.
1,2,4-Trimethylbenzene	95-63-6	10-30	Not available.
1,2,3-Trimethylbenzene	526-73-8	1-5	Not available.
1,3,5-Trimethylbenzene	108-67-8	5-10	Not available.
Xylene	1330-20-7	1-5	ACGIH (United States). TWA: 434 mg/m³ 8 hour(s). STEL: 651 mg/m³ 15 minute(s). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). TWA: 435 mg/m³ 8 hour(s). STEL: 655 mg/m³ 15 minute(s).
2-Ethylhexanol	104-76-7	5-10	Manufacturer TWA: 20 ppm

While trimethylbenzene isomers do not have exposure limits, trimethylbenzene (mixed isomers)(CAS No. 25551-13-7) has TWA value of 25 ppm for both ACGIH and OSHA (revoked limit).

Continued on Next Page

Section 3. Hazards Identification

Physical State and Appearance	State: Liquid., Color: Dark Brown., Odor: Acidic. Aromatic hydrocarbon.
CERCLA Reportable Quantity	Xylene 793 gal.
Hazard Summary	WARNING. May cause chronic effects. Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded. May be irritating to eyes, skin and respiratory tract. May cause central nervous system (CNS) effects if inhaled.
Routes of Exposure	Skin (Contact), Eyes, Inhalation.
Potential Acute Health Effects	
Eyes	May be severely irritating to the eyes.
Skin	May be irritating to skin.
Inhalation	May cause central nervous system (CNS) effects if inhaled. May be irritating to lungs.
Ingestion	Not considered a likely route of exposure, however, may be harmful or cause irritation if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: blood system, kidneys, nervous system, liver, gastrointestinal tract, respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	May be harmful if ingested. This product may be aspirated into the lungs during swallowing or vomiting of swallowed material. Aspiration into the lungs may produce chemical pneumonitis, pulmonary edema, and hemorrhaging. Repeated or prolonged contact may cause dermatitis (inflammation) and defatting of the skin (dryness).

Section 4. First Aid Measures

Eye Contact	Flush eyes with plenty of water for 15 minutes, occasionally lifting upper and lower eyelids. Get medical attention immediately.
Skin Contact	Remove and launder or clean contaminated clothing and shoes. Wash with soap and water for at least 15 minutes or until no evidence of material remains. Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions. Get medical attention if symptoms appear.
Notes to Physician	Not available.
Additional First Aid Remarks	If product is ingested and vomiting occurs naturally, have person lean forward to reduce the risk of aspiration into the lungs. If breathing has stopped or the heart has stopped, trained personnel should immediately administer artificial respiration or cardiopulmonary resuscitation, as required.

Continued on Next Page

Section 5. Fire Fighting Measures

Flammability of the Product	Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded.
OSHA Flammability Class	II
Autoignition temperature	Not available.
Flash Points	Closed cup: 46.7°C (116°F). (PMCC)
Flammable Limits	L.E.L. Not available. U.E.L. Not available.
Products of Combustion	These products are carbon oxides (CO, CO_2) nitrogen oxides (NO, NO_2...) sulfur oxides (SO_2, SO_3...).
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static, Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Not available.

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Keep personnel removed and upwind of spill. Shut off all ignition sources; no flares, smoking, or flames in hazard area. Approach release from upwind. Shut off leak if it can be done safely. Contain spilled material. Keep out of waterways. Dike large spills and use a non-sparking or explosion-proof means to transfer material to an appropriate container for disposal. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances from spill and flash back, if ignited. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.
Additional Accidental Release Measures Remarks	Not available.

Continued on Next Page

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or spray mists. Use only with adequate ventilation. Store in a dry, cool and well ventilated area. Keep away from heat, sparks and flame. Keep away from incompatibles. Keep container tightly closed and dry. To avoid fire or explosion, ground container equipment and personnel before handling product.
Additional Handling and Storage Remarks	Not available.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes Chemical safety goggles.

Body Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.

Hands Chemical resistant gloves. Nitrile or Neoprene gloves. 4H gloves.

Feet Chemical resistant boots or overshoes.

Other Information Not available.

Additional Exposure Control Remarks	Not available.

Section 9. Typical Physical and Chemical Properties

Physical State and Appearance	Liquid.	Odor	Acidic. Aromatic hydrocarbon.
pH	8.6 - 9.5 (5% of product in 75% isopropanol / 25% water solution)	Color	Dark Brown.
Specific gravity	0.962 - 0.964 @ 16°C (60°F)		
Density	7.93 - 8.03 lbs/gal @ 16°C (60°F)		
Vapor Density	>1 (Air = 1)		
Vapor Pressure	7.6 - mmHg @ 21°C (70°F) Calculated Value for all Components.		
Evaporation Rate	Not Available or Not Applicable for Solids.		
VOC	Not available.		
Viscosity	11 - 12 cps @ 38°C (100°F) Kinematic		
Pour Point	-40°C (-40°F)		
Solubility (Water)	Dispersible		
Boiling Point	Not available.		

Continued on Next Page

Physical Chemical Comments	Not available.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Oxidizing material.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Hazardous polymerization is not expected to occur.
Special Stability & Reactivity Remarks	Not available.

Section 11. Toxicological Information

Component Toxicological Information

Acute Animal Toxicity

Light aromatic naphtha	ORAL (LD50): Acute: 2800 mg/kg [Rat]. 8400 mg/kg [Rat].
1,2,4-Trimethylbenzene	ORAL (LD50): Acute: 5000 mg/kg [Rat]. VAPOR (LC50): Acute: 18000 mg/m³ 4 hour(s) [Rat].
1,2,3-Trimethylbenzene	Not available.
1,3,5-Trimethylbenzene	VAPOR (LC50): Acute: 24000 mg/m³ 4 hour(s) [Rat].
Xylene	ORAL (LD50): Acute: 4300 mg/kg [Rat]. 3523 mg/kg [Male rat]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit]. VAPOR (LC50): Acute: 5000 ppm 4 hour(s) [Rat].
2-Ethylhexanol	ORAL (LD50): Acute: 3730 mg/kg [Rat]. 2500 mg/kg [Mouse]. DERMAL (LD50): Acute: 1970 mg/kg [Rabbit].

Chronic Toxicity Data

1) Light aromatic naphtha

Ingestion has produced Central Nervous System effects in laboratory animals. (EPA/OTS 87-8214199 and 88-920000348)

2) 1,2,4-Trimethylbenzene

1,2,4-Trimethylbenzene, also know as pseudocumene, is a component of this product. Chronic pseudocumene exposure may provoke bronchospasm with cough and wheezing (Plunkett, 1976; ACGIH, 1991; Baltig et al, 1956). Respiratory distress was noted in experimental animals following sub acute inhalation exposure (Gage, 1970). Nervousness and anxiety were noted with chronic occupational exposure (Baltig et al, 1956; ACGIH, 1991).

At the time of this review, no studies were found on the potential adverse reproductive effects of pseudocumene in humans, but trimethylbenzenes (including pseudocumene) can cross the placental barrier (Clayton & Clayton, 1994; Dorolv et al, 1976). In an experimental animal study, offspring born to pregnant rats exposed to pseudocumene were healthy at birth and grew normally (Cameron et al, 1938).

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Blood effects such as anemia and delayed clotting time have been noticed in workers chronically exposed to a solvent containing trimethylbenzene. The blood effects, however, may have been due to a contaminant in the solvent such as benzene (a known blood toxin).

3) 1,2,3-Trimethylbenzene

Not available.

4) 1,3,5-Trimethylbenzene

1,3,5-Trimethylbenzene (Mesitylene) is a component of this product. Chronic asthmatic-like bronchitis may be a delayed chronic hazard (EPA, 1985; Laham, 1987; HSDB, 1997). Nervousness, tension, and anxiety have been noted in chronically exposed workers with exposure to a mixture of solvents including mesitylene (HSDB, 1997). Elevated alkaline phosphates and SGOT(liver enzymes) levels have been noted in chronic animal inhalation studies (Clayton & Clayton, 1994). These effects have not been reported in exposed humans. (Reprotext)

Thrombocytopenia (a lack of platelets in the blood) with bleeding from the gums and nose and mild anemia may occur with chronic exposure to mesitylene as a component of the commercial solvent mixture, "Fleet-X-DV-99" (Plunkett, 1976; Finkel, 1983; HSDB, 1997). Coagulation (clotting of the blood) times were delayed by about 40% in a group of workers chronically exposed to a mixture of solvents containing about 30% mesitylene (Laham, 1987). These hematological disorders may have been due to a contaminant, such as benzene (Hathaway et al, 1996). Thrombocytosis (an increase of platelets in the blood) and thrombocytopenia have been noted in rabbits (Clayton & Clayton, 1994). (Reprotext)

1,3,5-Trimethylbenzene has been positive in a mutagenicity assay (Lewis, 1992). (Reprotext)

5) Xylene

Xylene (mixed isomers) is a component of this product. Effects of chronic exposure to xylene are similar to those of acute exposure, but may be more severe. Chronic inhalation reportedly was associated with headache, tremors, apprehension, memory loss, weakness, dizziness, loss of appetite, nausea, ringing in the ears, irritability, thirst, anemia, mucosal bleeding, enlarged liver, and hyperplasia, but not destruction of the bone marrow (Clayton & Clayton, 1994; ILO, 1983). Some earlier reports of effects of chronic exposure to xylene have been questioned, as exposures were not limited to xylene alone.

Effects on the blood have been reported from chronic exposure to as little as 60 mg/m3 (Pap & Varga, 1987). Repeated exposure can damage bone marrow, causing low blood cell count and can damage the liver and kidneys (NJ Department of Health, Hazardous Substance Fact Sheet). Chronic xylene exposure (usually mixed with other solvents) has produced irreversible damage to the CNS (ILO, 1983). CNS effects may be exacerbated by ethanol abuse (Savolainen, 1980). Xylene may damage hearing or enhance sensitivity to noise in chronic occupational exposures (Morata et al, 1994), probably from neurotoxic mechanism. Tolerance to xylene can occur over the work week and disappear over the weekend. (ACGIH, 1992).

Inhalation exposure has produced fetotoxicity and postnatal developmental toxicity in laboratory animals. (API, 1978, Kensington, MD, EPA/OTS Document No. 878210350 and Hass, U., et al, 1995, Neurotoxicology and Teratology 17: 341-349 and 1997, Neurotoxicology 18: 547-552)

6) 2-Ethylhexanol

2-Ethylhexanol (2EH) is a component of this product. Chronic overexposure has been suggested as a cause of the following effects in laboratory animals, and may aggravate pre-existing disorders of these organs in humans: liver abnormalities, kidney damage, lung damage, cardiac abnormality, blood abnormalities, and spleen damage. (Vendor MSDS)

In subchronic oral studies, 2EH has produced liver and kidney effects in laboratory animals. (RTECS)

2EH has produced developmental effects in oral studies in laboratory animals including teratogenicity at maternally toxic doses (Clayton & Clayton, 1994). (HSDB)

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Product Toxicological Information	
Acute Animal Toxicity	Not available.
Target Organs	blood system, kidneys, nervous system, liver, gastrointestinal tract, respiratory tract, skin/epithelium, eyes.
Other Adverse Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Biodegradable/OECD	Not available.
Toxicity of the Products of Biodegradation	Not available.
Special Remarks	Not available.

Section 13. Disposal Considerations

Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Additional Waste Remarks	Not available.

Section 14. Transport Information

DOT Classification	FLAMMABLE LIQUID, N.O.S. (Contains: Light aromatic naphtha, 1,2,4-Trimethylbenzene), 3, UN1993, III	
DOT Reportable Quantity	Xylene 793 gal.	
Marine Pollutant	Not applicable.	
Additional DOT Information	Not available.	
Emergency Response Guide Page Number	128	

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Section 15. Regulatory Information

HCS Classification	Target organ effects, Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded. Irritant.
U.S. Federal Regulations	
Environmental Regulations	Extremely Hazardous Substances: Not applicable to any components in this product. SARA 313 Toxic Chemical Notification and Release Reporting: 1,2,4-Trimethylbenzene; Xylene; SARA 302/304 Emergency Planning and Notification substances: Not applicable to any components in this product. Hazardous Substances (CERCLA 302): Xylene 793 gal.; SARA 311/312 MSDS distribution - chemical inventory - hazard identification: fire; immediate health hazard; delayed health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Not applicable to any components in this product. Clean Water Act (CWA) 311 Hazardous Substances: Xylene; Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Not applicable to any components in this product.
Threshold Planning Quantity (TPQ)	Not applicable.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product contains the following components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States: Xylene; Naphthalene.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	B-3, D-2A, D-2B
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Harmonized Tariff Code	Not available.
Other Regulatory Information	No further regulatory information is available.

Continued on Next Page

Section 16. Other Information

Other Special Considerations: File 2634

Baker Petrolite Disclaimer

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Petrolite, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Safety Data Sheet

Section 1: Identification

Product identifier

Product Name • **PLEXGEL BREAKER XPA**

Product Code • 01025

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Petrochemical industry

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net

Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Eye Irritation 2

Label elements

OSHA HCS 2012

WARNING

Hazard statements • Causes serious eye irritation

Precautionary statements

Prevention • Wear eye/face protection - Safety glasses with side-shield, .
Wash thoroughly after handling.

Response • IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If eye irritation persists: Get medical advice/attention.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage/Disposal

- Store in a well-ventilated place. Keep cool.
  Store in a well-ventilated place. Keep container tightly closed.
  Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.
  Wash thoroughly after handling.

Other hazards

OSHA HCS 2012

- No data available

Canada

According to: WHMIS

Classification of the substance or mixture

WHMIS

- Other Toxic Effects - D2B

Label elements

WHMIS

- Other Toxic Effects - D2B

Other hazards

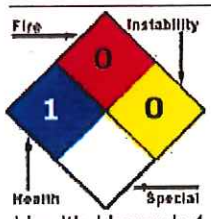
WHMIS

- No other WHMIS hazards than those reported above.
  See all section 2 hazard statements.

Other information

- One should be specifically trained before communicating or using the following National Fire Protection Association (NFPA) and or Hazardous Materials Identification System (HMIS) categories since the definition and scales applied do not match US OSHA GHS and HAZCOM 2012 definitions and rules.

NFPA



- Health Hazard: 1 - Caution: May be irritating
  Reactivity: 0 - Stable: Not reactive under normal conditions
  Flammability: 0 - Not combustible

HMIS

- HMIS Health - 1: Slight Hazard
  HMIS Flammability - 0: Minimal Hazard
  HMIS Physical Hazard - 0: Minimal Hazard

Section 3 - Composition/Information on Ingredients

Substances

- Not applicable. This material is a mixture.

Mixtures

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

Composition			
Chemical Name	**Identifiers**	**%**	**Hazardous**
Hydrogen peroxide	CAS:7722-84-1	5% TO 8%	Yes

- This product is considered hazardous according to the OSHA Hazard Communication Standard 29 CFR 1910.1200. Under Canadian regulations (Workplace Hazardous Materials Information System (WHMIS) - Hazardous Products Act (HPA), this material is hazardous.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation
- Get medical attention immediately if symptoms occur. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin
- Get medical attention immediately if symptoms occur. Rinse skin immediately with plenty of water for 15-20 minutes. Take off contaminated clothing and wash before reuse.

Eye
- Flush eyes with water for at least 15 minutes while holding eyelids open. Get medical attention immediately. If easy to do, remove contact lenses, if worn.

Ingestion
- Vomiting may occur spontaneously. To prevent aspiration of swallowed product, lay victim on side. Do NOT induce vomiting. Get medical attention immediately. Give nothing to drink.

Most important symptoms and effects, both acute and delayed

- Causes serious eye irritation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically. There is no specific antidote available.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media
- LARGE FIRES: Dry chemical, CO2, alcohol-resistant foam or water spray.
  SMALL FIRES: Dry chemical, CO2, water spray or alcohol-resistant foam.

Unsuitable Extinguishing Media
- DO NOT use high volume water jet.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- Hydrogen peroxide decomposes to release oxygen.
  Containers may explode when heated.

Hazardous Combustion Products
- Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes).

Advice for firefighters

- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.
  Standard procedures for chemical fires.

Collect contaminated fire extinguishing materials separately. This must be not be discharged into drains.
Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Cool closed containers exposed to fire with water spray.
Refer to Section 8 - Exposure Controls/Personal Protection.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions

- Avoid contact with eyes. Wear eye/face protection. Refer to Section 8 - Exposure Controls/Personal Protection.

Emergency Procedures

- Keep unauthorized personnel away. Avoid all contact. Strict hygiene. Ventilate closed spaces before entering. Stop leak if you can do it without risk.

Environmental precautions

- Spills may be reportable to the National Response Center (800-424-8802) and to state and or local agencies. Do not flush to sewer or allow to enter waterways. Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

Methods and material for containment and cleaning up

Containment/Clean-up Measures

- Dike to collect large liquid spills.
  Contain and recover liquid when possible.
  Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
  Wash remainder with plenty of water.
  Water will make area slippery.
  Repeat cleaning process until the contaminated surface is no longer slippery.
  Refer to Section 13 - Disposal Considerations.

Prohibited Materials

- Strong alkalines and oxidizing materials. Sources of ignition - heat, sparks and open flames.

Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection.

Section 7 - Handling and Storage

Precautions for safe handling

Handling

- Avoid contact with skin and eyes. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage

- Store locked up. Keep only in the original container/package in a cool well-ventilated place. Store away from alkali(bases)and oxidizing agents. Avoid excessive heat.

Incompatible Materials or Ignition Sources

- Reactive with strong bases and oxidizing agents.

Refer to Section 8 - Exposure Controls/Personal Protection.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines

- Use only with adequate ventilation. Avoid all contact. Strict hygiene.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Hydrogen peroxide (7722-84-1)	TWAs	1 ppm TWA	1 ppm TWA; 1.4 mg/m3 TWA	1 ppm TWA; 1.4 mg/m3 TWA

Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Respiratory

- When respirators are required, use NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face

- Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material. Wear eye/face protection - Safety glasses with Side-shield, .

Skin/Body

- Wear protective gloves/protective clothing/eye protection/face protection.

General Industrial Hygiene Considerations

- Avoid all contact. Strict hygiene. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Keep away from food, drink and animal feeding stuffs.

Environmental Exposure Controls

- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Additional Protection Measures

- The protective equipment must be selected in accordance with local standards and in cooperation with the supplier of the protective equipment. Selection of the appropriate personal protective equipment should be based upon an evaluation of the performance characteristics of the protective equipment relative to the tasks to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use. Emergency equipment should be immediately accessible, with instructions for use. Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use.

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Color	Red
Odor	Odorless	Odor Threshold	No data available
General Properties			
Boiling Point	214 F(101.1111 C)	Melting Point	No data available
Decomposition Temperature	No data available	pH	5.5 to 6.5
Specific Gravity/Relative Density	= 1.03 Water=1	Density	1.03 g/mL
Water Solubility	Soluble	Viscosity	No data available
Volatility			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
Flammability			
Flash Point	No data available	UEL	No data available
LEL	No data available	Autoignition	No data available
Flammability (solid, gas)	None		
Environmental			
Octanol/Water Partition coefficient	No data available	Bioaccumulation Factor	None

Section 10: Stability and Reactivity

Reactivity

- Hydrogen peroxide decomposes to release oxygen.

Chemical stability

- This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Excess heat.

Incompatible materials

- Hydrogen peroxide decomposes to release oxygen. Keep away from combustible and flammable materials.

Hazardous decomposition products

- Hydrogen peroxide decomposes to release oxygen. Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes)

Section 11 - Toxicological Information

Information on toxicological effects

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation - Classification criteria not met; Acute Toxicity - Oral - Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met
Skin corrosion/Irritation	OSHA HCS 2012 • Classification criteria not met
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
STOT-RE	OSHA HCS 2012 • Classification criteria not met
STOT-SE	OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Serious eye damage/Irritation	OSHA HCS 2012 • Eye Irritation 2

Medical Conditions Aggravated by Exposure

- None known.

Potential Health Effects

Inhalation

Acute (Immediate)

- Classification criteria not met.

Chronic (Delayed)

- No data available

Skin

Acute (Immediate)
- Classification criteria not met.

Chronic (Delayed)
- No data available

Eye

Acute (Immediate)
- Causes serious eye irritation.

Chronic (Delayed)
- No data available

Ingestion

Acute (Immediate)
- May cause burns of the gastrointestinal tract if swallowed.

Chronic (Delayed)
- No data available

Section 12 - Ecological Information

Toxicity

- No data available

Persistence and degradability

- No data available

Bioaccumulative potential

- No data available

Mobility in Soil

- No data available

Other adverse effects

- According to test data on the components and the classification criteria for mixtures, this product has no known adverse effects on aquatic organisms.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations.

Packaging waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Empty containers pose a fire risk, evaporate the residue under a fume hood. Rinse with an appropriate solvent.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	Not regulated	NDA	NDA	NDA	NDA
TDG	Not regulated	NDA	NDA	NDA	NDA
IMO/IMDG	Not regulated	NDA	NDA	NDA	NDA
IATA/ICAO	Not regulated	NDA	NDA	NDA	NDA

Special precautions for user
- No data available

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
- No data available

Other information
- Transportation status: The listed Transportation Classification does not address all regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

Note: The above regulatory prescriptions are those valid on the date of the publication of this sheet. Given the possible evolution of transportation regulations for Hazardous materials, it would be advisable to check their validity with your sales office.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications
- Acute

United States

Environment

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities		
• Hydrogen peroxide	7722-84-1	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs		
• Hydrogen peroxide	7722-84-1	1000 lb EPCRA RQ (concentration >52%)
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs		
• Hydrogen peroxide	7722-84-1	1000 lb TPQ (concentration >52%)
U.S. - CERCLA/SARA - Section 313 - Emission Reporting		
• Hydrogen peroxide	7722-84-1	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List		
• Hydrogen peroxide	7722-84-1	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
• Hydrogen peroxide	7722-84-1	Not Listed

Other Information

- All components of this product are listed on the following:

  - US TSCA Inventory.

Section 16 - Other Information

Last Revision Date
- 16/April/2015

Preparation Date
- 16/April/2015

Disclaimer/Statement of Liability
- The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport,

dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but does not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
IARC = International Agency for Research on Cancer
MSHA = Mine Safety and Health Administration
NIOSH = National Institute of Occupational Safety and Health
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
STEL = Short Term Exposure Limits are based on 15-minute exposures
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name Plexslick 957

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses advised against

- For industrial use only.

1.3 Details of the supplier of the safety data sheet

Company

Chemplex, Solvay Group
506 CR 137
Snyder, TX 97549
Phone: (325) 573-7298

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture

HCS 2012 (29 CFR 1910.1200)

- Not a hazardous product according to Globally harmonized System (GHS)

2.2 Label elements

HCS 2012 (29 CFR 1910.1200)

- Not a hazardous product according to Globally harmonized System (GHS)

2.3 Other hazards which do not result in classification

- Slightly irritating to eyes.
- Aspiration of the swallowed or vomited product can cause severe pulmonary complications.
- No specific risk when handled in accordance with good occupational hygiene and safety practice.
- Does NOT present any particular fire hazard.
- Hazardous reactions may occur on contact with certain chemicals. (Refer to the list of incompatible materials section 10: "Stability-Reactivity").

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

- Chemical nature — Emulsion of petroleum distillate and aqueous solution.

Hazardous Ingredients and Impurities

Chemical Name	Identification number CAS-No.	Concentration [%]
Distillates (petroleum), hydrotreated light	64742-47-8	14 - 19

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

- Show this material safety data sheet to the doctor in attendance.
- First responder needs to protect himself.
- Place affected apparel in a sealed bag for subsequent decontamination.

In case of inhalation

- Remove to fresh air.
- If breathing is difficult, give oxygen.
- If breathing has stopped, apply artificial respiration.
- Consult a physician if necessary.

In case of skin contact

- Wash off with soap and plenty of water.
- Remove contaminated clothing and shoes.
- Wash contaminated clothing before re-use.
- Call a physician if irritation develops or persists.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Consult a physician if necessary.

In case of ingestion

- Do NOT induce vomiting.
- Do not give anything to drink.
- Seek medical advice.
- Do not leave the victim unattended.
- Vomiting may occur spontaneously
- Risk of product entering the lungs on vomiting after ingestion.
- Lay victim on side.

4.2 Most important symptoms and effects, both acute and delayed

Effects

- No information available.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

SECTION 5: Firefighting measures

Flash point	> 200 °F (> 93 °C) closed cup
	Flammability class: Will burn
Autoignition temperature	no data available
Flammability / Explosive limit	no data available

5.1 Extinguishing media

Suitable extinguishing media

- Water mist
- Carbon dioxide (CO2)
- Foam
- Dry chemical

Unsuitable extinguishing media

- Do not use a solid water stream as it may scatter and spread fire.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- Under fire conditions:
- Will burn
- (following evaporation of water)
- Harmful or toxic vapors are released.

Hazardous combustion products:

- Hazardous combustion products
- Carbon oxides
- Nitrogen oxides (NOx)
- Sulfur oxides

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

Specific fire fighting methods

- Cool closed containers exposed to fire with water spray.
- Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Avoid contact with the skin and the eyes.
- Wear suitable protective equipment.
- For personal protection see section 8.
- Stop the leak. Turn leaking containers leak-side up to prevent the escape of liquid.

6.2 Environmental precautions

- Do not let product enter drains.
- Prevent product from entering sewage system.
- Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies

6.3 Methods and materials for containment and cleaning up

Recovery

- Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).
- Sweep up and shovel into suitable containers for disposal.
- Never return spills in original containers for re-use.

Decontamination / cleaning

- Clean contaminated surface thoroughly.
- Wash off with plenty of water.
- Recover the cleaning water for subsequent disposal.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.

Disposal

- Dispose of in accordance with local regulations.

Additional advice

- Material can create slippery conditions.

6.4 Reference to other sections

- no data available

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Avoid inhalation, ingestion and contact with skin and eyes.
- Handle in accordance with good industrial hygiene and safety practice.

Hygiene measures

- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

- Keep in a dry, cool and well-ventilated place.
- Keep container tightly closed.
- Do not freeze.

- Keep away from open flames, hot surfaces and sources of ignition.
- Keep away from incompatible materials to be indicated by the manufacturer

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Ingredients	Value type	Value	Basis
Distillates (petroleum), hydrotreated light	TWA	200 mg/m3	American Conference of Governmental Industrial Hygienists
	Danger of cutaneous absorption Expressed as :as total hydrocarbon vapor		
Distillates (petroleum), hydrotreated light	TWA	500 ppm 2,000 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.		

8.2 Exposure controls

Control measures

Engineering measures

- Effective exhaust ventilation system

- Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures :

Individual protection measures

Respiratory protection

- Use a respirator with an approved filter if a risk assessment indicates this is necessary.
- When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Hand protection

- Where there is a risk of contact with hands, use appropriate gloves
- Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.
- Gloves must be inspected prior to use.

- Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Eye protection
- Safety glasses with side-shields
- Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material.
- Eye contact should be prevented through the use of:

Skin and body protection
- Remove and wash contaminated clothing before re-use.
- Choose body protection according to the amount and concentration of the dangerous substance at the work place.
- Protective suit
- Boots

Hygiene measures
- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

Protective measures
- Ensure that eyewash stations and safety showers are close to the workstation location.
- The protective equipment must be selected in accordance with current local standards and in cooperation with the supplier of the protective equipment.
- Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Physical state: liquid Color: white
Odor	oily
Odor Threshold	no data available
pH	not determined
Boiling point/boiling range	no data available
Flash point	> 200 °F (> 93 °C) closed cup

	Flammability class: Will burn
Evaporation rate (Butylacetate = 1)	no data available
Flammability (solid, gas)	no data available
Flammability (liquids)	no data available
Flammability / Explosive limit	no data available
Autoignition temperature	no data available
Vapor pressure	no data available
Vapor density	no data available
Density	1.02 - 1.11 g/cm3 (25 °C)
Solubility	no data available
Partition coefficient: n-octanol/water	no data available
Thermal decomposition	no data available
Viscosity	no data available
Explosive properties	no data available
Oxidizing properties	no data available

9.2 Other information

no data available

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Polymerization

- Hazardous polymerization does not occur.

10.4 Conditions to avoid

- Heat, flames and sparks.

10.5 Incompatible materials

- Strong oxidizing agents

10.6 Hazardous decomposition products

- On combustion or on thermal decomposition (following the evaporation of water) releases:
- Carbon oxides
- Nitrogen oxides (NOx)
- Sulfur oxides

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	no data available
Acute inhalation toxicity	no data available
Acute dermal toxicity	no data available
Acute toxicity (other routes of administration)	no data available
Skin corrosion/irritation	Not classified as irritating to skin According to the data on the components
Serious eye damage/eye irritation	slight irritation
Respiratory or skin sensitization	Not classified as sensitizing by skin contact According to the data on the components

Mutagenicity

Genotoxicity in vitro	no data available
Genotoxicity in vivo	no data available
Carcinogenicity	no data available

Ingredients	CAS-No.	Rating	Basis
Distillates (petroleum), hydrotreated light	64742-47-8	Confirmed animal carcinogen with unknown relevance to humans	ACGIH

This product does not contain any ingredient designated as probable or suspected human carcinogens by:
NTP
IARC
OSHA

Toxicity for reproduction and development

Toxicity to reproduction / fertility	no data available

Developmental Toxicity/Teratogenicity	no data available

STOT

STOT-single exposure	no data available
STOT-repeated exposure	no data available
Aspiration toxicity	no data available

SECTION 12: Ecological Information

12.1 Toxicity no data available

12.2 Persistence and degradability

Biodegradation

Biodegradability	The product itself has not been tested.

12.3 Bioaccumulative potential	no data available
12.4 Mobility in soil	no data available
12.5 Results of PBT and vPvB assessment	This mixture contains no substance considered to be persistent, bioaccumulating, and toxic (PBT). This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).
12.6 Other adverse effects	no data available

Ecotoxicity assessment

Acute aquatic toxicity	This product has no known ecotoxicological effects. According to the data on the components
Chronic aquatic toxicity	This product has no known ecotoxicological effects. According to the data on the components

SECTION 13: Disposal considerations

13.1Waste treatment methods

Product Disposal

- Chemical additions, processing or otherwise altering this material may make the waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

Waste Code

- Environmental Protection Agency
- Hazardous Waste – NO

Advice on cleaning and disposal of packaging

- Completely empty the packaging prior to decontamination.
- Rinse with an appropriate solvent.
- Dispose of in accordance with local regulations.

Measure for waste avoidance or recovery

- Do not dispose of the product at a dump.

SECTION 14: Transport information

DOT
not regulated

TDG
not regulated

NOM
no data available

IMDG
not regulated

IATA
not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	On TSCA Inventory
Canadian Domestic Substances List (DSL)	All components of this product are on the Canadian DSL.
Australia Inventory of Chemical Substances (AICS)	On the inventory, or in compliance with the inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	On the inventory, or in compliance with the inventory
Korea. Korean Existing Chemicals Inventory (KECI)	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	On the inventory, or in compliance with the inventory

15.2 Federal Regulations

US. EPA EPCRA SARA Title III

SARA Hazard Designation Sections 311/312 (40 CFR 370)

Fire Hazard	no
Reactivity Hazard	no
Sudden Release of Pressure Hazard	no
Acute Health Hazard	no
Chronic Health Hazard	no

Section 313 Toxic Chemicals (40 CFR 372.65)

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)

Ingredients	CAS-No.	Reportable quantity
Oxirane	75-21-8	10 lb
Formaldehyde	50-00-0	100 lb

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)

Ingredients	CAS-No.	Reportable quantity
Oxirane	75-21-8	10 lb
Formaldehyde	50-00-0	100 lb

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Ingredients	CAS-No.	Reportable quantity
Diethanolamine	111-42-2	100 lb
Oxirane	75-21-8	10 lb
1,4-Dioxane	123-91-1	100 lb
Formaldehyde	50-00-0	100 lb
Methanol	67-56-1	5000 lb
Acetaldehyde	75-07-0	1000 lb

15.3 State Regulations

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

WARNING! This product contains a chemical known in the State of California to cause cancer.

Ingredients	CAS-No.
Diethanolamine	111-42-2
Oxirane	75-21-8
Acetaldehyde	75-07-0
1,4-Dioxane	123-91-1
Formaldehyde	50-00-0

WARNING: This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

Ingredients	CAS-No.
Methanol	67-56-1
Oxirane	75-21-8

SECTION 16: Other information

NFPA (National Fire Protection Association) - Classification

Health	0 minimal
Flammability	1 slight
Instability or Reactivity	0 minimal

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health	0 minimal
Flammability	1 slight
Reactivity	0 minimal
PPE	Determined by User; dependent on local conditions

Further information

- Product classified under the US GHS format.

Date Prepared: 03/13/2015

Key or legend to abbreviations and acronyms used in the safety data sheet

- TWA — 8-hour, time-weighted average
- ACGIH — American Conference of Governmental Industrial Hygienists
- OSHA — Occupational Safety and Health Administration
- NTP — National Toxicology Program

- IARC — International Agency for Research on Cancer
- NIOSH — National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Safety Data Sheet

Chemplex
SOLVAY GROUP

Section 1: Identification

Product identifier

Product Name • **Claymax**

Synonyms • Product number: 00601

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Potassium chloride substitute in oil well treatment

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net

Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Classification criteria not met

Label elements

OSHA HCS 2012

Hazard statements • No label element(s) required

Other hazards

OSHA HCS 2012 • This product is not considered hazardous under the U.S. OSHA 29 CFR 1910.1200 Hazard Communication Standard.

Canada

According to WHMIS

Classification of the substance or mixture

WHMIS • Classification criteria not met

Label elements

WHMIS

- No label element(s) required

Other hazards

WHMIS

- In Canada, the product mentioned above is not considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

Other information

NFPA

See Section 12 for Ecological Information.

Section 3 - Composition/Information on Ingredients

Substances

Mixtures

Composition					
Chemical Name	**Identifiers**	**%**	**LD50/LC50**	**Classifications According to Regulation/Directive**	**Comments**
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	**CAS:**67-48-1	40% TO 70%	Ingestion/Oral-Rat LD50 • 3400 mg/kg	**OSHA HCS 2012:** Not Classified - Criteria not met	NDA
Water	**CAS:**7732-18-5	15% TO 40%	Ingestion/Oral-Rat LD50 • >90 mL/kg	**OSHA HCS 2012:** Not Hazardous	NDA

- Material does not meet the criteria of a mixture.

See Section 11 for Toxicological Information.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- Move victim to fresh air. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing.

Skin

- IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

Eye

- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes.

Ingestion

- Do NOT Induce vomiting. Get medical attention immediately.

Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Notes to Physician
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media
- LARGE FIRE: Water spray, fog or regular foam.
  SMALL FIRES: Dry chemical, CO2, water spray or regular foam.

Unsuitable Extinguishing Media
- No data available.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- No unusual fire and explosion hazards known.

Hazardous Combustion Products
- No data available.

Advice for firefighters

- Structural firefighters' protective clothing will only provide limited protection.
  Wear positive pressure self-contained breathing apparatus (SCBA).

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Wear appropriate personal protective equipment. Do not walk through spilled material.

Emergency Procedures
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Ventilate closed spaces before entering.

Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

Methods and material for containment and cleaning up

Containment/Clean-up Measures
- Stop leak if you can do it without risk.
  Prevent entry into waterways, sewers, basements or confined areas.
  SMALL SPILLS: Take up with sand or other non-combustible absorbent material and place into containers for later disposal.
  LARGE SPILLS: Dike far ahead of liquid spill for later disposal.

Section 7 - Handling and Storage

Precautions for safe handling

Handling
- Wear appropriate personal protective equipment. Avoid contact with skin and eyes. DO NOT ingest. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage
- Keep away from heat, ignition sources and strong oxidizing agents. Store in a cool, dry, well-ventilated place. Keep container closed when not in use. Avoid storing at elevated temperatures and freezing temperatures. Optimal storage temperature: 41-81 F; Ground all equipment containing material.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines
- No applicable exposure limits have been established for the components or the

material.

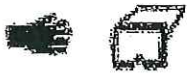
Exposure controls

Engineering Measures/Controls

- Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use. Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Pictograms

- 

Respiratory

- In case of insufficient ventilation, wear suitable respiratory equipment.

Eye/Face

- Wear protective eyewear (goggles, face shield, or safety glasses).

Skin/Body

- Wear appropriate gloves.

General Industrial Hygiene Considerations

- Do not get in eyes or on skin or clothing. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

Environmental Exposure Controls

- No data available

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Colorless to yellow liquid with slight fish odor.
Color	Colorless to pale yellow.	Odor	Slight fish odor.
Odor Threshold	Data lacking		
General Properties			
Boiling Point	> 212 F(> 100 C)	Melting Point	Data lacking
Decomposition Temperature	Data lacking	pH	Near neutral (1% solution with water)
Specific Gravity/Relative Density	1.0856 Water=1	Water Solubility	100 %
Viscosity	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Not Defined
Evaporation Rate	Data lacking		
Flammability			
Flash Point	> 200 F(> 93.3333 C) Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

Section 10: Stability and Reactivity

Reactivity

- No dangerous reaction known under conditions of normal use.

Chemical stability

- Stable

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- No data available.

Incompatible materials

- No data available.

Hazardous decomposition products

- No data available.

Section 11 - Toxicological Information

Information on toxicological effects

Components		
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride (40% TO 70%)	67-48-1	**Acute Toxicity:** Ingestion/Oral-Rat LD50 • 3400 mg/kg; *Sense Organs and Special Senses:Eye:***Chromodacyroffhea**; *Behavioral:***Excitement**; *Lungs, Thorax, or Respiration:***Respiratory depression**

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met
Skin corrosion/irritation	OSHA HCS 2012 • Classification criteria not met
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
STOT-RE	OSHA HCS 2012 • Classification criteria not met
STOT-SE	OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Serious eye damage/irritation	OSHA HCS 2012 • Classification criteria not met

Route(s) of entry/exposure
- Inhalation, Skin, Eye, Ingestion

Potential Health Effects

Inhalation

Acute (Immediate)
- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)
- No data available.

Skin

Acute (Immediate)
- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)
- No data available.

Eye

Acute (Immediate) • Under normal conditions of use, no health effects are expected.

Chronic (Delayed) • No data available.

Ingestion

Acute (Immediate) • Under normal conditions of use, no health effects are expected.

Chronic (Delayed) • No data available.

Key to abbreviations
LD = Lethal Dose

Section 12 - Ecological Information

Toxicity

• Material data lacking.

Persistence and degradability

• Material data lacking.

Bioaccumulative potential

• Material data lacking.

Mobility in Soil

• Material data lacking.

Other adverse effects

• No studies have been found.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	NDA	Not regulated	NDA	NDA	NDA
TDG	NDA	Not regulated	NDA	NDA	NDA
IATA/ICAO	NDA	Not regulated	NDA	NDA	NDA

Special precautions for user • None known.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code • Not relevant.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • None

State Right To Know				
Component	CAS	MA	NJ	PA
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	No	No	No
Water	7732-18-5	No	No	No

Inventory				
Component	CAS	Canada DSL	Canada NDSL	TSCA
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Yes	No	Yes
Water	7732-18-5	Yes	No	Yes

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Uncontrolled product according to WHMIS classification criteria (including 60%, 70%)
• Water	7732-18-5	Uncontrolled product according to WHMIS classification criteria

Canada - WHMIS - Ingredient Disclosure List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Environment

Canada - CEPA - Priority Substances List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed

• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - Pennsylvania

Labor

U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - Rhode Island

Labor

U.S. - Rhode Island - Hazardous Substance List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Section 16 - Other Information

Revision Summary		
Date	**MSDS No.**	**Changes**
18/August/2014		• Section 1 changed. Changes include Company Name Change.

Last Revision Date
- 18/August/2014

Preparation Date
- 27/November/2013

Disclaimer/Statement of Liability
- The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations
NDA = No data available

Safety Data Sheet

Chemplex
SOLVAY GROUP

Section 1: Identification

Product identifier

Product Name • **Ferriplex 66**
Synonyms • Acetic Acid Solution
Product Code • 00307
Chemical Category • Organic acids

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Petrochemical industry

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net
Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Skin Corrosion 1A
Serious Eye Damage 1

Label elements

OSHA HCS 2012

DANGER

Hazard statements • Causes severe skin burns and eye damage.
Causes serious eye damage

Precautionary statements

Prevention
- Keep container tightly closed.
Keep only in original container.
Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
In case of inadequate ventilation wear respiratory protection.

Response
- IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
Wash contaminated clothing before reuse.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.

Storage/Disposal
- Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Other hazards

OSHA HCS 2012
- Acetic acid concentrated at elevated temperature may be corrosive to metals and evolve flammable hydrogen gas. Mists of weak acid solution in water may be irritating to the respiratory system.

Canada

According to: WHMIS

Classification of the substance or mixture

WHMIS
- Corrosive - E
Other Toxic Effects - D2B

Label elements

WHMIS

- Corrosive - E
Other Toxic Effects - D2B

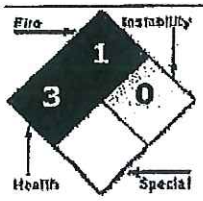
Other hazards

WHMIS
- No other WHMIS hazards than those reported above.

Other information

- One should be specifically trained before communicating or using the following National Fire Protection Association (NFPA) and or Hazardous Materials Identification System (HMIS) categories since the definition and scales applied do not match US OSHA GHS and HAZCOM 2012 definitions and rules.

NFPA



- Health Hazard: 3 - Warning: Corrosive or toxic. Avoid skin contact or inhalation.
  Flammability: 1 - Combustible if heated
  Reactivity: 0 - Stable: Not reactive under normal conditions

HMIS

- HMIS Health - 2: Moderate Hazard
  HMIS Flammability - 1: Slight Hazard
  HMIS Physical Hazard - 0: Minimal Hazard

Section 3 - Composition/Information on Ingredients

Substances

- Not applicable. This material is a mixture.

Mixtures

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

Composition			
Chemical Name	**Identifiers**	**%**	**Hazardous**
Acetic acid	CAS:64-19-7	40% TO 50%	Yes
Citric acid	CAS:77-92-9	25% TO 30%	Yes

- This product is considered hazardous according to the OSHA Hazard Communication Standard 29 CFR 1910.1200. Under Canadian regulations (Workplace Hazardous Materials Information System (WHMIS) - Hazardous Products Act (HPA), this material is hazardous.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- Get medical attention immediately if symptoms occur. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin

- Get medical attention immediately if symptoms occur. Rinse skin immediately with plenty of water for 15-20 minutes. Take off contaminated clothing and wash before reuse.

Eye

- Flush eyes with water for at least 15 minutes while holding eyelids open. Get medical attention immediately. If easy to do, remove contact lenses, if worn.

Ingestion

- Vomiting may occur spontaneously. To prevent aspiration of swallowed product, lay victim on side. Do NOT induce vomiting. Get medical attention immediately. Give nothing to drink.

Most important symptoms and effects, both acute and delayed

- Pain, irritation, redness or blistering of skin. May cause severe irritation and eye damage.

Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically. There is no specific antidote available. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media
- LARGE FIRES: Dry chemical, CO2, alcohol-resistant foam or water spray.
  SMALL FIRES: Dry chemical, CO2, water spray or alcohol-resistant foam.

Unsuitable Extinguishing Media
- DO NOT use high volume water jet.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- Corrosive
  When heated to decomposition it emits acrid smoke and irritating fumes.

Hazardous Combustion Products
- Carbon monoxide (CO), and Carbon dioxide (CO2)
  Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes).

Advice for firefighters

- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.
  Standard procedures for chemical fires.
  Collect contaminated fire extinguishing materials separately. This must be not be discharged into drains.
  Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
  Cool closed containers exposed to fire with water spray.
  Refer to Section 8 - Exposure Controls/Personal Protection.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Contact may cause burns to skin and eyes. Wear suitable protective clothing. Ventilate the area. Refer to Section 8 - Exposure Controls/Personal Protection.

Emergency Procedures
- Keep unauthorized personnel away. Avoid all contact. Strict hygiene. Ventilate closed spaces before entering. Stop leak if you can do it without risk.

Environmental precautions

- Spills may be reportable to the National Response Center (800-424-8802) and to state and or local agencies. Do not flush to sewer or allow to enter waterways. Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

Methods and material for containment and cleaning up

Containment/Clean-up Measures
- Dike to collect large liquid spills.
  Contain and recover liquid when possible.
  Neutralize the residue with dilute solution of sodium carbonate.
  Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
  Wash remainder with plenty of water.
  Water will make area slippery.
  Repeat cleaning process until the contaminated surface is no longer slippery.
  Refer to Section 13 - Disposal Considerations.

Prohibited Materials
- Strong alkalines and oxidizing materials. Sources of ignition - heat, sparks and open flames.

Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection.

Section 7 - Handling and Storage

Precautions for safe handling

Handling
- Do not breathe (dust, vapor or spray mist). Avoid contact with skin and eyes. Wash thoroughly after handling. Use only in well ventilated areas. Do not breathe (dust, vapor or spray mist)

Conditions for safe storage, including any incompatibilities

Storage
- Store locked up. Keep only in the original container/package in a cool well-ventilated place. Store away from alkali(bases)and oxidizing agents. Avoid excessive heat.

Incompatible Materials or Ignition Sources
- Reactive with strong bases and oxidizing agents. May be corrosive to metals.

Refer to Section 8 - Exposure Controls/Personal Protection.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines
- Use only with adequate ventilation. Avoid all contact. Strict hygiene.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Acetic acid (64-19-7)	TWAs	10 ppm TWA	10 ppm TWA; 25 mg/m3 TWA	10 ppm TWA; 25 mg/m3 TWA

Exposure controls

Engineering Measures/Controls
- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Respiratory
- When respirators are required, use NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face
- Wear tightly fitting safety goggles to protect from serious eye damage.

Skin/Body
- Wear protective gloves/protective clothing/eye protection/face protection.

General Industrial Hygiene Considerations
- Avoid all contact. Strict hygiene. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Keep away from food, drink and animal feeding stuffs.

Environmental Exposure Controls
- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Additional Protection Measures
- The protective equipment must be selected in accordance with local standards and in cooperation with the supplier of the protective equipment. Selection of the appropriate personal protective equipment should be based upon an evaluation of the performance characteristics of the protective equipment relative to the tasks to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use. Emergency equipment should be immediately accessible, with instructions for use. Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use.

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Color	Clear Colorless .
Odor	Pungent, Vinegar-like.	Odor Threshold	0.48 ppm acetic acid
General Properties			
Boiling Point	None	Melting Point	None

Decomposition Temperature	None	pH	2 to 4
Specific Gravity/Relative Density	= 1.18 @ 25 C(77 F) Water=1	Density	9.67 lbs/gal
Water Solubility	Soluble	Viscosity	None
Volatility			
Vapor Pressure	None	Vapor Density	1.45 Air=1
Evaporation Rate	No data available		
Flammability			
Flash Point	> 200 F(> 93.3333 C) closed cup	UEL	None
LEL	None	Autoignition	463 C(865.4 F) acetic acid
Flammability (solid, gas)	None		
Environmental			
Octanol/Water Partition coefficient	None	Bioaccumulation Factor	None

Section 10: Stability and Reactivity

Reactivity

- Strong Bases, Strong oxidizing agents, Strong reducing agents.

Chemical stability

- This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Excess heat.

Incompatible materials

- Strong alkalines and oxidizing materials. Acetic acid concentrated at elevated temperature may be corrosive to metals and evolve flammable hydrogen gas.

Hazardous decomposition products

- Carbon monoxide (CO), and Carbon dioxide (CO2) Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes)

Section 11 - Toxicological Information

Information on toxicological effects

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation - Classification criteria not met; Acute Toxicity - Oral - Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met

Skin corrosion/irritation	OSHA HCS 2012 • Skin Corrosion 1A
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
STOT-RE	OSHA HCS 2012 • Classification criteria not met
STOT-SE	OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Serious eye damage/irritation	OSHA HCS 2012 • Serious Eye Damage 1

Medical Conditions Aggravated by Exposure
- None known.

Potential Health Effects

Inhalation

Acute (Immediate)
- Classification criteria not met. Mists of weak acid solution in water may be irritating to the respiratory system.

Chronic (Delayed)
- No data available

Skin

Acute (Immediate)
- Causes severe skin burns and eye damage.

Chronic (Delayed)
- No data available

Eye

Acute (Immediate)
- Causes serious eye damage.

Chronic (Delayed)
- No data available

Ingestion

Acute (Immediate)
- May cause burns of the gastrointestinal tract if swallowed.

Chronic (Delayed)
- No data available

Section 12 - Ecological Information

Toxicity
- No data available

Persistence and degradability
- No data available

Bioaccumulative potential
- No data available

Mobility in Soil
- No data available

Other adverse effects
- According to test data on the components and the classification criteria for mixtures, this product has no known adverse effects on aquatic organisms.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Please be advised that state and local requirements for

waste disposal may be more restrictive or otherwise different from federal laws and regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Empty containers pose a fire risk, evaporate the residue under a fume hood. Rinse with an appropriate solvent.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	UN2790	ACETIC ACID SOLUTION	8	II	NDA
TDG	UN2790	ACETIC ACID SOLUTION	8	II	NDA
IMO/IMDG	UN2790	ACETIC ACID SOLUTION	8	II	NDA
IATA/ICAO	UN2790	ACETIC ACID SOLUTION	8	II	NDA

Special precautions for user

- No data available

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- No data available

Other information

- Transportation status: The listed Transportation Classification does not address all regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

DOT

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

This product contains one or more ingredients identified as a hazardous substance in Appendix A of 49 CFR 172.101. The product quantity, in one package, which triggers the RQ requirements under 49 CFR for each ingredient is as follows:

Reportable quantities: RQ substance: Acetic acid RQ limit for substance: 5,000 lbs.

The Emergency Response Guidebook (ERG) number for the assigned proper shipping name is 153.

TDG

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

The Emergency Response Guidebook (ERG) number for the assigned proper shipping name is 153.

IMO/IMDG

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

IATA/ICAO

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

Note: The above regulatory prescriptions are those valid on the date of the publication of this sheet. Given the possible evolution of transportation regulations for Hazardous materials, it would be advisable to check their validity with your sales office.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications

- Acute

United States

Environment

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Acetic acid	64-19-7	5000 lb final RQ; 2270 kg final RQ
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

Section 16 - Other Information

Last Revision Date • 03/March/2015

Preparation Date • 03/March/2015

Other Information • All components of this product are listed on the following:

US TSCA Inventory

Canada Domestic Substance List (DSL)

Australia Inventory of Chemical Substances (AICS)

China Inventory of Existing chemical Substances in China (IECSC)

Japan Inventory of Existing and New Chemicals (ENCS)

Korea Existing Chemical Inventory (KECI)

Disclaimer/Statement of Liability • The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but does not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
IARC = International Agency for Research on Cancer
MSHA = Mine Safety and Health Administration
NIOSH = National Institute of Occupational Safety and Health
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
STEL = Short Term Exposure Limits are based on 15-minute exposures
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: WaterSourceManagementPlan

Please save attachment and use the file name above.

Water Source Management Plan §1-35(b)(10); 245.210(a)(10). Note: If recycled water is anticipated to be used in the HVHHF treatment, describe the source of the recycled water and the anticipated water to be used in (a), but skip subsections (c) through (g) below. If water other than fresh water or recycled water is anticipated to be used in the HVHHF treatment, describe the source and the anticipated volume to be used in (a); and if the water derives from a river, lake, stream, other surface water or groundwater and, but for the total dissolved solids (TDS) levels, would be considered fresh water, provide all the information requested in this section.

(a) List the source(s) of the water (surface, groundwater, etc.) that will be used in the HVHHF treatment

(b) Identify precisely the anticipated withdrawal location(s) including county, latitude and longitude

(c)Identify the anticipated volume and rate of each water withdrawal from each withdrawal location.

(d) Identify the months when water withdrawals are expected to be made from each location

(e) Identify the methods to be used to accurately monitor water withdrawals, and how the data will be recorded and maintained.

(f)) Identify the methods to be used to minimize adverse impact to aquatic life.

(g) Identify the methods to be used to minimize withdrawals as much as feasible.

(h) Specify how you will transport or deliver water to the well site

Source water is subject to a Source Water Sampling Plan under §1-80 of the Act. Describe the general structure of the sampling program, including but not limited to: who will conduct the sampling, sampling protocols, and provide any relevant certifications. The required tests are marked in **bold** in the table below. You can use the table provided or insert your own table and/or text.

Water Source Management Plan

This Water Source Management Plan is submitted to identify the source of water to be used for High Volume Horizontal Hydraulic Fracturing (HVHHF) operations and the management of the source water. This plan shall be submitted to the White County Soil and Water Conservations District, as well as to Community Water Suppliers in the area.

(a) List the source(s) of water that will be used in the HVHHF Treatment

Groundwater will be used for HVHHF treatment. Three new water supply wells will be drilled in close proximity to the HVHHF well and will supply the full volume of water needed for hydraulic fracturing. Temporary above-ground storage of the extracted groundwater will be provided in an excavated water supply impoundment pit to be constructed at the well site to allow the limited number of wells to make the total required volume of water available prior to the start of hydraulic fracturing operations. Backflow will not commence until injection in all frac stages have been completed, thus there will be no opportunity for use of recycled water in the hydraulic fracture completion.

(b) Identify precisely the anticipated withdrawal location(s) including county, latitude and longitude.

Well No.	County	Latitude	Longitude
WSW 1	White	38.135287	-88.361048
WSW 2	White	38.135171	-88.360673
WSW 3	White	38.134849	-88.360967

(c) Identify the anticipated withdrawal volume and rate of each water withdrawal from each withdrawal location.

Well No.	Rate Gallons/day	Volume Total Gallons
WSW 1	34,000	2.5×10^6

WSW 2	34,000	2.5×10^6
WSW 3	34,000	2.5×10^6

(d) Identify the months when water withdrawals are expected to be made from each location.

The following schedule assumes that the drilling permit and HVHHF permit will be issued by September 1, 2017. The individual withdrawal rates may vary to achieve the overall 7,500,000 gallons required.

Month	Well No.	Quantity (Gallons)
Sept, 2017	WSW 1	500,000
Nov, 2017	WSW 1,2, & 3	3,000,000
Dec, 2017	WSW 1,2, & 3	3,000,000
Jan, 2017	WSW 1,2,& 3	1,000,000

(e) Identify the methods to be used to accurately monitor water withdrawals, and how the data will be recorded and maintained.

The three wells will be equipped with individual totalizing meters on their output lines. The total output from each well will be recorded daily by the operator in the well log during the operation of the water wells. As required by the Water Use Act of 1983, (525 ILCS 45/5.3) the water withdrawal shall be reported to the Illinois State Water Survey's (ISWS) Illinois Water Inventory Program, In addition, the water use shall be reported to the White County Soil and Water Conservation District, as required by the District.

(f) Identify the methods to be used to minimize impact to aquatic life.

Since no surface water supply will be used other than the fresh water reservoir pit to be constructed prior to HVHHF operations, there will be no impact to aquatic life in surface waters.

(g) Identify the methods to be used to minimize withdrawals as much as feasible.

It is not in the interest of the applicant to overuse water in the HVHHF process. Excessive use of water results in the need for additional storage capacity for both the raw water and the produced water that results from the process. In addition, treatment, transport, and disposal of produced water results in increased well costs. While using recycled water may be feasible and desirable in the future should this exploratory well prove the potential of the target for commercial production, however, there is no compatible source nearby that would be logistically realistic. Wasting water is in no one's best interest.

The design of hydraulic fracturing stages and the chemistry of the fluids used will dictate the quantity of water required. Modern horizontal completion technology has shown that increasing the number of stages and thus overall treatment results in better well performance which in turn drains a larger area and reduces the overall number of wells and resource impact. To put the volumes in perspective, it takes 27,000 gallons of water to irrigate one acre of land with one inch of water. The anticipated usage of 7,500,000 gallons is equivalent to irrigating 278 acres with one inch of water which is a very small percentage as compared to the amount of water used annually for agricultural irrigation in White County, Illinois.

The highest potential for wasting water would be from leakage of water in the pumping, storage, and delivery systems to be used at the site. This potential will be minimized by locating the water wells in close proximity to the HVHHF well, and using piping rather than trucking of the water to and from the impoundment reservoir. Piping the water eliminates the loading and off-loading of water trucks, which would be the process with the highest potential for loss due to overfilling of the transport vehicles.

(h) Specify how you will transport or deliver water to the well site.

As described above, the water will be produced from on-site wells, and transported by pipeline from the water wells to the storage reservoir. No off-site traffic will result from water transport to the site, other than the one-time movement of equipment to and from the well site.

SOURCE WATER SAMPLING

The source water wells will be within 1,500 feet of the proposed HVHHF well. Thus, in addition to the requirements of a Source Water Sampling Plan, they will be included in the required Water Quality Monitoring Work Plan (WQMWP – Section 21 of this application). Under that plan, the wells will each be sampled a minimum of three times between the date of their completion and the start of hydraulic fracturing operations. This will be accomplished by the collection of grab samples from the pump discharges. After HVHHF operations are complete, the wells will continue to be monitored under the WQMWP. Since water quality parameters may change due to exposure at the surface, the on-site reservoir shall also be sampled prior to beginning HVHHF operations. Analytes for each well and the surface impoundment shall include the following:

Analyte	Method Used (EPA Method unless otherwise noted
Arsenic	6010
Barium	6010
Cadmium	6010
Calcium	6010
Chromium	6010
Iron	6010
Lead	6010
Magnesium	6010
Selenium	6010
Silver	6010
Mercury	7470
Volatile Organic Compounds (VOCs)	8260
BTEX (included in VOCs)	8260
Dissolved Propane	RSK-175
Dissolved Methane	RSK-175
Dissolved Ethane	RSK-175
Chloride	300.0
Sulfide	376x/SM4500 S2-F
Nitrate	300.0
Nitrite	300/SM 4500 NO3 F
Sulfate	300.0
Gross Alpha	900.0
Gross Beta	900.0
pH	Measured in the field
Total Dissolved Solids	160.1 / SM2540C
Alkalinity	310.x / SM2320B
Specific Conductance	120.1 / SM2510B

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. Referencesto"240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: HydraulicFracturingFluidsandFlowbackPlan

Please save attachment using the name above

Hydraulic Fracturing Fluids and Flowback Plan § 1-35 (b)(11); 245.210(a)(11), 245.825, 245.830, 245.850. Please review the above-listed statute and rules, including the testing and reporting requirements found in Subpart H of the Rules, and describe the proposed methods for handling, storage, transportation and disposal of hydraulic fracturing fluids and flowback in sufficient detail to demonstrate that your plan for the materials meets the requirements of the statute and rules. In so doing, (a) identify, including name, identification number, specific location, and date of the most recent mechanical integrity test, the Class II injection well or wells to be used for disposal, reuse, or recycling of the fluid*; (b) explain the injection schedule, flow rate, reuse volume, storage, any treatment, and total volume in detail; (c) describe the capacity and qualities of tanks and any lined reserve pit to be used for capture and storage of flowback, the expected flowback rate and amount, and the frequency that the storage tanks will be emptied.

In so far as you will be recycling or reusing the hydraulic fracturing fluids and/or flowback, identify the name and address of said entity or facility accepting the fluid, the estimated amount of fluid to be reused or recycled, and the proposed purpose(s) said fluid will be used for.

If any part of the well or well site is in an area identified by the U.S. Geological Service as having a 2% or greater probability of exceedance in 50 years of peak ground acceleration of 0.4 standard gravity or more, identify measures you will take to protect the components in this plan against earthquakes of M 4.5 or more.

* Please contact the Office of Oil and Gas Resource Management at (217) 782-7756 for further information on specific Class II injection wells.

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Hydraulic Fracturing Fluids and Flow back Plan

The Class II injections wells that are planned to be used for disposal are:
Rankin #1 SWD, Reference #11947, SE N/2 NE, Sec 31-3S-11E, White County, IL., MIT Date; 9/20/2013
Trueflow #1, Reference #216072, SE SW SW, Sec 6-6S-9E, White County, IL., MIT Date: 3/27/2015

All chemicals associated with the makeup of the Hydraulic Fracturing Fluid will be delivered by authorized carrier and stored on site in manufacturer's approved containers. The primary constituent of the Hydraulic Fracturing Fluid is fresh water and will not require any special handling. At the conclusion of HVHHF operations any remaining unused chemicals will be returned to the manufacturer in the same container. As the chemicals are mixed "on-the-fly" only fresh water will be left in the makeup tanks save for one lined acid tank. Residual acid will be removed and hauled to an approved facility. All such Hydraulic Fracturing Chemicals will be removed from the well site within 60 days of the completion of HVHHF operations. The fracturing treatment fluids will be flowed into a flow back tank having a capacity of approximately 500 barrels. This "flow back tank" is a closed tank constructed of steel with a sufficient pressure rating and maintained in a leak-free condition for the express purpose of recovering flow back fluids. It is lined with a material resistant to; corrosion, erosion, swelling, deterioration or other damage as a result of exposure to the flow back fluids, see attached diagram. The tank is inspected routinely for corrosion. This tank will be used to separate any gas or proppant in the flow back fluid and measure the flow back fluid volume. Up to five (5) additional closed storage tanks that meet the requirements set out in 245.825(a) will be connected to the primary flow back tank for temporary storage of the flow back fluid (approx. 3,000 barrels of maximum onsite storage). Flow back fluid is comprised of treatment fluid used in the HVHHF operations being primarily 2-5% KCL (Potassium Chloride) with minor amounts of other treating chemicals listed in the Chemical Disclosure Report. Flow back operations will occur at the wellsite on the drilling pad. The temporary storage tanks will be enclosed by earthen containment berms which will be of sufficient size to contain all of the possible flow back fluid temporary storage

volume. The flow from the well will be regulated by an adjustable choke. Anticipated flow rates will be between 10 and 25 barrels per hour. The flow back fluid will be hauled on a 24 hour basis as needed. Multiple water transports will be available and will be undertaken by liquid oilfield waste haulers permitted by the Illinois Department of Natural Resources. Expected haul frequency will depend on the flow rate and the size of the truck available. Bobtail trucks commonly can haul 80 barrels at a time and transports 120 barrels. If, for any reason the fluid cannot be hauled timely or safely, the well will be closed in until the fluid can be hauled. There are no plans to use open pits for capture and store of flow back fluids. The primary site where the flow back fluid will be disposed of is the Haggard Well Service Rankin #1 Class II disposal facility located in White County, Illinois. A secondary site is the TrueFlo Solutions LLC Class II disposal facility located in White County, Illinois. Flow back fluids will not be disposed into the above referenced disposal wells until an electronic flowmeter is installed and approved by IDNR as stated in Section 245.850(g). As this would be the first well to undergo HVHHF operations there would be no recycled fluid to use. If, in the future additional HVHHF operations are undertaken a method to reuse or recycle flow back water could be derived. The well will be flowed until there is little or no proppant being produced. At that time flow back operations will cease and the well turned to production facilities. It is anticipated that between 4,000 and 5,000 barrels of flow back will be recovered prior to terminating flow back and beginning to produce the well through the production facilities. As defined per 245.110 of the Illinois Administrative Code: *"Flowback period" ends with either the well shut in or when the well is producing continuously to the flow line.* For this reason the bulk of the fluid recovered will be treated as produced fluid as it would be from any conventional well. Flow back fluids will be tested for the presence of volatile organic chemicals, semi-volatile organic chemicals, inorganic chemicals, heavy metals and naturally occurring radioactive material before being removed from the well site.

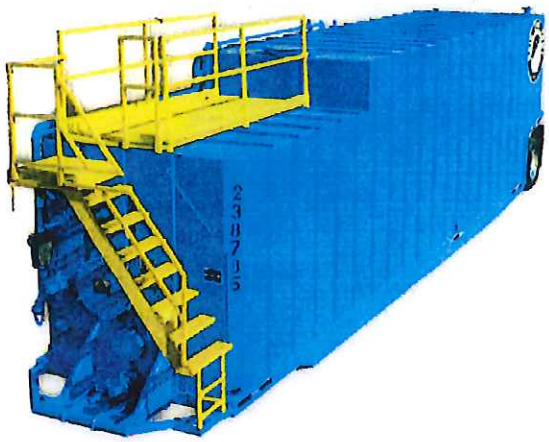
The wellsite lies outside of the area identified by the U.S. Geological Survey as having a 2% or greater probability of exceedance in 50 years of ground acceleration of 0.4 standard gravity or more.

Steel Tank

Bi-Level Coated

Overview:

21,000 gallon bi-level tanks from Rain for Rent have a standard "V" shaped floor for ease of draining all stored liquids completely through a 4" butterfly valve with Buna seals standard. This tank also has a standard vacuum pressure relief valve.



Features:

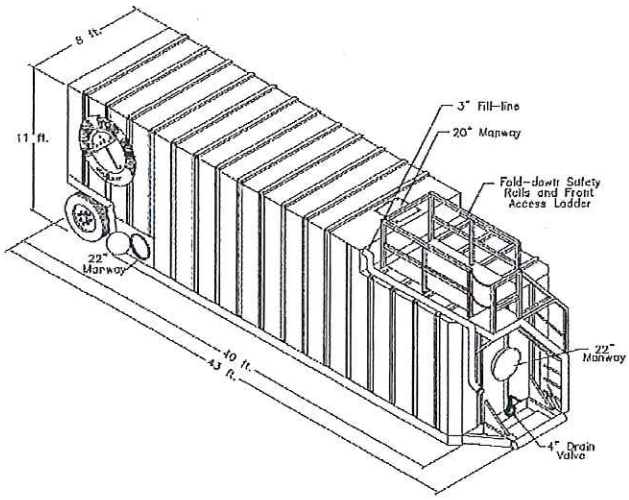
Store liquids with confidence with Rain for Rent's 21,000 gallon bi-level tank. Permanently attached axels for maximum maneuverability allow this 21,000 gallon tank to be moved with ease on the jobsite and a safety staircase ensures proper protection for workers on site. Epoxy coating offers chemical resistance and additional cleanliness for sensitive environmental applications.

Specs:

Manways	Four 22" hatches
Material	Steel, Coated
Capacity	21,000 gallons
Dry weight	26,000 lbs.
Footprint (LxWxH):	516" x 96" x 141"

Accessories:

- Spillguard
- Suction and discharge piping
- Vapor tight features
- Level gauges
- Steam coils



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ILLINOIS DEPARTMENT OF NATURAL RESOURCES

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Attachment: WellSiteSafetyPlan

Please save attachment and use the file name above.

Well Site Safety Plan §1-35(b)(12); 245.210(a)(12). Provide a copy of the OSHA-compliant plan for the safety measures you will employ during high volume horizontal hydraulic fracturing operations to protect persons on site and the general public. Please address safety measures for an emergency, identify the presence of any hazardous materials used or stored at the site, and provide contact information for the applicant and for all appropriate emergency responders. If any part of the well or well site is in an area identified by the U.S. Geological Service as having a 2% or greater probability of exceedance in 50 years of peak ground acceleration of 0.4 standard gravity or more, identify measures you will take to protect the components in this plan against earthquakes of M4.5 or more.

Have you provided a copy of this plan to the county or counties in which fracturing operations will be occurring? [✓] YES [ ] NO If "NO" provide, within 15 calendar days after submitting the permit application to the Department, a copy of the plan to the county or counties in which hydraulic fracturing operations will occur as required by § 1-35(12).

Woolsey Operating Company, LLC
125 North Market, Suite 1000
Wichita, Kansas, 67202

Well Site Safety and Health Plan
Woodrow #1H-410308-193

Raymond Gibson — February 2, 2017

Prepared by: — Date

SRP Environmental, LLC
(318) 222-2364

Mark Sooter — May 5, 2017

Approved by: — Date

Vice President of Business Development
Woolsey Companies, Inc. LLC
(Phone)

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Tables

Figures

Abbreviations and Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standard Institute
APR	air purifying respirator
AQC	air quality control
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
CIH	Certified Industrial Hygienist
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CSP	Certified Safety Professional
dB	decibel
dBA	decibel average
EPA	U.S. Environmental Protection Agency
H&S	health and safety
HSP	health and safety program
HVHHF	High Volume Horizontal Hydraulic Fracturing
IDLH	immediately dangerous to life or health
JSA	job safety analysis
mg/m3	milligrams per cubic meter
MSA	Mine Safety Appliance Company
NFPA	National Fire Protection Agency
NIOSH	National Institute for Occupational Safety and Health
NORM	naturally occurring radioactive material
NRR	noise reduction rating
OSHA	Occupational Safety and Health Administration
OU	operable unit
OCV	Operations Control Van
PEL	permissible exposure limit
PID	photoionization detector
PM	project manager
PPE	personal protective equipment
ppm	parts per million
SDS	safety data sheet
SSHO	site safety and health officer
SSHP	site safety and health plan
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average

WGBT Wet-Bulb Globe Temperature

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Section 1: Introduction

1.1 Purpose and Objectives

This Site Safety and Health Plan (SSHP) addresses the minimum safety, health, and emergency response requirements for Woolsey Operating Company, LLC (Woolsey) during High Volume Horizontal Hydraulic Fracturing (HVHHF) operations. These HVHHF activities have the potential to result in employee and general public exposure to potential health and safety hazards. Woolsey has developed this SSHP to mitigate these concerns. Woolsey will obtain full compliance with this plan by its employees and subcontractors. All HVHHF personnel and subcontractors are required to adhere to the SSHP requirements. Trespassers not associated with the field activities will be discouraged from entering the site.

The SSHP objectives are to ensure that all necessary precautions for HVHHF activities are in place and that appropriate health and safety procedures are followed at all times to protect personnel and the general public; to prevent damage, injury, or loss of property and equipment; and to respond quickly and effectively to activity-related emergencies.

Before commencing HVHHF activities, all company and subcontractor employees assigned to the project will receive a copy of the SSHP and will be trained in its provisions. A copy of the SSHP will be kept on site in the Operations Control Van (OCV) at all times. The site safety and health officer (SSHO) (or alternate SSHO) will be responsible for ensuring that the SSHP requirements are understood by field personnel and that site activities are performed with the utmost regard for the safety and health of all personnel, subcontractors and the general public involved. Woolsey is only responsible for the health, safety, and emergency response activities related to its activities. Woolsey and its subcontractors are required to conduct job safety analysis (JSAs) summarizing the potential hazards that may be encountered while conducting the HVHHF tasks for this project. The JSAs will also provide a summary of the precautionary and preventative measures associated with these hazards. The requirements of this section are based on current information and understanding of the existing impacts at the site. Woolsey will assess all aspects of safety and health protection, including individual activities and long-term health monitoring, and will continually evaluate future health and safety requirements.

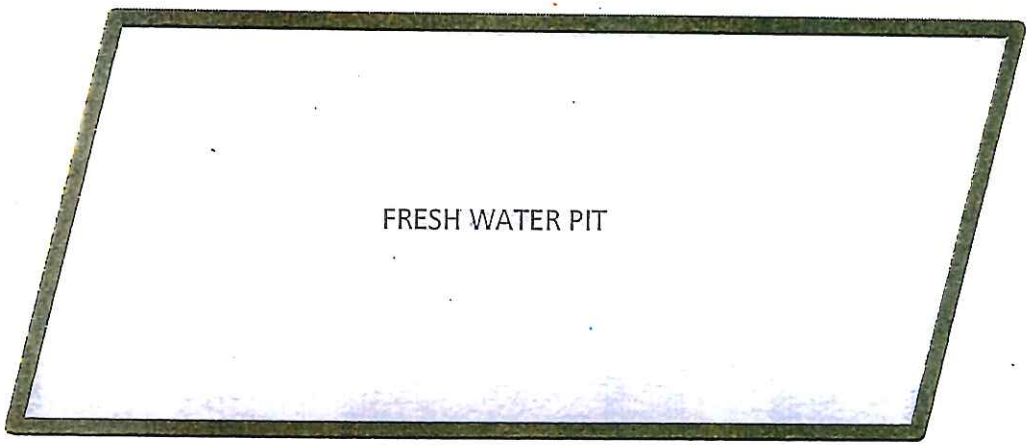
1.2 Plan Updates and Revisions

This SSHP will be evaluated on an annual basis to ensure compliance with local, state, and federal regulations. The plan will be updated based upon the review findings.

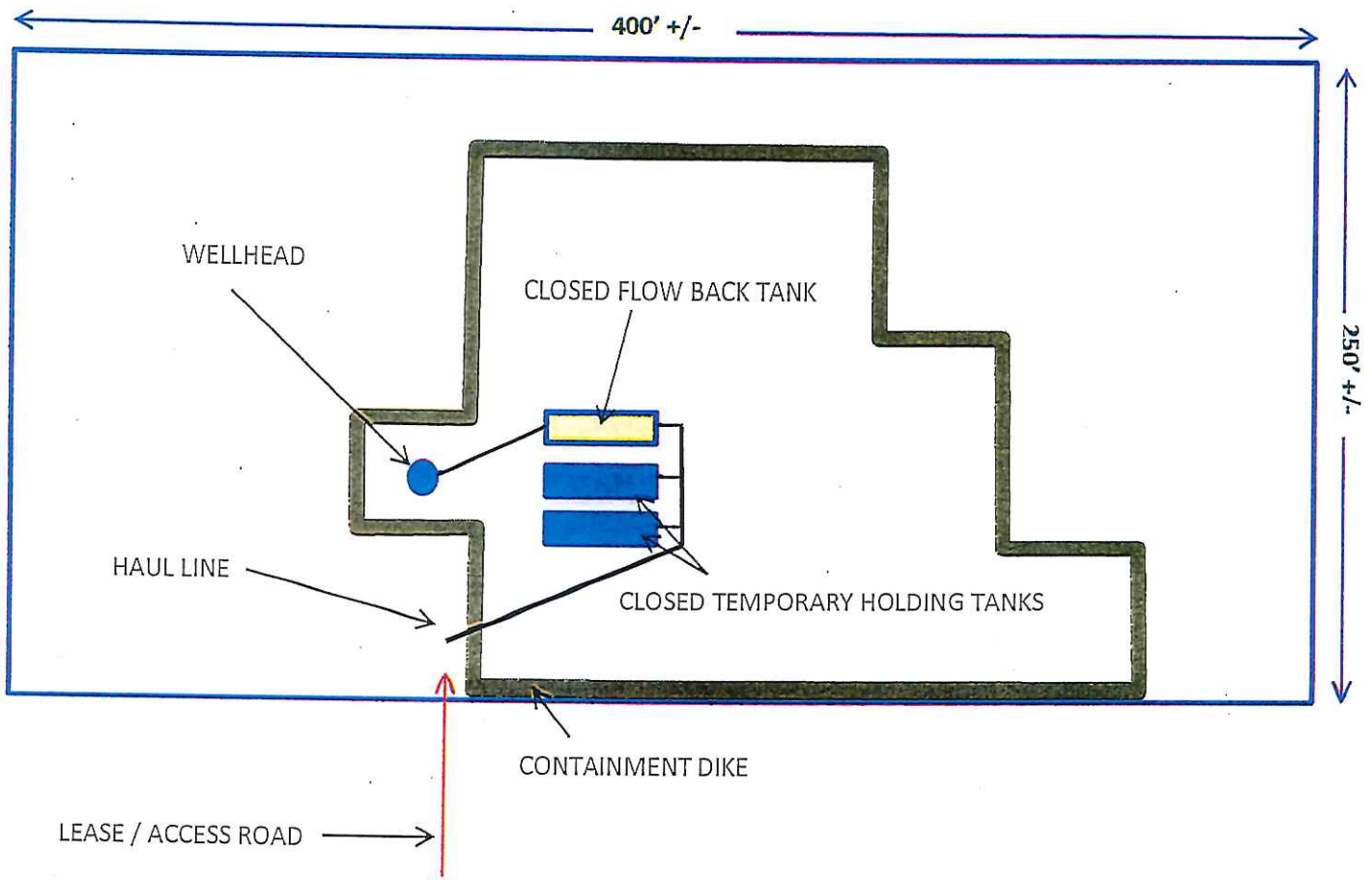
WOOLSEY OPERATING COMPANY, LLC

WOODROW #1H-410308-193

WHITE COUNTY, ILLINOIS



SCHEMATIC of WELL PAD & HVHHF FLOW BACK OPERATIONS



Section 2: Site Description

Figure 2-1 Work Site Description

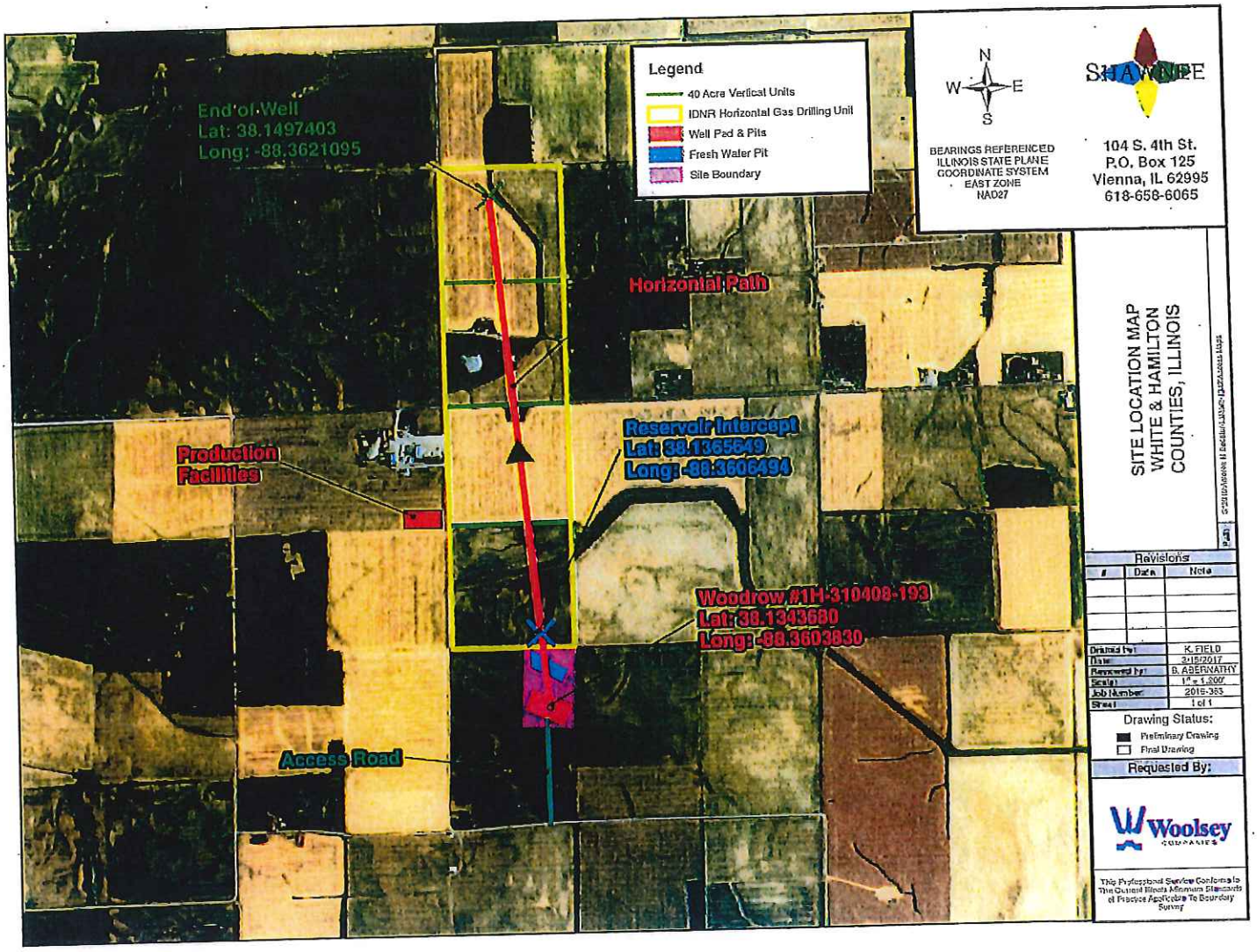


Figure 2-2: Site Location Map

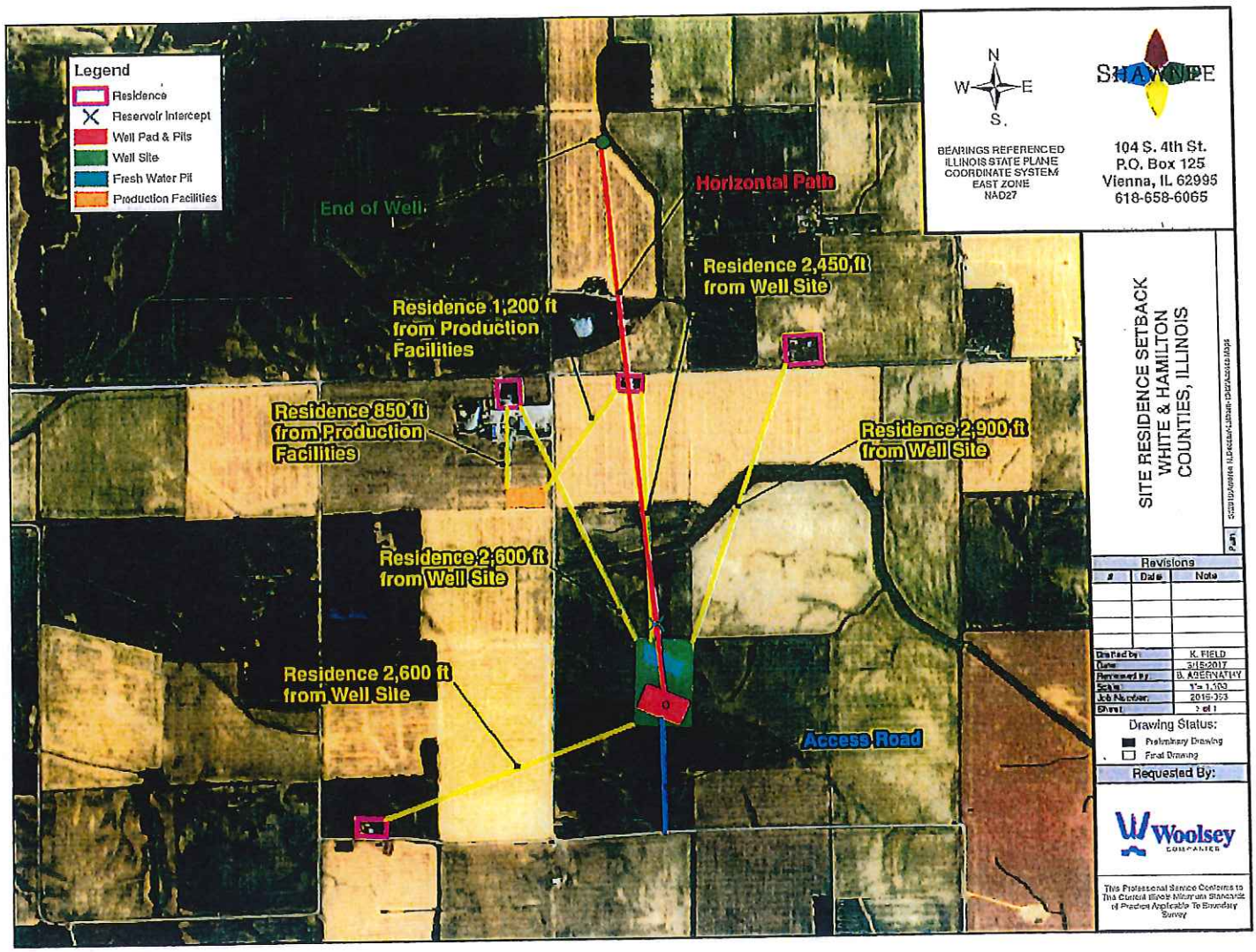


Figure 2-3: Site Residence Setback

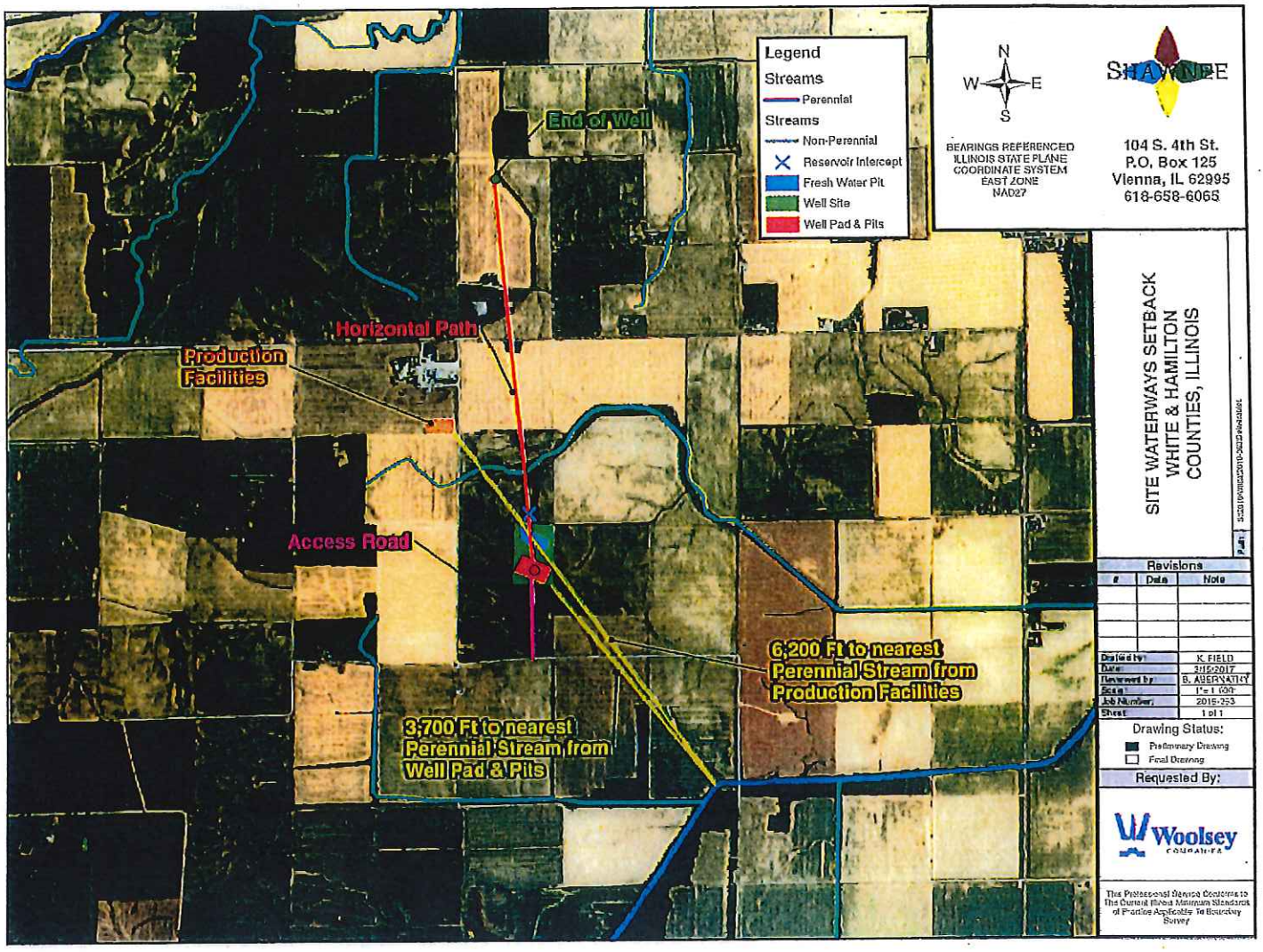


Figure 2-4: Site Waterways Setback

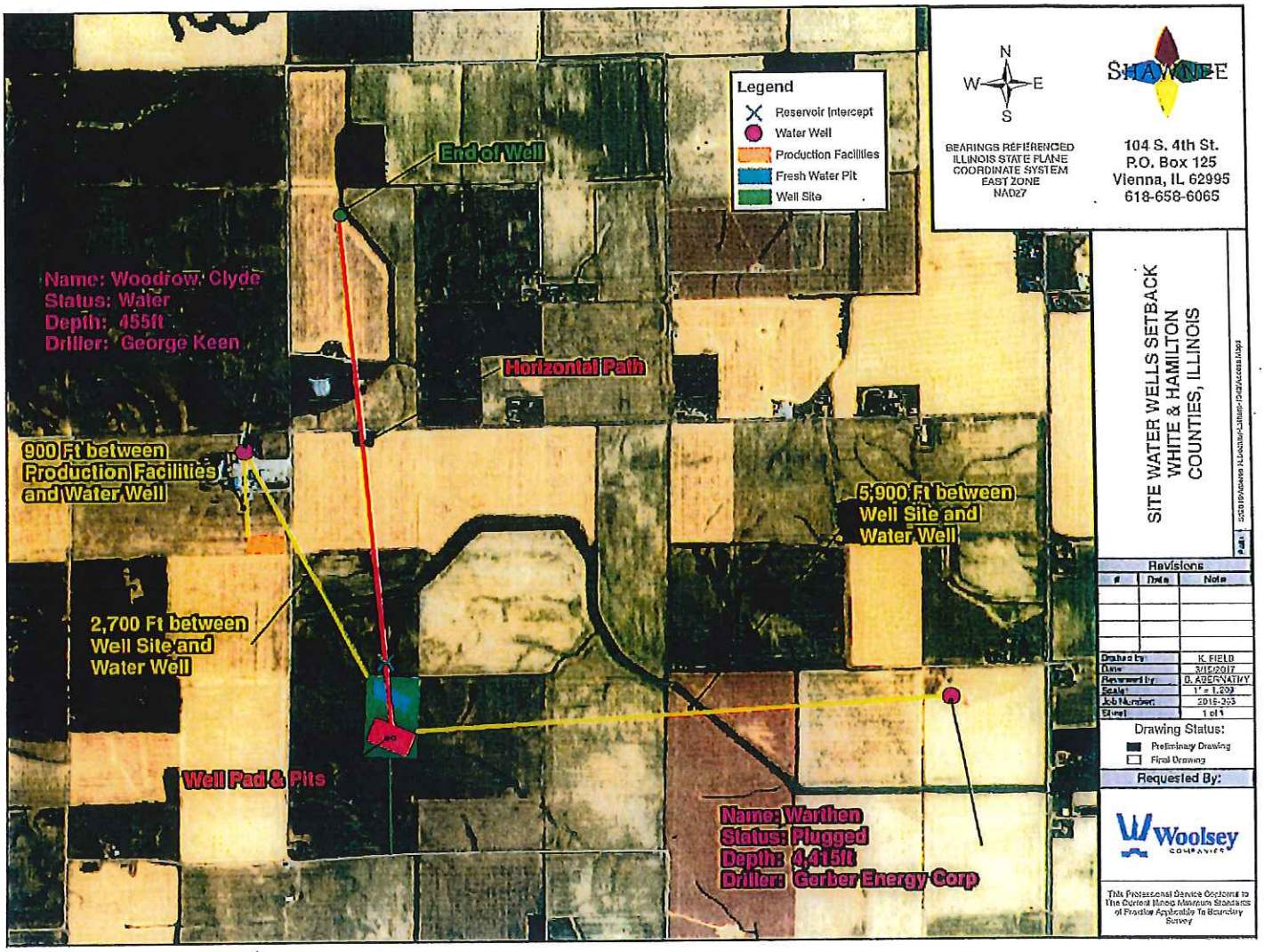


Figure 2-5: Site Water Wells Setback

Section 3: Hazard/Risk Analysis

3.1 Chemical Hazards

Woolsey and subcontractor employees will be exposed to various chemicals throughout the duration of this project. Safety Data Sheets (SDSs) will be located in the OCV. A list of hazardous materials used or stored at the site during HVHHF activities is included in Table 3-1.

Table 3-1

TRADE NAME/MATERIAL
Hydrochloric Acid
Cronox AK-50
NE-6 Surfactant
Plexgel Breaker XPA/Plexbreak 134
Plexslick 957 FR-7
Ferriplex 66
Diesel

3.1.1 Skin Contact

One route of possible exposure is through skin contact. Acute exposure to these chemicals can produce skin irritation. The following PPE to protect against skin contact will be utilized by personnel during chemical handling activities:

- Nitrile disposable gloves
- Butyl-rubber gloves

3.1.2 Eye Contact

Safety glasses in accordance with American National Standard Institute (ANSI) Z87.1 will be worn for all site activities. Face splash shields will be worn during mixing or pouring of chemicals. A portable eyewash station will be present onsite during all activities. Location of the eyewash station will be checked prior to activities that require the use of face splash shields to ensure it is readily accessible.

3.1.3 Inhalation

Another possible route of exposure is inhalation of vapors and dust particles. Refer to the Fugitive Dust Control Plan (Attachment E) for potential inhalation hazards and controls.

3.2 Physical Hazards

Physical hazards will be present in all job areas. The SSHO (or alternate SSHO) will screen the area for physical hazards prior to beginning work. Multiple physical hazards may be present at the area.

3.2.1 Heat and Cold Stress

Seasonal site conditions should be considered for all HVHHF activities. For field personnel, heat stress is usually a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures. Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Thus, heat and cold stress prevention will be practiced in accordance with the techniques in Section 9 and in Attachment B of this SSHP.

3.2.2 Slips, Trips, and Falls

Possible site conditions including rough terrain and steep slopes may be encountered for all HVHHF activities. Slips, trips, and falls can be easily prevented by using common sense practices such as good housekeeping procedures, identifying tripping hazards and rectifying or avoiding them, and walking slowly with proper footwear on slippery surfaces.

3.2.3 Working near Heavy Equipment

Heavy equipment activities during will include the use of excavators, front loaders, and dump trucks. Hazards associated with heavy equipment activities include mechanical hazards associated with rotating and/or unsecured equipment or cables, tripping hazards, falling objects, electrical shock from surface or underground utility lines or electrical equipment, noise from operating equipment, burns which might be incurred using pressure washer equipment, and inhalation hazards associated with equipment exhaust, or dust.

3.2.4 Noise

Use of heavy equipment may expose the field team to noise levels that exceed the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) of 90 decibels average (dBA) for an 8-hour day. Exposure to noise can result in the following:

- Temporary hearing losses where normal hearing returns after a rest period
- Interference with speech communication and the perception of auditory signals
- Interference with the performance of complicated tasks
- Permanent hearing loss due to repeated exposure resulting in nerve destruction in the hearing organ

Since personal noise monitoring will not be conducted during the proposed activities, all personnel performing activities at the jobsite while heavy equipment and drilling equipment is in operation must wear either disposable earplugs or earmuffs, but all hearing protection must have a minimum noise reduction rating (NRR) of 27 decibels (dB). An ear protection station with a sign stating "Ear Protection Required" will be placed at the entry point.

3.2.5 Handling Heavy Objects

Use mechanical means for lifting whenever possible (i.e., forklift, lift gate, loader, etc.). Observe proper lifting techniques and use certified lift chains and appropriate load points. Obey sensible lifting limits (60 pound maximum per person manual lifting or 1/3 a person's bodyweight, whichever is less).

3.2.6 Combustible and Flammable Materials/Liquids

FM/UL-approved flammable liquid containers, labeled with the content, will be used to store fuel.

All fuel containers will be stored at least 15 meters (50 feet) from any facilities and ignition sources or

stored inside an approved flammable storage cabinet.

ABC fire extinguishers will be located in each field vehicle and on all heavy equipment.

Post "NO SMOKING" signs in refueling areas and on fuel storage tanks.

Avoid parking vehicles in area of tall dry grass or other potentially combustible material

3.2.7 Fire Protection

The work site will at all times be equipped with a means of communication with the fire department (i.e., cell phone), a 20# ABC portable fire extinguisher, and a shovel.

Combustible material hazards may include materials near ignition sources (hot motor or exhaust system), and transfer and storage of flammable or combustible liquids (if a generator or other portable fueled equipment is used).

Only FM/UL-approved flammable liquid containers, labeled with the content, will be used to store fuel.

All fuel containers will be stored at least 15 meters (50 feet) from any facilities and ignition sources, or stored inside an approved flammable storage cabinet.

Fire suppression equipment will be staged in all areas where flammable materials are stored (i.e. fuel dispensing and storage locations).

3.2.8 Electrical Hazards

3.2.8.1 Electrical Installation

Woolsey employees will not conduct electrical installation activities.

3.2.8.2 Working near Energized Circuits

Per OSHA electrical regulations (29 Code of Federal Regulations [CFR] 1910.333), only "qualified" persons may work on energized electrical circuit parts or equipment or perform testing work on energized electrical circuits or equipment.

The OSHA standard further states that even qualified persons working near exposed energized electrical parts can't approach closer than 1 foot of a system that is over 300 volts (V) but not over 750V. The standard does allow for closer approaches by qualified personnel if personnel are wearing insulated gloves with the proper voltage rating. For this program, qualified personnel will wear rubber insulated gloves with a voltage rating of up to 1,000 V (Class O glove). Leather protector gloves will be worn over the rubber insulating gloves.

3.2.8.3 Lock-Out/Tag-Out

It is the responsibility of Woolsey employees and/or subcontractors to verify that all equipment is locked out in accordance with standard operating procedures before performing any maintenance or repair work on energized equipment. The source must be locked out; it is not enough to push the power switch to "off" and disconnect the breaker. Anyone can re-engage power under these circumstances. Locking out the power source is the only way to guarantee that the power will not be inadvertently reactivated.

3.2.9 Confined Space Entry

Woolsey employees will not enter into confined spaces.

3.2.10 Naturally Occurring Radioactive Material (NORM)

NORM might be released from oil and gas formations. Workers at risk of exposure include those who handle pipes and equipment that might have been contaminated with NORM. Sludge, drilling mud, and

pipe scales, for example, often contain elevated levels of NORM, and the radioactive materials might be moved from site to site as equipment and materials are reused. Disposal, reuse, and recycling of NORM might cause worker exposures.

Testing of black shale drill cuttings, flowback, surface waters, and soil will be conducted to determine levels the presence and levels of the following:

- Total dissolved solids
- Gross Alpha
- Gross Beta
- Radium-226
- Radium-228
- Potassium-40

Site characterization of radioactive materials in the soil and surface waters will be determined during the initial site sampling event.

3.2.10.1 Scope of Field Testing

Field screening activities will consist of using field measurement instruments to identify the presence and approximate amounts of NORM and TENORM in cutting pits (open and closed), flowback and produced water. Screening of solid and aqueous samples and swipes (smears) samples will also be performed.

Direct-read radiological survey instruments will be used throughout the HVHHF operations of the project for scanning and surveying of personnel, equipment, materials and general areas. The survey instruments will be operated and maintained by Woolsey personnel or qualified contractors. Additional equipment that may be used on-site will be maintained and operated by the operator's technician(s) or subcontractors. Proposed instruments, detectors, and equipment (or their equivalents) to be used on-site during field screening are listed below.

Table 3-2

Equipment Instrument	Detector	Parameter
Ludlum Model 2224, or equivalent	Ludlum Model 43-89, alpha/beta scintillator, or equivalent	Portable scaler/ ratemeter for detecting alpha and beta radiation
Ludlum Model 2221, or equivalent	Ludlum Model 44-10, gamma scintillator, or equivalent	Portable scaler/ ratemeter for detecting gamma radiation
Ludlum Model 2929, or equivalent	Ludlum Model 43-10-1, or equivalent	Table top counter for detecting alpha and beta radiation
Bicron Microrem, or equivalent	Internally-mounted plastic gamma scintillator	Portable exposure rate survey meter for gamma radiation
Ludlum Model 3, or equivalent	Ludlum Model 44-9, thin window GM detector, or equivalent	Portable survey meter for detecting beta radiation
Ludlum Model 19, MicroR meter, or equivalent	Internally-mounted 1x1 NaI gamma scintillator	Portable exposure rate survey meter for gamma radiation

3.2.10.2 Field Sampling Activities

Field sampling will consist of collecting representative samples of environmental media from sources for

either on-site measurements or off-site laboratory analysis. The following types of field samples will be collected:

- Black shale drill cuttings, accumulated solids, scale, treatment water sludge, discharge sediment, soil samples and crystalline salts from brine water evaporation as appropriate for off-site radiological laboratory analyses for characterization and evaluation of potential mobility in the environment;
- Flowback and produced water, for off-site radiological laboratory analysis for characterization purposes;
- Solid and aqueous phases to be evaluated separately;
- Swipe (smear) samples to determine removable alpha and beta surface contamination as an indicator of potential inhalation or incidental ingestion exposures.

3.2.10.3 Sampling Methods

Solid samples will be collected using reusable or disposable sampling tools (e.g., stainless steel trowels or tubes). Sampling tools will be decontaminated prior to first use on-site, between sampling locations, and following last use on-site (i .e., before demobilizing that equipment) as appropriate based on survey data. The samples selected for analysis will be placed into laboratory approved containers immediately following collection and labels promptly affixed to the sample containers. The samples will be transported via delivery service under chain-of-custody control to the off-site subcontract laboratory for analysis.

Representative samples will be collected for flowback and production water by performing multiple collection events over the entire flowback period and initial production. A representative grab sample will be collected from the appropriate tank/outlet using a disposable Teflon® bailer or a reusable stainless steel thief sampler; contents of the selected sampling implement will be added directly to sample containers. Samples will be placed into laboratory-prepared containers immediately following collection and caps and labels promptly affixed to the sample containers. In cases where sample valves are available, samples may be collected directly into approved sample containers. The samples will be transported under chain-of-custody control to the off-site subcontract laboratory.

3.2.10.4 Sampling Equipment Decontamination

Disposable sampling equipment will be used wherever possible to reduce decontamination requirements. When reusable equipment is used, such equipment will be decontaminated both prior to sampling in the field, between uses, and following the last use on each site, as appropriate. The following decontamination steps will be performed for reusable equipment, in the following order as necessary:

1) Potable water rinse;

2) Wash with laboratory-grade detergent (Alconox®, Liquinox® or equivalent);

3) Distilled water rinse;

4) Acetone, Isopropanol or Methanol rinse;

5) Distilled water rinse; and

6) Air drying.

3.3 Biological Hazards

The SSHO (or alternate SSHO) will also screen the area for biological hazards prior to beginning work. Care should be taken during field activities to prevent contact with biological hazards.

3.3.1 Insects

Ticks, bees, wasps, yellow jackets, black widow spiders, and brown recluse spiders present a potential hazard on this project. A victim suspected of being bitten by a black widow spider or brown recluse spider will receive medical attention. The venom from the brown recluse spider is capable of causing coma and kidney failure in its victim.

Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personnel will receive training on working in conditions where insects will be present prior to HVHHF activities.

3.3.2 Vermin

Feral cats, skunks, rats, mice, squirrels, and rabbits may be carriers of disease. Where vermin are identified in work areas, the SSHO (or alternate SSHO) shall be immediately notified. Bites will be immediately reported and medical care obtained.

Infections may occur in humans associated with activities that bring humans into contact with rodents, rodent saliva, or rodent excreta. Activities that may bring humans into contact with the etiologic agents causing infections include the following situations:

- Working in areas of field crops
- Disturbing rodent-infested areas
- Visiting areas where rodent populations have increased
- Entry into potential rodent-infested areas

Transmission of disease may occur through broken skin, contact with conjunctivae, ingestion of contaminated food or water, or inhalation of aerosols. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin.

Workers will be advised that if a fever or respiratory illness develops within 45 days of the potential exposure, they should seek medical attention and inform the physician of potential Hantavirus exposure. All precautions will be made to ensure Hantavirus exposure is eliminated in the field. Rodent-borne diseases, including Hantavirus, result in severe respiratory distress and plague.

Section 4: Responsibilities

Woolsey's responsibilities and chain of command are discussed below.

4.1 Woolsey Responsibilities

Woolsey is responsible for taking all necessary precautions and providing the necessary protection to prevent damage, injury, or loss (as a result of project activities) to the following:

- All individuals at or near the location of the work performed
- All Woolsey employees and subcontractors
- All equipment or materials used in the work performed
- Other property at or adjacent to the site or work location

Woolsey will notify the project manager (PM) immediately when work may affect adjacent properties. Woolsey will obtain full compliance with this plan by its employees and subcontractors.

4.2 Chain of Command

Accountability for implementing and enforcing this SSHP lies with the CHSM. Day-to-day onsite accountability is delegated to the SSHO (or alternate SSHO). Each employee is responsible for

performing the tasks assigned to him/her in this SSHP. The individuals who fill these positions and the responsibilities assigned to them are detailed in Sections 4.2.1 and 4.2.2.

Subcontractor competent persons are also responsible for implementing and enforcing this SSHP.

4.2.1 Woolsey Corporate Health and Safety Manager

Mickey Neville from Basic's Pressure Service Division will act as the Corporate Safety and Health Manager (CSHM) on this project.

4.2.2 Site Safety and Health Officer

Tommy Marcellus will act as the Site Safety and Health Officer (SSHO) for this project.

Shane Herridge will act as an alternate SSHO for this project.

4.2.3 Public Visitors

Public Visitors who arrive on-site are responsible for following the Health, Safety and Environment policies of Woolsey (HSE) Management. Visitors are required to sign in immediately upon arrival and must be accompanied at all times while on-site with no exceptions. This policy allows site personnel to implement and maintain the HSE program and will periodically assess its effectiveness. On-site personnel who accompany visitors will ensure that safety programs are being followed, identify safety needs, communicate hazards, and supply and enforce the use of appropriate personal protective equipment and clothing. Employees, contractors, and visitors are expected to obey all safety rules, follow recommended procedures, use personal protective equipment and clothing, communicate hazards, and assist with ongoing improvements to Woolsey's HSE Management policies. Visitors and contractors who knowingly violate safety rules may face disciplinary action, dismissal and/or legal action.

Section 5: Health and Safety Training

Woolsey understands the importance of ensuring that employees and subcontractors are adequately trained to safely perform those tasks to which they are assigned during the HVHHF operations.

5.1 Site-Specific Health and Safety Training

Site-specific H&S training is presented to all employees as they are assigned to the site and periodically during the course of the project when there is a change in site activities. This onsite Field H&S Meeting will cover specific topics including: chemical and physical hazards associated with the task to be performed; necessary PPE required for the task; the type of environmental monitoring to be performed during the task; actions to be initiated based on environmental monitoring results; emergency and contingency plans; and task-specific topics such as small spill containment. Meeting attendance and materials covered are documented using the Field H&S Meeting Record in Attachment C.

No Woolsey employee or subcontractor will be put into a hazardous field situation without training. Prior to the initiation of HVHHF activities, all employees will attend a site-specific safety orientation given by the SSHO (or alternate SSHO) emphasizing the following:

- Names of personnel and alternates responsible for site H&S
- Site-specific H&S hazards
- Basic occupational H&S
- Appropriate PPE
- General occupational health
- Work practices by which employees can minimize risks from hazards
- Medical surveillance requirements, including recognition of symptoms and signs of exposure

- Onsite communication
- Evacuation routes
- Route to the hospital
- Emergency and fire response
- Smoking restrictions
- Locations of emergency equipment and list of emergency contacts
- Site work areas
- The SSHP

Topics covered in initial employee training are reinforced and emphasized in field orientation. It will include a tour of site facilities relevant to the HVHHF activities to be performed and the site safety equipment including the following (as appropriate):

- Fire extinguishers
- Eye wash stations
- Designated work areas
- First aid kits
- Posted emergency contact list

The contents of this SSHP shall be discussed among the entire field team prior to start of work. The field team shall simulate an emergency situation to exercise the guidance within this plan for emergency response procedures. The SSHO (or alternate SSHO) will evaluate the response, and provide feedback for lessons learned that will be incorporated into the existing site procedures.

5.2 Hazard Communication

OSHA Standard 29 CFR 1910.1200 "Hazard Communication Standard" requires that all employees handling or using materials that may be hazardous be advised and informed as to the hazard potential associated with those materials.

The SSHO (or alternate SSHO) will discuss with the team members the following items:

- An overview of the hazard communication requirement
- A review of the chemicals anticipated to be encountered during the course of project work
- The location and availability of the written hazard communication program and an inventory of chemicals expected to be encountered
- Methods and observation techniques that may be used to detect the presence or release of hazardous chemicals in the work area
- Procedures to lessen or prevent exposure to hazardous workplace chemicals
- Emergency procedures to follow if employees are exposed to hazardous chemicals
- Explanation of the proper use of PPE

5.3 Daily Health and Safety Meetings

The SSHO (or alternate SSHO) will conduct the daily H&S meetings for field workers. The SSHO (or alternate SSHO) will address safety concerns before the day's planned activities. The SSHO (or alternate SSHO) will discuss the meeting places in case of evacuation and rally points at this daily safety meeting,

as well as other H&S reminders regarding safe work practices discussed in this SSHP. These meetings will be documented in the field logbook. A brief meeting at the end of the day's work will also be attended by the field team if an emergency response situation has occurred.

5.4 Training Records

Initial employee, site-specific, and daily H&S training will be documented. The SSHO (or alternate SSHO) is responsible for documenting all training activities and maintaining the files. To ensure that all site employees have read and fully understand the contents of this SSHP, a signature form is provided as Attachment D.

Section 6: Personal Protective Equipment

For the protection of all persons involved with HVHHF operations on Woolsey projects, general application is required for the PPE described in this section. The SSHO (or alternate SSHO) will perform a hazard assessment requiring the use of PPE when developing a JSA for each Definable Feature of Work. Employees will review these PPE requirements during JSA review and at the safety meetings.

6.1.1 Eye Protection

Safety glasses shall be worn at all times except while in vehicles with enclosed cabs or where additional eye protection is required. Safety goggles in accordance with ANSI Z87.1 shall be worn when working with corrosive chemicals or when possible eye irritation hazards are present.

6.1.2 Hard Hats

Hard hats in accordance with ANSI Z89.1 shall be worn during all heavy equipment and HVHHF activities. No modification to the shell or suspension is allowed unless approved by the manufacturer in writing. Hard hats will be worn with the bill facing forward.

6.1.3 Shoes

Steel-toed boots are required. All foot gear must meet the requirements of ANSI Z41.1.

6.1.4 Shirts and Pants

The outer most layers must be fire resistant (FR) material and meet the NFPA 2112 standard.

6.1.5 Gloves

Personnel shall wear gloves that are appropriate for the hazard they require protection from.

6.1.6 Hearing Protection

Woolsey will implement a hearing protection program. This program will consist of performing an initial assessment that is designed to determine if persons in the defined work areas are exposed to sound levels greater than 85 dBA as a time-weighted average or 140 dBA impulses. Based on the initial assessment, the SSHO (or alternate SSHO) will make sure adequate protection is worn during those operations. If field conditions change, another assessment will be performed. This assessment will be based on task-based operations and will also focus on the work zone boundary.

6.1.7 Respiratory Protection

Woolsey has established a respiratory protection program for any employee that may be exposed to inhalation hazards while within the footprint of the wellsite. Any person required to wear a respirator on the job will receive instruction and training prior to using the equipment. In part, the training will include the nature, extent, and effects of the respiratory hazards to which a person may be exposed as well as signs and symptoms of exposure. Before a person is required to wear a respirator on the job, a

determination will be made that he/she is physically fit and able to wear a respirator. The respiratory protective program can be found in Attachment F of this SSHP.

6.1.8 Vehicle Safety

Seat belts shall be worn in all vehicles. Riding in the bed of pickups is prohibited. Vehicles will be inspected prior to each use. Only authorized Woolsey personnel and designated contractors are allowed to operate Woolsey vehicles used during the HVHHF operations.

6.1.9 Visitor Protection

All visitors to the well site will be provided with a hard hat, safety glasses, and hearing protection to ensure they are protected from potential hazard exposure while on the job site. Visitors will also be accompanied by site personnel while they are within the footprint of the operation to ensure they maintain a safe distance from any high hazard areas.

Section 7: Medical Surveillance

7.1 Purpose and Scope

All personnel performing onsite work that will result in exposure to contaminant-related H&S hazards shall be enrolled in a medical surveillance program that complies with OSHA standards 29 CFR (f) and 29 CFR 1926.65 (f).

Woolsey administers an occupational medical surveillance program for the following activities:

- Hazardous waste operations
- Activities that require the use of respiratory protection beyond the use of "loose fitting dust masks"
- Project-specific activities or job assignments that may expose employees to hazards where medical surveillance is required by regulation or it has been determined by the PM, resource manager and/or CHSM that a project-specific medical evaluation program or biological monitoring is warranted
- As requested by a client

The occupational medical surveillance program is designed and overseen by a board-certified occupational physician. The medical surveillance program is intended primarily to monitor an employee's fitness for duty and is not intended for the diagnosis or treatment of injury or illness. The functions of the medical surveillance program include:

- Establishing a baseline medical condition prior to project or job assignment
- Monitoring the employee's physical ability to perform assigned job functions
- Identifying the presence or absence of conditions that could be aggravated by the type of work assigned
- Monitoring health trends during hazardous waste and other designated project assignments
- Establishing a medical condition at time of termination or post assignment

In addition, medical exams or evaluations of employees may be provided in the following circumstances:

- Employment-related injuries or illnesses
- Exposures to toxic or hazardous substances
- Medical clearance to return to work

7.2 Responsibilities

Direct Managers and Resource Managers – Direct managers and resource managers ensure employees participate in the medical surveillance program when required by project assignment and notify the CHSM of employee termination or reassignment requiring an exit physical examination.

Corporate H&S Manager – The CHSM selects and monitors performance of the medical contractor and oversees Woolsey administration of the program.

H&S Coordinators – The H&S coordinator or their designees coordinate medical appointments and maintain employee medical clearance forms for their office(s).

Medical Consultant – The medical surveillance consultant identifies qualified clinics, medical facilities, and maintains employee medical records. The medical consultant provides the services of a board certified occupational physician to advise on recommended medical protocols, provide medical opinions regarding employee fitness for duty, and provide medical advice as requested.

Employees – Employees selected for activities that include participation in a medical surveillance program are responsible for participating in the program by attending assigned appointments and maintaining their medical qualifications.

7.3 Medical Release Forms

Upon completion of a medical exam or evaluation, results shall be reviewed by the medical consultant's occupational physician and a medical release letter shall be sent to the H&S database administrator indicating the medical status of the employee. The medical consultant shall also provide a copy of the results of the exam to the employee.

7.4 Employment-Related Injury or Illness Medical Evaluations

In a non-emergency situation, employees who are injured or contract an illness that may be related to their employment at Woolsey should notify their direct manager or resource manager and contact their CHSM or H&S coordinator. If necessary, an appointment will be arranged at a medical facility identified by the medical consultant at a time and location convenient to the employee.

The CHSM or H&S coordinator must be notified by the employee, their group leader, direct manager, or resource manager prior to seeking non-emergency medical services for employment-related injuries or illnesses.

7.5 Return to Work Examinations

An employee desiring to return to work following a leave of absence due to injury or illness, or return to full work status from a restricted work period, must obtain a medical release to work, signed by a licensed physician stating that the employee is capable of performing assigned duties with or without restrictions and with or without reasonable accommodation. The content of the examination may be determined by the medical consultant and may be performed at a facility selected by the medical consultant at a time and location acceptable to the employee. A medical work status form should be provided to the CHSM and human resources benefits manager.

7.6 Access to Medical Records and Exposure Data

Employee medical records, including results of medical tests and X–Rays, shall be retained by the medical consultant and kept confidential in accordance with OSHA medical record-keeping requirements, 29 CFR 1910.1020. Medical records, and information obtained in the course of the administration of the Woolsey medical surveillance program shall be kept confidential and released only under the following conditions:

- An employee, former employee, or their designated representative may obtain a copy of his/her personal records by submitting a written request for the information to the CHSM. The written

request must include the employee's name, the address to send the records to, and a phone number to call to verify the identity of the requestor.

- Woolsey's workers' compensation insurance carrier may request information related to alleged occupational illnesses or injuries with the written permission of the employee.
- The CHSM may obtain medical information without personal identifiers by submitting a written request to the medical consultant.
- Recognized government research and regulatory agencies may obtain medical information without personal identifiers by submitting a written request to the CHSM. The request shall identify the nature and purpose of the information requested.

Air monitoring data and exposure records for specific projects are kept with project H&S records. Employees may obtain access to data related to their exposure or generic data associated with potential exposure of employees in their job classification or performing similar duties by submitting a written request to their CHSM.

Section 8: Air Monitoring

Refer to the Fugitive Dust Control Plan for air monitoring requirements. All personnel will wear personal monitors while working on location.

Section 9: Heat and Cold Stress Prevention

Seasonal site conditions should be considered for all HVHHF activities. Heat and cold stress prevention will be practiced in accordance with the techniques in the following sections and in Attachment B of this SSHP.

9.1 Heat Stress Prevention

Heat stress occurs when the body's physiological processes fail to maintain a normal body temperature because of excessive heat. Individual susceptibility to heat stress disorders can vary widely. Individual physical factors that can affect a person's response to hot work environments include a person's general fitness and age. If necessary, appropriate heat stress prevention can include the following techniques:

- Advise workers to drink 16-ounces of water before beginning HVHHF activities and continue to drink fluids throughout the work day.
- Acclimatize workers to site work conditions by slowly increasing workloads.
- Wear loose clothing, appropriate to the weather and HVHHF tasks.
- In hot weather, conduct HVHHF activities in the early morning and evening.
- Allow appropriate rest period (i.e., at least 15 minutes each hour, depending on working and weather conditions).
- Ensure that adequate shelter is available to protect personnel against heat.

Attachment B to this SSHP, Heat and Cold Stress Guidelines, contains more information regarding heat stress monitoring.

9.2 Cold Stress Prevention

Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Cold Stress is not a major concern since colder temperatures are not expected during field activities. If necessary, the following prevention techniques should be considered when working in ambient air temperatures below 40 degrees Fahrenheit (°F),

especially when other contributing weather conditions such as snow, rain, or wind are present.

- Employees whose clothing may become wet shall wear an outer layer of clothing that is impermeable to water.
- Dress in layers and bring extra clothing.
- When manual dexterity is not required of an employee, thermally protective gloves shall be worn.
- Curtail work if extreme weather conditions such as a blizzard, extreme wind chill (e.g., less than 0°F), torrential cold rains, or wind is expected.
- Take warming breaks as needed.

Attachment B to this SSHP, Heat and Cold Stress Guidelines, contains more information regarding heat stress monitoring.

Section 10: Standard Work Practices

Standard work practices have been developed for general as well as for specific task activities. Some minimum standard general work practices are outlined below.

10.1 General HVHHF Activities

Specific safety practices associated with equipment and HVHHF activities conducted during work activities are listed in the JSAs; general safety practices include:

- Qualified, adequately trained, and licensed personnel will be onsite.
- Personnel will not consume or be under the influence of alcoholic beverages, medication, or drugs while operating heavy equipment. The presence of intoxicating substances on site is strictly prohibited.
- Work area will be kept clear of obstructions and debris.
- Personnel will wear proper PPE during all activities

10.2 Working around Heavy Equipment

Heavy equipment will be used on the jobsite. All heavy equipment shall be operated only by qualified (by training and experience) personnel who are authorized to operate the equipment to be used onsite.

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. At Woolsey projects, these areas should be taped or barricaded off, however, when equipment moves frequently, you cannot count on the other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's' backup alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist.
- Do not cut across the path of equipment backing up.

- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of a least 10 feet between any part of the machine or its load and electrical line or apparatus carrying up to 50,000 V. One foot of additional clearance is required for every additional 30,000 V.

10.3 Underground Utilities

Some tasks milestones in this SSHP may require drilling or heavy equipment penetrating the ground. In all these tasks utilities located underground will be a concern and hazard. Utility mark outs and geophysical contractors will be procured to locate any potential underground utilities in all work areas prior to any work completed in each milestone.

10.4 Spill Response

In the event that a spill occurs, the following procedures will be taken:

- The spill will have absorbent material placed over the area. Enough absorbent will be used to contain the entire spill. The absorbent material will then be placed in an appropriately labeled container using a shovel and disposed of properly.
- PPE to be used during the spill cleanup will be equal to the PPE being worn when the spill occurred, unless the SSHO (or alternate SSHO) determines that a PPE upgrade is necessary.
- The spill will be reported to the Woolsey PM and noted in the field logbook.

The spill response equipment will be stored in the OCV.

10.5 Site Safety Practices

Historically, slips, trips, and falls have been major causes of physical injuries. To prevent this type of hazard, tools, parts, and other equipment should not be left lying around. Grease and oils found on the ground should be cleaned up as soon as possible. The simple knowledge of proper lifting techniques, bending the knees and lifting with muscles of the legs can eliminate many strained or injured backs.

Several general practices will be followed to ensure personnel safety during operations at the site. The following is a list of some of these practices:

- Do not run on location.
- Do not operate moving equipment unless instruction in its use has been given and use authorized by the SSHO (or alternate SSHO).
- Observe driving regulations within the site. These include wearing seat belts at all times when the vehicle is in motion and maintaining posted speeds or under 10 miles per hour.
- Get authorization from the SSHO (or alternate SSHO) before removing safety equipment or supplies from their normal location.
- Clean hand tools and special tools and keep them in good repair.
- Use the correct tool for the particular job in the proper manner.
- Carry materials and tools with concern for overloads and balance, and hold these items securely.
- Avoid movement with obscured vision.
- Practice good housekeeping at all times.

- Do not participate in "horseplay". Horseplay is defined as any frivolous behavior that increases the probability of an accident.

10.6 Material Lifting

Many types of objects may be handled during the course of HVHHF activities. Care should be taken in handling heavy or bulky items, because they are the cause of a considerable number of accidents. There are certain fundamentals in the proper lifting of materials to avoid back injuries as listed below:

- The size, shape, and weight of the object to be lifted must be considered. A worker will not lift more than what one person can handle comfortably.
- The feet will be placed far enough apart for good balance and stability. The footing will be solid.
- The worker will get as close to the load as possible. The legs will be bent at the knees. If the load is too large or bulky and the worker cannot see around or over it, the worker will get assistance.
- The back will be kept as straight as possible.
- The object will be gripped firmly.
- To lift the object, the legs are straightened from their bend. Twisting motions will be avoided while lifting and/or carrying objects.
- A worker will never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the persons carrying the load. When carrying the object, each worker, if possible, will face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines will be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential. The hands and object will be free of oil, grease, or water that might prevent a firm grip.
- The item will be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces.
- Gloves will be used when necessary.
- The fingers will be kept away from any points that may cause the fingers to be pinched or crushed, especially when setting the object down.

10.7 Contingency Plans

If unexpected hazards or conditions are encountered, field personnel will stop work and move a safe distance from the site, upwind or to the access road. Work stoppage will continue until the SSHO (or alternate SSHO) indicates it is safe to return to the site.

If unsafe conditions persist, the SSHO (or alternate SSHO) will notify Woolsey's PM, and the Woolsey CHSM will be notified by the PM, as needed.

Section 11: Site Control and Personal Hygiene

The following site control and personal hygiene activities will be followed:

- All personnel and general public will be required to sign in and out of the location for accountability purposes and to ensure that unauthorized access to the site is not granted.
- Signs will be posted at the entrance to the location to distinguish the wellsite to the general public,

so that they will know that there are additional hazards associated with the locations footprint.

- All Woolsey and subcontractor personnel assigned to work in any restricted area must be provided with a copy of this SSHP, agree to the terms in writing and sign the form in Attachment D, and attend a safety briefing before commencing work.
- All team members will make sure to address personal hygiene issues by washing hands, arms, and face prior to eating, drinking, smoking, applying lipstick, or any other hand to mouth function.
- Eating, drinking, and chewing gum, or tobacco will only be permitted outside the work zone. Smoking is permitted in designated areas only.
- Before initiating any non-routine operation, personnel must consult the SSHO (or alternate SSHO) about H&S requirements for that operation.

Section 12: Accident and Illness Prevention

12.1 Introduction

Woolsey believes that the H&S of each of its employees is of the utmost importance. Woolsey's objective is a HSP that reduces the number of illnesses and injuries to an absolute minimum. The Woolsey medical surveillance program, designed and administered by a board-certified, occupational physician, consists of a combination of (1) baseline, annual, interim, exit, and return to work examinations; (2) services for the evaluation and follow-up of occupationally-related injuries and illnesses; and (3) emergency medical services required to stabilize severely injured or ill patients prior to their transport to an offsite medical care facility. The prevention of occupationally induced illnesses and injuries takes precedence over operating productivity at all times. Woolsey provides quality supervision, training and educational opportunities, and protective clothing and equipment to ensure maximum employee H&S protection. Subcontractors will provide training and educational opportunities, and protective clothing and equipment for subcontractor employees to ensure H&S protection of its employees.

12.2 Safety Promotion

The training and subsequent implementation of the HSP, as well as the scheduled site-specific training, are all designed to instill a high level of safety consciousness in all personnel working on the project. These programs, in conjunction with the high level of experience and professionalism of the personnel working onsite and the periodic safety audits and inspections, will maintain safety as a prime concern for all involved. Additionally, the performance of work in a safe manner is expected and required from each Woolsey employee and subcontractor.

12.3 Medical and First Aid Requirements

Notification of, and arrangement with medical facilities, ambulance service, and medical personnel will be established to ensure their readiness and availability for prompt attention to the injured prior to implementation of HVHHF activities. The list of emergency contacts is included in Table 13-1. A minimum of two Woolsey or subcontractor employees performing HVHHF activities for this project will have current First Aid/CPR training certificates.

At least one first aid kit will be maintained onsite during field operations. These kits will have been reviewed by a medical consultant for their adequacy. The first aid kit will be stored in the OCV.

Section 13: Emergency Response and Contingency Procedures

If field personnel observe a potential or actual emergency condition, such as a chemical spill or fire, they will notify the personnel listed in Table 13-1. In the case of an emergency such as a fire at an off-site location, the appropriate agencies (i.e., the fire department [911]) will be notified. During the morning

H&S briefing, the emergency action plan will be discussed and demonstrated. The contents of this SSHP shall be discussed among the entire field team prior to start of work. The field team shall simulate an emergency to exercise the guidance within this plan for emergency response procedures. The SSHO (or alternate SSHO) will evaluate the response, and provide feedback for lessons learned that will be incorporated into the existing site procedures.

The emergency alerting procedure will be a 5-second continuous sounding of the field vehicle's horn. All posted safety and health requirements onsite will be strictly followed. If unexpected hazards or conditions occur, field personnel will evacuate immediately and meet upwind of the site at the meeting place designated during the field kickoff meeting. It will be the responsibility of the SSHO (or alternate SSHO) to account for all field personnel that have evacuated the site. Field personnel will be instructed to contact the SSHO/alternate SSHO via cell phone if they evacuate the site to somewhere other than the agreed upon safe meeting location. The proper authorities listed in Table 13-1 will be contacted.

13.1 Emergency Medical Facility

The medical facility used for emergencies related to HVHHF activities conducted is:

Hamilton Memorial Hospital
611 S. Marshall Ave.
McLeansboro, Illinois 62859

Directions to Hospital from worksite:

Head north on County Road 50E toward County Road 1825N – 0.06 mi
Turn right at the first cross street onto County Road 1825N – 1.5 mi
Turn right onto US-45S – 4.2 mi
Turn right onto IL-14W – 11.2 mi
Turn left onto S. Marshall Avenue – 0.2 mi

13.2 Medical Emergencies

In the event of an accident requiring first aid, the SSHO (or alternate SSHO) will be responsible for coordinating the first aid and/or requesting aid from a medical service (Table 13-1). If the person requiring attention is capable of being moved without further injury, the SSHO (or alternate SSHO) may transport the injured party to obtain medical assistance. Site support vehicles may be used to transport injured or ill personnel. Directions and maps showing the routes to the medical facility will be located in all vehicles. This SSHP should also be brought to the hospital. As aforementioned, a minimum of two Woolsey or subcontractor employees performing field activities for this project will have current CPR and first aid training certifications.

Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. Emergency first aid equipment, such as a first aid kit, will be in the OCV on site. For more serious injuries, additional assistance may be required at the site, or the victim may have to be treated at a medical facility. Any members of the general public, who incur any injury while within the footprint of the project, will be treated in the same manner as those working on the job site.

Life-saving care should be instituted immediately without considering decontamination, if chemical exposure occurs. The outside garments can be removed (depending on the weather) if they do not cause delays, interfere with treatment, or aggravate the problem. If the other contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of the ambulance and/or medical personnel. Outside garments will then be removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause further or severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

Exposure to chemicals can be divided into two categories:

1. Injuries from direct contact such as acid burns or inhalation of toxic chemicals
2. Potential injury due to gross contamination on clothing or equipment

If a contaminant is inhaled, treatment can only be conducted by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed. Workers showing symptoms of acute exposure should be transported, immediately, following appropriate decontamination, to the nearest medical facility.

Heat-related illnesses range from heat fatigue to heat stroke, the most serious condition. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Section 9 and Attachment B present a discussion of recommended heat stress prevention procedures. Any worker who is medically treated for a heat stress related injury will be evaluated by a physician and medically cleared before return to work.

13.3 Exposure/Injury Reporting

The purpose of the exposure/injury reporting system is twofold: (1) to learn from past mistakes in order to maintain an exposure/injury-free work environment and (2) to document incidents as required by OSHA. The reporting system consists of monthly surveys and exposure/incident reports. All incidents involving injury, illness, exposure, vehicle, or equipment damage will be thoroughly investigated by the CHSM, including incidents that might not cause injury, illness, or property damage but had the potential to do so ("near miss incidents").

13.3.1 Accident Reporting and Investigation

Personnel are required to notify the CHSM of reportable exposures and injuries. Individuals will discuss all potential exposures with the CHSM and/or SSHO/alternate SSHO to ascertain if the exposure is reportable. All injuries will be reported.

An Injury/Illness Report Form will serve as the basis for the written documentation and investigation of all accidents resulting in employees receiving more than first aid. All such accidents will be verbally communicated to the CHSM or SSHO/alternate SSHO as soon as medical services are secured. These individuals will verbally notify the CHSM within 24 hours of the accident.

The investigation will be thorough and performed by the injured employee's immediate supervisor. The results of the investigation will be documented using the report form and will be signed by the investigator. The form will then be sent to the appropriate section or local manager, who following a review is also required to sign the form before forwarding it to the SSHO (or alternate SSHO). Following the SSHO/alternate SSHO's review and signature, a copy of the form will be made for the office/project file with the original forwarded to the CHSM.

13.3.2 Follow-Up

If the injury/illness resulted from the uncontrolled release of hazardous material, the CHSM will be notified immediately, so that discussions with the occupational physician can occur to determine if additional biological monitoring should be prescribed.

As soon as practical, following the initial medical treatment, the injured employee will be scheduled into the clinic that administers the annual examinations for the injured employee's office. This procedure is

necessary to ensure that the employee receives quality medical treatment during any type of recovery period.

The CHSM and the SSHO/alternate SSHO will follow up with the PM to ensure that corrective action, if identified in the Injury/Illness Report Form, has been implemented.

13.3.3 Occupational Injuries and Illnesses

The CHSM maintains a log of all occupational injuries and illnesses in accordance with OSHA requirements. The log is maintained using OSHA Form 200.

13.4 Emergency Evacuation Plan

The following steps are to be taken in the event that evacuation of the general public in close proximity of the well site becomes necessary due to a fire, explosion, or spill.

1. In the event that there is a problem at the well site which poses a threat to the general public, the SSHO will notify the Sheriff's Department. If the SSHO is incapacitated the site supervisor will make the proper notification.
2. Once the Sheriff's Department has been notified of the emergency, they will contact additional resources dependent upon the type of emergency.
3. If isolation and evacuation are necessary, the Sherriff's Department will dispatch units to set up roadblocks and assist with the evacuation.
4. The project manager will begin the evacuation of those in immediate danger, based on wind conditions at the site. They will begin by telephoning any residents in the danger zone directly downwind from the location in the potential radius for exposure. They will then proceed to the residents whom they were not able to contact by phone to make a face-to-face contact to insure that they have evacuated.
5. The entrance to the location will be blocked off and any incoming vehicles will be diverted away from the wellsite. Only emergency response and authorized vehicles will be granted entrance to the location.
6. In the event that it becomes necessary to divert school busses away from the wellsite, the project manager, or their designee, will notify the local school district.
7. Onsite personnel will take every step within the means of their training to mitigate or eliminate the emergency situation and begin to establish a safe perimeter.
8. The Illinois Department of Natural Resources (IDNR) and any other appropriate government officials will be notified of the emergency situation.
9. Other contractors may be called upon to assist in the elimination and cleanup from the emergency situation.

13.5 Fire or Explosion Response Procedures

The objective of this Emergency Response Procedure is to identify the appropriate actions to take in the event of a fire or explosion at the wellsite location.

1. If you observe a fire and/or explosion on or near the location, contact personnel in the OCV and sound the alarm. Give specific directions to the area affected by the fire or explosion. Provide the OCV with sufficient information to determine what response actions and resources are necessary.
2. If a fire or explosion is ongoing, the OCV will immediately call 911 (fire department) and provide the dispatcher with the following information
    a. Location of the fire
    b. Time the fire started or the explosion occurred
    c. Number of personnel on the site at the time of the incident
    d. Any chemicals which may be involved in the fire or explosion

e. Any other pertinent information the dispatcher may ask for

3. The OCV shall then notify and direct the First Responders to the scene. Depending on the severity of the fire or explosion, the Responder(s) should wait at a safe distance to direct other responders or implement evacuation of the area, if necessary.
4. The OCV shall monitor the location entrance to direct any emergency vehicles to the scene. If possible, an employee will be at the gates to escort responders to the scene.
5. The First Responders shall evaluate the fire/explosion to determine the following:
    a. Location of the fire/explosion
    b. Type of material(s) that are burning
    c. Potential spread or exposure
    d. Fire protection systems activated
    e. Site evacuation necessary or on-going
    f. Other potential safety or environmental hazards
6. The evaluation information can be relayed by the First Responders either upon the fire department arrival on-scene or through continuous contact through the dispatcher
7. If Responder(s) determine that the fire is already extinguished or will be extinguished immediately using on-site resources (incipient stage fires only), the Incident Commander can cancel fire department prior to its arrival.
8. If the potential for encounter with smoke or an Immediate Dangerous to Life and Health (IDLH) atmosphere exists, prior to entry, the First Responders may don self-contained breathing apparatus (SCBA). SCBA shall only be worn by personnel trained and medically cleared for its use. Upon encountering smoke or a potential IDLH environment, First Responders shall immediately activate their SCBA unit and exit the area. The First Responders shall not use SCBA for any firefighting or search and rescue purposes, but rather solely for respiratory protection during egress. All firefighting beyond the incipient stage, and all personnel search and rescue shall be performed by the fire department.
9. Responder(s) shall ensure that any affected electrical systems are shut down along with any affected operations, if it is safe to do so.
10. The OCV will notify the First Responder(s) of the arrival of the fire department. The First Responder(s) will report to the location entrance, if necessary, and coordinate with the fire department in establishing an on-scene mobile command post to direct fire or explosion responders. They will direct individuals to assemble at the command post to help coordinate response efforts, verify that the appropriate fire or explosion response personnel have responded to the incident, and obtain additional back-up, if necessary.
11. All First Responders will assist the fire department as necessary and as directed (if the activities can be conducted in a safe manner) by the Incident Commander with:
    a. Connections to water sources.
    b. Identification of materials involved.
    c. Use of proper personal protective clothing.
    d. Isolation of electrical systems
    e. Identification of fire suppression systems
12. Responders will identify any hazardous substances that may have been involved in the fire or explosion. SDS may be obtained from the electronic database, or if necessary and safely obtainable, hard copies in the OCV respectively. Responders shall also refer to the U.S. Department of Transportation Guidebook for First Response to Hazardous Materials Incidents for Emergency Actions for Small and Large Fires. The Responder(s) shall implement the wellsite spill response plan, as needed, to address a spill of oil or hazardous material associated with the fire or to initiate cleanup activities.

13. The Responder(s) will evaluate the need for medical services and perform rescue operations. Refer to the medical procedures and evacuation procedures.
14. The Incident Commander will assess actions needed to mitigate on-site and off-site impacts and environmental impacts.
15. The Incident Commander will determine when the emergency is over and provide the "all clear" announcement.
16. After the emergency has been terminated, the Incident Commander shall coordinate a debriefing and emergency documentation. Other activities to be considered/conducted following termination of the incident shall include:
    a. Briefing Public Relations so that all questions can be directed to them
    b. Coordinate the refilling of any fire extinguisher which may have been used
    c. Forming a team to clean up the affected area to resume normal operations
    d. Conducting an incident investigation
    e. Analyzing the fire/explosion emergency response plan for its effectiveness

13.6 Spill Response Procedures

Significant spillage of certain types of materials that are at the facility may need to be reported to agencies such as Illinois Department of Natural Resources (IDNR), Environmental Protection Agency (EPA), etc. Substantial fines can result from improper or unauthorized handling of spills, as well as from not reporting them to the proper agencies.

The objective of this Emergency Response Procedure is to identify the appropriate actions to take when a spill or release of oil, hazardous materials or other potentially harmful substances (i.e., sanitary waste, blood, etc.) occurs at the wellsite location. The intent is to minimize the health, safety and environmental impacts from a discharge of fuel, lubricating oil, or hazardous material and to prevent discharge(s) from leaving the site, especially to the nearby waterways. Response activities will be completed only when it is determined to be safe to do so.

A spill is defined as a release of a material from outside its normal container. Spilled materials can be liquid, solid, or gas in nature. Because fires also release chemicals (smoke, fumes, etc.), they fall into the definition of a spill and therefore, also need to be reported internally. Releases into spill containment areas (dikes, separators, etc.) are still considered spills, must be reported internally, and may need to be reported to governmental agencies depending upon the type and quantity of material released.

a. Immediate notification shall be given by the owner/operator of the wellsite location when a release equal to or exceeding the reportable quantity of an extremely hazardous substance or a CERCLA hazardous substance is released at the wellsite location. Notification will be provided to the following:
    1. Illinois Emergency Management Agency (IEMA)/State Emergency Response Commission (SERC) at 1-800-782-7860
    2. The Local Emergency Planning Committee for Hamilton County (Mr. William Sandusky) at 1-618-231-4001
    3. The National Response Center (NRC) at 1-800-424-8802 (if the substance meets the criteria of a CERCLA hazardous substance.
b. Immediate notification must also be given if the hazardous substance release results in any of the following:
    1. A member of the general public is killed
    2. A member of the general public receives injuries resulting in hospitalization
    3. An authorized official of an emergency agency recommends an evacuation of an area by the general public
    4. Fire, breakage, release or suspected contamination occurs involving an infectious agent

5. Any release of petroleum (or oil) that produces a sheen on nearby surface water4 and/or threatens navigable waters

c. Notification shall include the following criteria:
   1. The chemical name or identity of any substance involved in the release
   2. An indication of whether the substance is an extremely hazardous substance
   3. An estimate of the quantity in pounds of any such substance that was released into the environment
   4. The time and duration of the release
   5. The specific location of the release
   6. The medium or media (air, land, water) into which the release occurred
   7. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals
   8. Proper precautions to take as a result of the release, including evacuations
   9. The name and telephone number of the person or persons to be contacted for further information.

d. Written follow-up notice is required with respect to incidents as described above, according to the IEMA. As soon as practicable after such release (within 30 days), the owner or operator shall provide a written follow-up emergency notice (or notices, as more information becomes available) to the SERC and the LEPC, updating the information provided in the immediate notification and including additional information with respect to:
   1. Actions taken to respond to and contain the release
   2. Any known acute or chronic health effects associated with the released substance
   3. Advice regarding medical attention necessary for exposed individuals

13.6.1 Spill Response

1. If you detect a spill at the wellsite location:
   a. Immediately contact the OCV. Provide information regarding the nature and extent of the spill so that they can initiate appropriate response activities. This information shall include:
   - Type of chemical spilled
   - Location of the spill
   - Approximate volume of the spill
   - Number of injured employees; and
   - If possible, a copy of the SDS for the spilled chemical.

   b. Determine if the spill is significant by estimating the volume of spilled material.
   c. If the spill is not significant, operations must clean up the spill immediately. For non-significant spill cleanup procedures, refer to the SDS or contact the SSHO. Notify your supervisor and/or the SSHO following clean up.
2. If you detect a spill that is in progress, initiate actions to stop or control the spill, if it is safe to do so and you are adequately trained and authorized to do so. Your supervisor should be informed of the spill as soon as conditions permit.
3. Based on the information provided, Operations will notify the First Responders and direct them to the scene. Operations may also notify additional response personnel, including the emergency coordinator (for significant spills), fire department (in case of fire/explosion, the waste contractor, and/or off-site resources) as directed by the Incident Commander.
4. Upon arrival at the scene, the Responder(s) shall

a. Assess the spill event and secure access to the affected area. Depending on the type or quantity spilled.
b. Determine if any injuries are involved, and if so, will implement or direct someone else to implement the Medical Emergency Procedure.
c. Determine if evacuation is necessary and if so, will implement or direct someone to implement the Evacuation Procedure.
d. Determine if a fire/explosion hazard exists and if so, will implement or direct someone to implement the Fire/Explosion.

5. The Responder(s) should cordon off and secure the spill area, at a safe distance and should secure any affected operating equipment and possible ignition sources or other hazards.
6. The Incident Commander should designate support, decontamination and hot zones as necessary.
7. If the release has impacted or may potentially impact the surrounding waterways, the Responder(s), under the direction of the Incident Commander, should secure access to the affected area, which may include:
    a. Request the Control Van to notify the Emergency Spill Responders
    b. Securing skimmers and/or booms near openings to those waterways
8. If a potential Reportable Quantity (RQ) has been released, the Incident Commander will request the OCV to notify the SSHO to assist in the evaluation of the spill/release to determine whether the release potentially triggers any reporting criteria.
9. Following the completion of spill response activities, the Incident Commander should contact the SSHO to arrange for the storage and disposal of waste generated during spill response. Types of solid materials that may need to be disposed of include sorbent pads, protective clothing, and soil impacted by the release. Liquids would include water, oil, and chemicals recovered as part of the spill response activity, as well as fluids used for decontamination processes.
10. Soils that are excavated must be transported to a secure location at a designated soil stockpile area, where they must be segregated, placed on plastic sheeting, covered, and labeled pending characterization and disposal. Other solid waste, slurry, sediment, and liquid waste must be containerized in drums or tanks and labeled with sufficient information to enable subsequent tracking and disposal. The EHS department must be notified of the quantities, nature, and date of generation of all waste products, and is responsible for arranging for classification and recycling, re-use, or disposal in accordance with State and Federal regulations.
11. After the spill/release incident has been stabilized or remediated, the Incident Commander shall conduct a debriefing/critique of the spill/release ERP.

13.7 Equiupment and Training

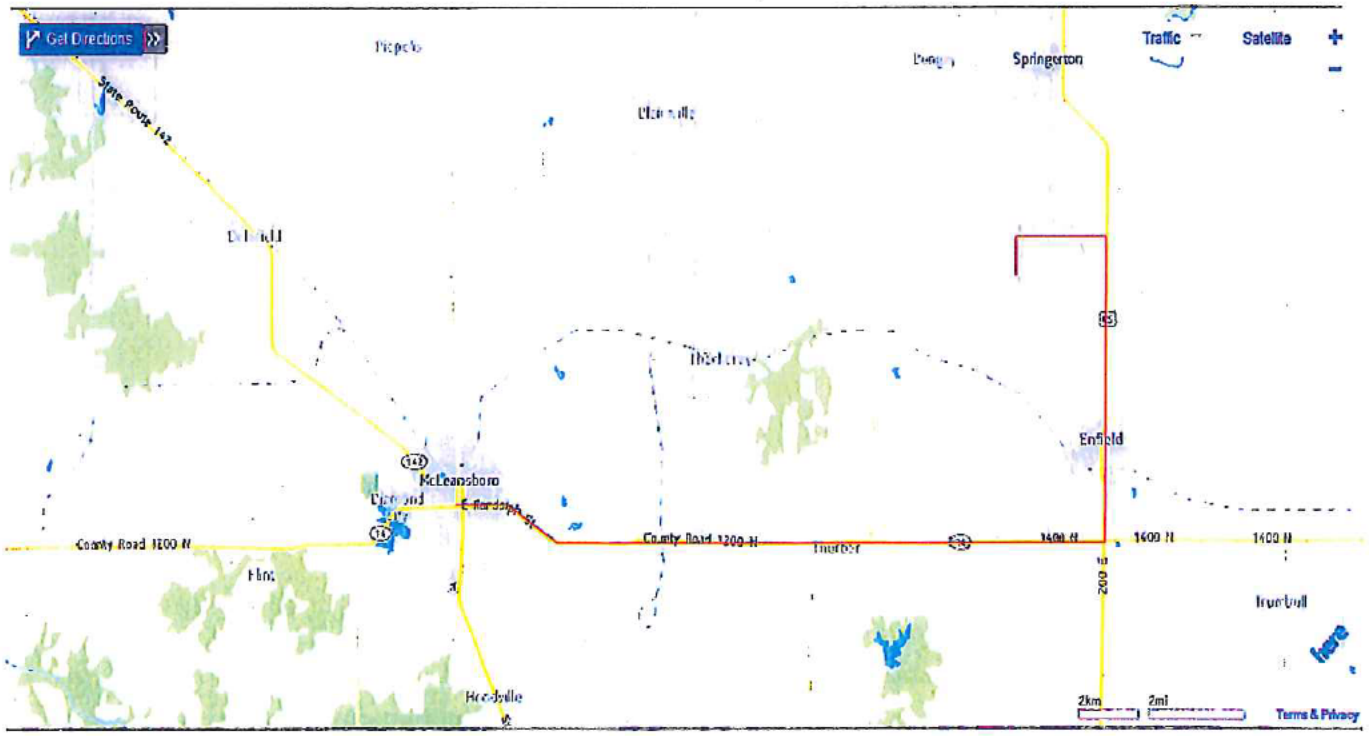
The well site is located in White County and this area has for decades experienced oil production, field service, drilling and completion activity. The White County Emergency Management Agency has the training and equipment for oil field related fires, including foam trucks. Emergency spill contractors have been identified in Table 13-1. The Mt. Vernon, Illinois Fire Department has 2 Hazmat Trucks and Trailers with Hazmat equipment.

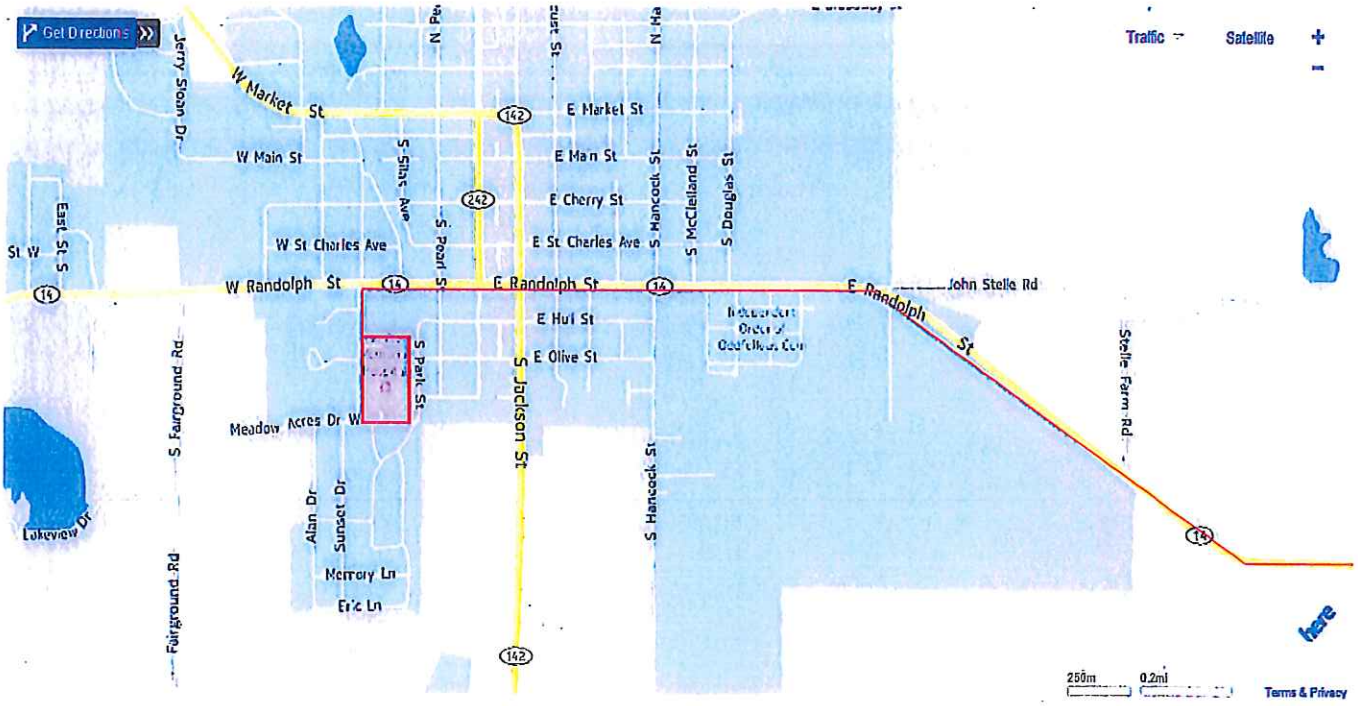
Table 13-1 Emergency Contacts

Resource	Provider/Title	Telephone No.
Emergency Contacts		

Fire Department	Enfield Fire Protection District	911
Ambulance Service	White County Ambulance Service	911
Hospital	Hamilton Memorial Hospital	(618) 643-2361
Poison Control Center		(800) 222-1222
Woolsey Operating Company		
Ryan Kelley	Project Manager	[redacted]
Mickey Neville	CHSM	[redacted]
Tommy Marcellus	SSHO	[redacted]
Woolsey – Wichita, Kansas	Main Number	[redacted]
Emergency Spill Contractors		
Bodine Environmental Services, Inc.	Decatur, Il Springfield, Il	(217) 428-3629 (217) 698-0700
SET Environmental, Inc.	Glenwood, Il	(847) 537-9221
SWS Environmental Services	Paducah, KY	(270) 444-8003

Figure 13-1 Map to Emergency Medical Facility





Attachment A
Safety Data Sheets

SAFETY DATA SHEET

M34514 NA_EN

Occidental Chemical Corporation

A subsidiary of Occidental Petroleum Corporation

Responsible Care®

HYDROCHLORIC ACID (HCl) (ALL GRADES)

MSDS No.: M34514 **Rev. Date:** 09-Aug-2012 **Rev. Num.** 06

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification:	Occidental Chemical Corporation 5005 LBJ Freeway P.O. Box 809050 Dallas, TX 75380-9050
24 Hour Emergency Telephone Number:	1-800-733-3665 or 1-972-404-3228 (U.S.); CHEMTREC (U.S.): 1-800-424-9300; CHEMTREC (outside U.S.): +1 703-527-3887
To Request an SDS:	MSDS@oxy.com or 1-972-404-3245
Customer Service:	1-800-752-5151 or 1-972-404-3700
Trade Name:	Hydrochloric Acid (HCl) aqueous all grades
Synonyms:	Muriatic Acid, HCl Solution, Aqueous hydrogen chloride
Product Use:	Process chemical, Metal cleaning, Water purification, Petroleum Industry

2. HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW:

Color:	Colorless
Physical State:	Liquid
Appearance:	Clear
Odor:	Irritating, Pungent, Sharp
Signal Word:	**Danger**

MAJOR HEALTH HAZARDS: CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN AND EYES. CAUSES PERMANENT EYE DAMAGE. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

PHYSICAL HAZARDS: May spatter or generate heat when mixed with water. Contact with metals may evolve flammable hydrogen gas.

PRECAUTIONARY STATEMENTS: Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Wash thoroughly after handling. Use only with adequate ventilation.

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POTENTIAL HEALTH EFFECTS:

Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema.

Skin contact: May cause irritation (possibly severe) and chemical burns.

Eye contact: May cause irritation (possibly severe), chemical burns, eye damage, and blindness.

Ingestion: Not a likely route of exposure.

Chronic Effects: Repeated or prolonged exposure to dilute solutions may result in dermatitis. Discoloration of the teeth may occur as a result of long term exposure.

Interaction with Other Chemicals Which Enhance Toxicity: None known.

Medical Conditions Aggravated by Exposure: None known.

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/ INFORMATION ON INGREDIENTS

Component	%	CAS Number
Hydrogen chloride	9 - 36	7647-01-0
Water	63 - 91	7732-18-5

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer basic life support (Cardio-Pulmonary Resuscitation and/or Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

SKIN CONTACT: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Not a likely route of exposure.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire.

Fire Fighting: Keep unnecessary people away, isolate hazard area and deny entry. Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in pressure demand mode. Move container from fire area if it can be done without risk. Cool non-leaking containers with water. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

Hazardous Combustion Products: Hydrogen chloride, Chlorine, Hydrogen gas

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Remove sources of ignition. Wear appropriate personal protective equipment recommended in Section 8 of the SDS. Stop leak if possible without personal risk. Consider evacuation of personnel located downwind if material is leaking. Shut off ventilation system if needed. Completely contain spilled material with dikes, sandbags, etc. Neutralize with soda ash or dilute caustic soda. Collect with appropriate absorbent and place into suitable container. Liquid material may be removed with a properly rated vacuum truck. Keep out of water supplies and sewers. This material is acidic and may lower the pH of the surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Storage Conditions: Store and handle in accordance with all current regulations and standards. Store in rubber-lined steel, acid-resistant plastic or glass containers. Keep container tightly closed. Store in a cool, dry area. Store in a well-ventilated area. Keep away from heat, sparks and open flames. Keep separated from incompatible substances (see Section 10 of SDS). Do not store in aluminum container or use aluminum fittings or transfer lines. Protect from physical damage. Dike and vent storage tanks.

Handling Procedures: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Regulatory Exposure Limit(s): As listed below

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrogen chloride 7647-01-0	------	----------	5 ppm 7 mg/m^3

OEL: Occupational Exposure Limit; OSHA: United States Occupational Safety and Health Administration; PEL: Permissible Exposure Limit; TWA: Time Weighted Average; STEL: Short Term Exposure Limit

Non-Regulatory Exposure Limit(s): As listed below

Component	CAS Number	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Hydrogen chloride	7647-01-0	-----	-------	2 ppm	-------	-------	5 ppm 7 mg/m^3

- **The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.**

ENGINEERING CONTROLS: Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a face-shield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Always place pants legs over boots.

Hand Protection: Wear appropriate chemical resistant gloves. Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Nitrile, Neoprene, Butyl rubber, Polyvinyl chloride (PVC), Responder®, Trellchem® HPS, Tychem®

Component	Immediately Dangerous to Life/ Health (IDLH)
Hydrogen chloride	50 ppm IDLH

Respiratory Protection: A NIOSH approved full-face respirator equipped with acid gas cartridges (appropriate for hydrogen chloride) may be permissible when symptoms have been observed that are indicative of overexposure. When the level may be above the IDLH, use an SCBA or pressure-demand supplied air with an auxilliary self-contained escape pack. Pressure-demand SCBA (self-contained breathng apparatus) must be used when there is a potential for uncontrolled release or unknown concentrations. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear
Color:	Colorless
Odor:	Irritating, Pungent, Sharp
Odor Threshold:	0.3 ppm (causes olfactory fatigue)
Molecular Weight:	36.46
Molecular Formula:	HCl
Boiling Point/Range:	140 - 221°F (60 - 105 °C)
Freezing Point/Range:	-29 to 5 °F (-34 to -15 °C)
Vapor Pressure:	14.6 - 80 mmHg @ 20 °C
Vapor Density (air=1):	1.3 @ 20 °C
Specific Gravity (water=1):	1.05 - 1.18
Density:	8.75 - 9.83 lbs/gal
Water Solubility:	100%
pH:	2 @ (0.2% solution)
Volatility:	9 - 36% by volume
Evaporation Rate (ether=1):	< 1.00 (butyl acetate = 1)
Flash point:	Not flammable

10. STABILITY AND REACTIVITY

Reactivity/ Stability: Stable at normal temperatures and pressures.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Avoid contact with water. Will react with some metals forming flammable hydrogen gas. Hydrogen chloride may react with cyanide, forming lethal concentrations of hydrocyanic acid. Avoid contact with incompatible materials.

Incompatibilities/ Materials to Avoid: Metals, Alkalis, Oxidizing agents, Mercuric sulfate, Perchloric acid, Carbides of calcium, cesium, rubidium, Acetylides of cesium and rubidium, Phosphides of calcium and uranium, Lithium silicide

Hazardous Decomposition Products: chlorine, hydrogen chloride, hydrogen gas

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

IRRITATION DATA: As listed below

Standard Draize (Eye):	rabbit-eye mild
Standard Draize (Skin):	human-skin mild

TOXICITY DATA:

Component	LD50 Oral:	LC50 Inhalation:	LD50 Dermal:
Hydrogen chloride	700 mg/kg (Rat)	3124 ppm (1 hr-Rat)	5010 mg/kg (Rabbit)
Water	900 mg/kg (Rabbit)	1108 ppm (1hr-Rat)	

TOXICITY:
Inhalation will cause severe irritation and possible burns with coughing and choking. If inhaled deeply, edema and hemorrhage of the lungs may occur. Prolonged exposure may cause discoloration and/or erosion of teeth. Contact with eyes causes immediate severe irritation with possible burns, permanent visual impairment, or total loss of sight. Skin contact with this material may cause severe irritation and corrosion of tissue. Ingestion may cause immediate burns of the mouth, esophagus, and stomach. Ingestion may cause intense pain, nausea, vomiting, bleeding, circulating collapse, shock, and death.

CARCINOGENICITY: This product is not classified as a carcinogen by NTP, IARC or OSHA.

12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

- **Aquatic Toxicity:**
  LC50 Gambusia affinis: 282 mg/L 96 hr.
- **Fish Toxicity:**
  LC50 Goldfish: 178 mg/L (1 to 2 hour survival time)
- **Freshwater Fish Toxicity:**
  LC50 Bluegill: 3.6 mg/L 48 hr
- **Invertebrate Toxicity:**
  LC50 Shrimp: 100 - 330 mg/L

FATE AND TRANSPORT:

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is believed not to persist in the environment. This material is believed to exist in the disassociated state in the environment. If released to soil, hydrogen chloride will sink into the soil. The acid will dissolve some soil material (in particular, anything with a carbonate base) and will be somewhat neutralized. The remaining portion is thought to transport downward to the water table. If released to water, it dissociates almost completely and will be neutralized by natural alkalinity and carbon dioxide.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited toxicity to terrestrial organisms. May decrease pH of waterways and adversely affect aquatic life.

13. DISPOSAL CONSIDERATIONS

Reuse or reprocess, if possible. All disposals of this material must be done in accordance with local, state and federal regulations. Dispose in accordance with all applicable regulations. May be subject to disposal regulations: U.S. EPA 40 CFR 261.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

UN NUMBER:	UN1789
PROPER SHIPPING NAME:	Hydrochloric acid solution
HAZARD CLASS/ DIVISION:	8
PACKING GROUP:	II
LABELING REQUIREMENTS:	8
RQ (lbs):	RQ 5,000 Lbs. (Hydrochloric acid)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

UN NUMBER:	UN1789
SHIPPING NAME:	Hydrochloric acid solution
CLASS OR DIVISION:	8
PACKING/RISK GROUP:	II

15. REGULATORY INFORMATION

U.S. REGULATIONS

- **OSHA REGULATORY STATUS:**
  This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

- **CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):** If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Component	CERCLA Reportable Quantities:
Hydrogen chloride	5000 lb (final RQ)

- **EPCRA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**
  If a release is reportable under EPCRA, notify the state emergency response commission and local emergency planning committee. If the TPQ is met, facilities are subject to reporting requirements under EPCRA Sections 311 and 312.

Component	EPCRA RQs	Threshold Planning Quantity (TPQs)
Hydrogen chloride	5000 lb (EPCRA RQ)	500 lb (TPQ) gas only

- **EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.10):**
  Acute Health Hazard, Reactive Hazard

- **EPCRA SECTION 313 (40 CFR 372.65):**
  The following chemicals are listed in 40 CFR 372.65 and may be subject to Community Right-to Know Reporting requirements.

Component	Status:
Hydrogen chloride	Listed – Aerosol form only

- **OSHA PROCESS SAFETY (PSM) (29 CFR 1910.119):** Not regulated

NATIONAL INVENTORY STATUS

- **U.S. INVENTORY STATUS: Toxic Substance Control Act (TSCA):** All components are listed or exempt
- **TSCA 12(b):** This product is not subject to export notification
- **Canadian Chemical Inventory:** All components of this product are listed on either the DSL or the NDSL.

STATE REGULATIONS

California Proposition 65:
This product is not listed, but it may contain impurities/trace elements known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act.

Hydrogen chloride	
California Proposition 65 Cancer WARNING:	Not Listed
California Proposition 65 CRT List - Male reproductive toxin:	Not Listed
California Proposition 65 CRT List - Female reproductive toxin:	Not Listed
Massachusetts Right to Know Hazardous Substance List	Listed
New Jersey Right to Know Hazardous Substance List	sn 1012; sn 2909 (gas only)
New Jersey Special Health Hazards Substance List	corrosive
New Jersey - Environmental Hazardous Substance List	Listed
Pennsylvania Right to Know Hazardous Substance List	Listed
Pennsylvania Right to Know Special Hazardous Substances	Not Listed
Pennsylvania Right to Know Environmental Hazard List	Listed
Rhode Island Right to Know Hazardous Substance List	Listed

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

Canada - CEPA Schedule I - Toxic Substance list	Not Listed
WHMIS - Classifications of Substances:	• E - Corrosive material

16. OTHER INFORMATION

Prepared by: OxyChem Corporate HESS - Product Stewardship

Disclaimer:
This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)

Health:	3	**Flammability:**	0	**Reactivity:**	1

NFPA 704 - Hazard Identification Ratings (SCALE 0-4)

Health:	3	**Flammability:**	0	**Reactivity:**	1

Reason for Revision:
- Updated 24 Hour Emergency Telephone Number: SEE SECTION 1
- PPE recommendations have been modified: SEE SECTION 8
- Updated Transportation Information: SEE SECTION 14
- Revised California Proposition 65 Statement: SEE SECTION 15
- Revised Preparer Information: SEE SECTION 16
- Added "End of Safety Data Sheet" phrase

IMPORTANT:
The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTY OR GUARANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, SAFETY, SUITABILITY, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling, storage, disposal and other factors that may involve other or additional legal, environmental, safety or performance considerations, and OxyChem assumes no liability whatsoever for the use of or reliance upon this information. While our technical personnel will be happy to respond to questions, safe handling and use of the product remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State, local or foreign laws.

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees.

End of Safety Data Sheet

SAFETY DATA SHEET

Section 1. Identification

Product identifier : CRONOX™ AK-50 CORROSION INHIBITOR
™ a trademark of Baker Hughes Incorporated.

Product code : CROAK50

Relevant identified uses of the substance or mixture and uses advised against

Identified uses Acid Corrosion Inhibitor.

Uses advised against Not applicable.

Print date : 2/24/2017

Validation date : 2/24/2017

Version : 1

Supplier's details : Baker Hughes Canada Company
5050 47th Street S.E.
Calgary, Alberta, T2B 3S1
Canada
For Product Information: 281-276-5400
(8:00 a.m. - 5:00 p.m. CST, Monday - Friday

Emergency telephone number (with hours of operation) : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606 (North America 24 hour)
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887

Section 2. Hazard identification

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (dermal) - Category 3
ACUTE TOXICITY (inhalation) - Category 3
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SKIN SENSITIZATION - Category 1
GERM CELL MUTAGENICITY - Category 2
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (kidneys and liver) - Category 2
AQUATIC HAZARD (ACUTE) - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 2
Health Hazards Not Otherwise Classified - Category 1

GHS label elements

Hazard pictograms :

Section 2. Hazard identification

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Toxic in contact with skin or if inhaled.
Harmful if swallowed.
Causes serious eye irritation.
Causes skin irritation.
Prolonged or repeated contact may dry skin and cause irritation.
May cause an allergic skin reaction.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure. (kidneys, liver)
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace.

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF ON SKIN: Take off immediately all contaminated clothing and wash it before reuse. Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Avoid contact with skin and clothing. Wash thoroughly after handling.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
Oxyalkylated alkylphenol	10 - 20	68891-11-2
Heavy aromatic naphtha	10 - 20	64742-94-5
Isopropanol	10 - 20	67-63-0
Fatty acids	5 - 10	61790-12-3
Complex alkylaryl polyo-ester	5 - 10	68188-40-9
Tar bases, quinoline derivs., benzyl chloride-quaternized	5 - 10	72480-70-7
Formaldehyde	5 - 10	50-00-0
Acetylenic alcohol	1 - 5	5877-42-9
Propargyl alcohol	1 - 5	107-19-7
Naphthalene	1 - 5	91-20-3

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 15 minutes. Check for and remove any contact lenses. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 15 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Toxic if inhaled. Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Toxic in contact with skin. Causes skin irritation. Defatting to the skin. May cause an allergic skin reaction.

Ingestion : Harmful if swallowed. Can cause central nervous system (CNS) depression.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : respiratory tract irritation,coughing,nausea or vomiting,headache,drowsiness/fatigue, dizziness/vertigo,unconsciousness

Skin contact : irritation,redness,dryness,cracking

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides,sulfur oxides,halogenated compounds

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Section 6. Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isopropanol	**ACGIH TLV (United States, 4/2014).** STEL: 400 ppm, 0 times per shift, 15 minutes. TWA: 200 ppm, 0 times per shift, 8 hours.
Formaldehyde	**ACGIH TLV (United States, 3/2015). Skin sensitizer. Inhalation sensitizer.** C: 0.3 ppm C: 0.37 mg/m³
Propargyl alcohol	**ACGIH TLV (United States, 3/2015). Absorbed through skin.** TWA: 2.3 mg/m³, 0 times per shift, 8 hours.

Section 8. Exposure controls/personal protection

Naphthalene	TWA: 1 ppm, 0 times per shift, 8 hours. **ACGIH TLV (United States, 3/2015). Absorbed through skin.** TWA: 52 mg/m³, 0 times per shift, 8 hours. TWA: 10 ppm, 0 times per shift, 8 hours.

Consult local authorities for acceptable exposure limits.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Hand protection : Chemical-resistant gloves.

Skin protection : Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory protection : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Amber.

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Melting/freezing point : Not available.

Boiling point : Not available.

Initial Boiling Point : Not available.

Flash point : Closed cup: 37.8°C (100°F) [SFCC]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : 5 kPa (37.2 mm Hg) @ 37.8°C

Section 9. Physical and chemical properties

Vapor density : >1 [Air = 1]

Relative density : 0.9664 (15.6°C)

Density : 8.05 (lbs/gal)

Solubility in water : Insoluble

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Dynamic (15.6°C): 38 cP

VOC : Not available.

Pour Point : -23.3°C (-9.9°F)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Isopropanol is incompatible with acrylaldehyde, aluminum powder, and potassium tert-butoxide.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Heavy aromatic naphtha	LC50 Inhalation Vapor	Rat	>11.4 mg/l	6 hours
	LD50 Oral	Rat	3200 mg/kg	-
	LD50 Oral	Rat	>2000 mg/kg	-
Isopropanol	LC50 Inhalation Vapor	Rat	>10000 ppm	6 hours
	LD50 Dermal	Rabbit	6.29 g/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
Fatty acids	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>10000 mg/kg	-
Formaldehyde	LD50 Dermal	Rabbit	270 mg/kg	-
	LD50 Oral	Rat	640 mg/kg	-
	LD50 Oral	Rat	800 mg/kg	-
Acetylenic alcohol	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	4100 mg/kg	-
Propargyl alcohol	LC50 Inhalation Vapor	Rat	2000 mg/m³	2 hours
	LD50 Oral	Rat	55 mg/kg	-

Section 11. Toxicological information

Naphthalene	LD50 Dermal	Rabbit	>20 g/kg	-
CRONOX™ AK-50 CORROSION INHIBITOR	LD50 Dermal	Rabbit	630 mg/kg	-
	LD50 Oral	Rat	1400 mg/kg	-

Irritation/Corrosion

No applicable toxicity data

Sensitization

No applicable toxicity data

Mutagenicity

No applicable toxicity data

Carcinogenicity

Product/ingredient name	OSHA	IARC	NTP
Isopropanol	-	3	-
Formaldehyde	+	1	Known to be a human carcinogen.
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

No applicable toxicity data

Teratogenicity

No applicable toxicity data

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Heavy aromatic naphtha	Category 3	Not applicable.	Narcotic effects
Isopropanol	Category 3	Not applicable.	Narcotic effects
Formaldehyde	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Propargyl alcohol	Category 2	Inhalation	kidneys and liver

Aspiration hazard

Name	Result
Heavy aromatic naphtha	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Section 11. Toxicological information

General : May cause damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Suspected of causing genetic defects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (vapors)	8.145 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Isopropanol	Acute LC50 1400000 µg/l Marine water	Crustaceans - Crangon crangon	48 hours
	Acute LC50 1400000 µg/l	Fish - Gambusia affinis	96 hours
Formaldehyde	Acute EC50 0.788 mg/l Marine water	Algae - Ulva pertusa	96 hours
	Acute EC50 12.98 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute EC50 14000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 1.41 ppm Fresh water	Fish - Oncorhynchus mykiss	96 hours
	Chronic NOEC 100 µg/l Marine water	Algae - Phyllospora comosa	96 hours
Propargyl alcohol	EC50 98.1 mg/l	Algae	72 hours
	Acute EC50 3.36 mg/l	Daphnia	48 hours
	Acute LC50 4.64 mg/l	Fish	96 hours
Naphthalene	Acute EC50 1.6 ppm Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours
	Chronic NOEC 0.67 ppm Fresh water	Fish - Oncorhynchus kisutch	40 days

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Propargyl alcohol	-	-	Readily

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	UN1992	UN1992	UN1992	UN1992
UN proper shipping name	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)	FLAMMABLE LIQUID, TOXIC, N.O.S. (Contains: Isopropanol, Propargyl alcohol)
Transport hazard class(es)	3 (6.1) 	3 (6.1) 	3 (6.1) 	3 (6.1) 
Packing group	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3), 2.26-2.36 (Class 6)	**Emergency schedules (EmS)** F-E S-E	-

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

DOT Reportable Quantity

Formaldehyde, 167 gal of this product.
Propargyl alcohol, 2535 gal of this product.
Naphthalene, 837 gal of this product.

Section 14. Transport information

Marine pollutant Heavy aromatic naphtha
Acetylenic alcohol

North-America NAERG : 131

Section 15. Regulatory information

Canadian lists

Canadian NPRI : The following components are listed: Formaldehyde; Heavy aromatic solvent naphtha; Naphthalene; Isopropyl alcohol; Propargyl alcohol

CEPA Toxic substances : The following components are listed: Formaldehyde; Naphthalene

Canada (CEPA DSL): : At least one component is not listed in DSL but all such components are listed in NDSL.

Inventory list

United States : All components are listed or exempted.

Additional information

This product contains a chemical (CAS No. 72480-70-7 - tar bases, quinoline derivatives, benzyl chloride-quaternized) that has not been placed on the DSL due to a suspicion of being toxic. Environment Canada has imposed a condition which allows the importation of this substance for the purpose of use as an acid corrosion inhibitor employed in the stimulation of oil and gas wells. This substance should not be discharged into water and disposal is limited to deep-well injection. All users must be notified of these conditions in writing.

Section 16. Other information

National Fire Protection Association (U.S.A.)

History

Date of printing : 2/24/2017

Notice to reader

NOTE: The information on this SDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This SDS was prepared and is to be used for this product. If the product is used as a component in another product, this SDS information may not be applicable.

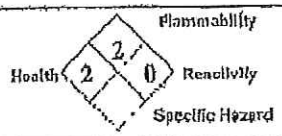
NE 1

NE-6 Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	ARBREAK 8792 DEMULSIFIER	Code	ARB8792
Supplier	Aquaness Chemical A Division Of Baker Petrolite Corporation A Baker Hughes company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday)	Version	1.0
Material Uses	Demulsifier.	Effective Date	12/14/2004
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (North America 24 hour) CANUTEC 613-996-6666 (Canada 24 hours)	Print Date	12/14/2004

National Fire Protection Association (U.S.A.)



Section 2. Composition and Information on Ingredients

Name	CAS #	% by Weight	Exposure Limits
Light aromatic naphtha	64742-95-6	30-60	Not available.
1,2,4-Trimethylbenzene	95-63-6	10-30	Not available.
1,2,3-Trimethylbenzene	526-73-8	1-5	Not available.
1,3,5-Trimethylbenzene	108-67-8	5-10	Not available.
Xylene	1330-20-7	1-5	ACGIH (United States). TWA: 434 mg/m³ 8 hour(s). STEL: 651 mg/m³ 15 minute(s). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). TWA: 435 mg/m³ 8 hour(s). STEL: 655 mg/m³ 15 minute(s).
2-Ethylhexanol	104-76-7	5-10	Manufacturer TWA: 20 ppm

While trimethylbenzene isomers do not have exposure limits, trimethylbenzene (mixed isomers)(CAS No. 25551-13-7) has TWA value of 25 ppm for both ACGIH and OSHA (revoked limit).

Continued on Next Page

Section 3. Hazards Identification

Physical State and Appearance	State: Liquid., Color: Dark Brown., Odor: Acidic. Aromatic hydrocarbon.
CERCLA Reportable Quantity	Xylene 793 gal.
Hazard Summary	WARNING. May cause chronic effects. Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded. May be irritating to eyes, skin and respiratory tract. May cause central nervous system (CNS) effects if inhaled.
Routes of Exposure	Skin (Contact), Eyes, Inhalation.
Potential Acute Health Effects	
Eyes	May be severely irritating to the eyes.
Skin	May be irritating to skin.
Inhalation	May cause central nervous system (CNS) effects if inhaled. May be irritating to lungs.
Ingestion	Not considered a likely route of exposure, however, may be harmful or cause irritation if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: blood system, kidneys, nervous system, liver, gastrointestinal tract, respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	May be harmful if ingested. This product may be aspirated into the lungs during swallowing or vomiting of swallowed material. Aspiration into the lungs may produce chemical pneumonitis, pulmonary edema, and hemorrhaging. Repeated or prolonged contact may cause dermatitis (inflammation) and defatting of the skin (dryness).

Section 4. First Aid Measures

Eye Contact	Flush eyes with plenty of water for 15 minutes, occasionally lifting upper and lower eyelids. Get medical attention immediately.
Skin Contact	Remove and launder or clean contaminated clothing and shoes. Wash with soap and water for at least 15 minutes or until no evidence of material remains. Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions. Get medical attention if symptoms appear.
Notes to Physician	Not available.
Additional First Aid Remarks	If product is ingested and vomiting occurs naturally, have person lean forward to reduce the risk of aspiration into the lungs. If breathing has stopped or the heart has stopped, trained personnel should immediately administer artificial respiration or cardiopulmonary resuscitation, as required.

Continued on Next Page

Section 5. Fire Fighting Measures

Flammability of the Product	Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded.
OSHA Flammability Class	II
Autoignition temperature	Not available.
Flash Points	Closed cup: 46.7°C (116°F). (PMCC)
Flammable Limits	L.E.L. Not available. U.E.L. Not available.
Products of Combustion	These products are carbon oxides (CO, CO_2) nitrogen oxides (NO, NO_2...) sulfur oxides (SO_2, SO_3...).
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static, Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Not available.

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Keep personnel removed and upwind of spill. Shut off all ignition sources; no flares, smoking, or flames in hazard area. Approach release from upwind. Shut off leak if it can be done safely. Contain spilled material. Keep out of waterways. Dike large spills and use a non-sparking or explosion-proof means to transfer material to an appropriate container for disposal. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances from spill and flash back, if ignited. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.
Additional Accidental Release Measures Remarks	Not available.

Continued on Next Page

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or spray mists. Use only with adequate ventilation. Store in a dry, cool and well ventilated area. Keep away from heat, sparks and flame. Keep away from incompatibles. Keep container tightly closed and dry. To avoid fire or explosion, ground container equipment and personnel before handling product.
Additional Handling and Storage Remarks	Not available.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes Chemical safety goggles.

Body Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.

Hands Chemical resistant gloves. Nitrile or Neoprene gloves. 4H gloves.

Feet Chemical resistant boots or overshoes.

Other Information Not available.

Additional Exposure Control Remarks	Not available.

Section 9. Typical Physical and Chemical Properties

Physical State and Appearance	Liquid.	Odor	Acidic. Aromatic hydrocarbon.
pH	8.5 - 9.5 (5% of product in 75% isopropanol / 25% water solution)	Color	Dark Brown.
Specific gravity	0.962 - 0.964 @ 16°C (60°F)		
Density	7.93 - 8.03 lbs/gal @ 16°C (60°F)		
Vapor Density	>1 (Air = 1)		
Vapor Pressure	7.6 - mmHg @ 21°C (70°F) Calculated Value for all Components.		
Evaporation Rate	Not Available or Not Applicable for Solids.		
VOC	Not available.		
Viscosity	11 - 12 cps @ 38°C (100°F) Kinematic		
Pour Point	-40°C (-40°F)		
Solubility (Water)	Dispersible		
Boiling Point	Not available.		

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Physical Chemical Comments	Not available.

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Oxidizing material.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Hazardous polymerization is not expected to occur.
Special Stability & Reactivity Remarks	Not available.

Section 11. Toxicological Information

Component Toxicological Information

Acute Animal Toxicity

Light aromatic naphtha	ORAL (LD50): Acute: 2800 mg/kg [Rat]. 8400 mg/kg [Rat].
1,2,4-Trimethylbenzene	ORAL (LD50): Acute: 5000 mg/kg [Rat]. VAPOR (LC50): Acute: 18000 mg/m³ 4 hour(s) [Rat].
1,2,3-Trimethylbenzene	Not available.
1,3,5-Trimethylbenzene	VAPOR (LC50): Acute: 24000 mg/m³ 4 hour(s) [Rat].
Xylene	ORAL (LD50): Acute: 4300 mg/kg [Rat]. 3523 mg/kg [Male rat]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit]. VAPOR (LC50): Acute: 5000 ppm 4 hour(s) [Rat].
2-Ethylhexanol	ORAL (LD50): Acute: 3730 mg/kg [Rat]. 2500 mg/kg [Mouse]. DERMAL (LD50): Acute: 1970 mg/kg [Rabbit].

Chronic Toxicity Data

1) Light aromatic naphtha

Ingestion has produced Central Nervous System effects in laboratory animals. (EPA/OTS 87-8214199 and 88-920000348)

2) 1,2,4-Trimethylbenzene

1,2,4-Trimethylbenzene, also know as pseudocumene, is a component of this product. Chronic pseudocumene exposure may provoke bronchospasm with cough and wheezing (Plunkett, 1976; ACGIH, 1991; Baltig et al, 1956). Respiratory distress was noted in experimental animals following sub acute inhalation exposure (Gage, 1970). Nervousness and anxiety were noted with chronic occupational exposure (Baltig et al, 1956; ACGIH, 1991).

At the time of this review, no studies were found on the potential adverse reproductive effects of pseudocumene in humans, but trimethylbenzenes (including pseudocumene) can cross the placental barrier (Clayton & Clayton, 1994; Dorofy et al, 1976). In an experimental animal study, offspring born to pregnant rats exposed to pseudocumene were healthy at birth and grew normally (Cameron et al, 1938).

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Blood effects such as anemia and delayed clotting time have been noticed in workers chronically exposed to a solvent containing trimethylbenzene. The blood effects, however, may have been due to a contaminant in the solvent such as benzene (a known blood toxin).

3) 1,2,3-Trimethylbenzene

Not available.

4) 1,3,5-Trimethylbenzene

1,3,5-Trimethylbenzene (Mesitylene) is a component of this product. Chronic asthmatic-like bronchitis may be a delayed chronic hazard (EPA, 1985; Laham, 1987; HSDB, 1997). Nervousness, tension, and anxiety have been noted in chronically exposed workers with exposure to a mixture of solvents including mesitylene (HSDB, 1997). Elevated alkaline phosphates and SGOT(liver enzymes) levels have been noted in chronic animal inhalation studies (Clayton & Clayton, 1994). These effects have not been reported in exposed humans. (Reprotext)

Thrombocytopenia (a lack of platelets in the blood) with bleeding from the gums and nose and mild anemia may occur with chronic exposure to mesitylene as a component of the commercial solvent mixture, "Fleet-X-DV-99" (Plunkett, 1976; Finkel, 1983; HSDB, 1997). Coagulation (clotting of the blood) times were delayed by about 40% in a group of workers chronically exposed to a mixture of solvents containing about 30% mesitylene (Laham, 1987). These hematological disorders may have been due to a contaminant, such as benzene (Hathaway et al, 1996). Thrombocytosis (an increase of platelets in the blood) and thrombocytopenia have been noted in rabbits (Clayton & Clayton, 1994). (Reprotext)

1,3,5-Trimethylbenzene has been positive in a mutagenicity assay (Lewis, 1992). (Reprotext)

5) Xylene

Xylene (mixed isomers) is a component of this product. Effects of chronic exposure to xylene are similar to those of acute exposure, but may be more severe. Chronic inhalation reportedly was associated with headache, tremors, apprehension, memory loss, weakness, dizziness, loss of appetite, nausea, ringing in the ears, irritability, thirst, anemia, mucosal bleeding, enlarged liver, and hyperplasia, but not destruction of the bone marrow (Clayton & Clayton, 1994; ILO, 1983). Some earlier reports of effects of chronic exposure to xylene have been questioned, as exposures were not limited to xylene alone.

Effects on the blood have been reported from chronic exposure to as little as 60 mg/m3 (Pap & Varga, 1987). Repeated exposure can damage bone marrow, causing low blood cell count and can damage the liver and kidneys (NJ Department of Health, Hazardous Substance Fact Sheet). Chronic xylene exposure (usually mixed with other solvents) has produced irreversible damage to the CNS (ILO, 1983). CNS effects may be exacerbated by ethanol abuse (Savolainen, 1980). Xylene may damage hearing or enhance sensitivity to noise in chronic occupational exposures (Morata et al, 1994), probably from neurotoxic mechanism. Tolerance to xylene can occur over the work week and disappear over the weekend. (ACGIH, 1992).

Inhalation exposure has produced fetotoxicity and postnatal developmental toxicity in laboratory animals. (API, 1978; Kensington, MD, EPA/OTS Document No. 878210350 and Hass, U., et al, 1995, Neurotoxicology and Teratology 17: 341-349 and 1997, Neurotoxicology 18: 547-552)

6) 2-Ethylhexanol

2-Ethylhexanol (2EH) is a component of this product. Chronic overexposure has been suggested as a cause of the following effects in laboratory animals, and may aggravate pre-existing disorders of these organs in humans: liver abnormalities, kidney damage, lung damage, cardiac abnormality, blood abnormalities, and spleen damage. (Vendor MSDS)

In subchronic oral studies, 2EH has produced liver and kidney effects in laboratory animals. (RTECS)

2EH has produced developmental effects in oral studies in laboratory animals including teratogenicity at maternally toxic doses (Clayton & Clayton, 1994). (HSDB)

Continued on Next Page

Product Toxicological Information	
Acute Animal Toxicity	Not available.
Target Organs	blood system, kidneys, nervous system, liver, gastrointestinal tract, respiratory tract, skin/epithelium, eyes.
Other Adverse Effects	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Biodegradable/OECD	Not available.
Toxicity of the Products of Biodegradation	Not available.
Special Remarks	Not available.

Section 13. Disposal Considerations

Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Additional Waste Remarks	Not available.

Section 14. Transport Information

DOT Classification	FLAMMABLE LIQUID, N.O.S. (Contains: Light aromatic naphtha, 1,2,4-Trimethylbenzene), 3, UN1993, III	
DOT Reportable Quantity	Xylene 793 gal.	
Marine Pollutant	Not applicable.	
Additional DOT Information	Not available.	
Emergency Response Guide Page Number	128	

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Section 15. Regulatory Information

HCS Classification	Target organ effects, Combustible liquid. At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Vapors can flow along surfaces to distant ignition sources and flash back. Static discharges can cause ignition or explosion when container is not bonded. Irritant.
U.S. Federal Regulations	
Environmental Regulations	Extremely Hazardous Substances: Not applicable to any components in this product. SARA 313 Toxic Chemical Notification and Release Reporting: 1,2,4-Trimethylbenzene; Xylene; SARA 302/304 Emergency Planning and Notification substances: Not applicable to any components in this product. Hazardous Substances (CERCLA 302): Xylene 793 gal.; SARA 311/312 MSDS distribution - chemical inventory - hazard identification: fire; immediate health hazard; delayed health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Not applicable to any components in this product. Clean Water Act (CWA) 311 Hazardous Substances: Xylene; Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Not applicable to any components in this product.
Threshold Planning Quantity (TPQ)	Not applicable.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product contains the following components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States: Xylene; Naphthalene.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	B-3, D-2A, D-2B
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Harmonized Tariff Code	Not available.
Other Regulatory Information	No further regulatory information is available.

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Section 16. Other Information

Other Special Considerations File 2634

Baker Petrolite Disclaimer

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Petrolite, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Safety Data Sheet

Section 1: Identification

Product identifier

Product Name • **PLEXGEL BREAKER XPA**

Product Code • 01025

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Petrochemical industry

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net

Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Eye Irritation 2

Label elements

OSHA HCS 2012

WARNING

Hazard statements • Causes serious eye irritation

Precautionary statements

Prevention • Wear eye/face protection - Safety glasses with side-shield, .
Wash thoroughly after handling.

Response • IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If eye irritation persists: Get medical advice/attention.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage/Disposal

- Store in a well-ventilated place. Keep cool.
  Store in a well-ventilated place. Keep container tightly closed.
  Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.
  Wash thoroughly after handling.

Other hazards

OSHA HCS 2012

- No data available

Canada

According to: WHMIS

Classification of the substance or mixture

WHMIS

- Other Toxic Effects - D2B

Label elements

WHMIS

- Other Toxic Effects - D2B

Other hazards

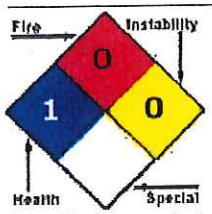
WHMIS

- No other WHMIS hazards than those reported above.
  See all section 2 hazard statements.

Other information

- One should be specifically trained before communicating or using the following National Fire Protection Association (NFPA) and or Hazardous Materials Identification System (HMIS) categories since the definition and scales applied do not match US OSHA GHS and HAZCOM 2012 definitions and rules.

NFPA



- Health Hazard: 1 - Caution: May be irritating
  Reactivity: 0 - Stable: Not reactive under normal conditions
  Flammability: 0 - Not combustible

HMIS

- HMIS Health - 1: Slight Hazard
  HMIS Flammability - 0: Minimal Hazard
  HMIS Physical Hazard - 0: Minimal Hazard

Section 3 - Composition/Information on Ingredients

Substances

- Not applicable. This material is a mixture.

Mixtures

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

Composition			
Chemical Name	Identifiers	%	Hazardous
Hydrogen peroxide	CAS:7722-84-1	5% TO 8%	Yes

- This product is considered hazardous according to the OSHA Hazard Communication Standard 29 CFR 1910.1200. Under Canadian regulations (Workplace Hazardous Materials Information System (WHMIS) - Hazardous Products Act (HPA), this material is hazardous.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation
- Get medical attention immediately if symptoms occur. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin
- Get medical attention immediately if symptoms occur. Rinse skin immediately with plenty of water for 15-20 minutes. Take off contaminated clothing and wash before reuse.

Eye
- Flush eyes with water for at least 15 minutes while holding eyelids open. Get medical attention immediately. If easy to do, remove contact lenses, if worn.

Ingestion
- Vomiting may occur spontaneously. To prevent aspiration of swallowed product, lay victim on side. Do NOT induce vomiting. Get medical attention immediately. Give nothing to drink.

Most important symptoms and effects, both acute and delayed

- Causes serious eye irritation.

Indication of any immediate medical attention and special treatment needed

Notes to Physician
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically. There is no specific antidote available.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media
- LARGE FIRES: Dry chemical, CO2, alcohol-resistant foam or water spray.
  SMALL FIRES: Dry chemical, CO2, water spray or alcohol-resistant foam.

Unsuitable Extinguishing Media
- DO NOT use high volume water jet.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- Hydrogen peroxide decomposes to release oxygen.
  Containers may explode when heated.

Hazardous Combustion Products
- Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes).

Advice for firefighters

- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.
  Standard procedures for chemical fires.

Collect contaminated fire extinguishing materials separately. This must be not be discharged into drains.
Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Cool closed containers exposed to fire with water spray.
Refer to Section 8 - Exposure Controls/Personal Protection.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions

- Avoid contact with eyes. Wear eye/face protection. Refer to Section 8 - Exposure Controls/Personal Protection.

Emergency Procedures

- Keep unauthorized personnel away. Avoid all contact. Strict hygiene. Ventilate closed spaces before entering. Stop leak if you can do it without risk.

Environmental precautions

- Spills may be reportable to the National Response Center (800-424-8802) and to state and or local agencies. Do not flush to sewer or allow to enter waterways. Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

Methods and material for containment and cleaning up

Containment/Clean-up Measures

- Dike to collect large liquid spills.
  Contain and recover liquid when possible.
  Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
  Wash remainder with plenty of water.
  Water will make area slippery.
  Repeat cleaning process until the contaminated surface is no longer slippery.
  Refer to Section 13 - Disposal Considerations.

Prohibited Materials

- Strong alkalines and oxidizing materials. Sources of ignition - heat, sparks and open flames.

Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection.

Section 7 - Handling and Storage

Precautions for safe handling

Handling

- Avoid contact with skin and eyes. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage

- Store locked up. Keep only in the original container/package in a cool well-ventilated place. Store away from alkali(bases)and oxidizing agents. Avoid excessive heat.

Incompatible Materials or Ignition Sources

- Reactive with strong bases and oxidizing agents.

Refer to Section 8 - Exposure Controls/Personal Protection.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines

- Use only with adequate ventilation. Avoid all contact. Strict hygiene.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Hydrogen peroxide (7722-84-1)	TWAs	1 ppm TWA	1 ppm TWA; 1.4 mg/m3 TWA	1 ppm TWA; 1.4 mg/m3 TWA

Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Respiratory

- When respirators are required, use NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face

- Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material. Wear eye/face protection - Safety glasses with Side-shield, .

Skin/Body

- Wear protective gloves/protective clothing/eye protection/face protection.

General Industrial Hygiene Considerations

- Avoid all contact. Strict hygiene. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Keep away from food, drink and animal feeding stuffs.

Environmental Exposure Controls

- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Additional Protection Measures

- The protective equipment must be selected in accordance with local standards and in cooperation with the supplier of the protective equipment. Selection of the appropriate personal protective equipment should be based upon an evaluation of the performance characteristics of the protective equipment relative to the tasks to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use. Emergency equipment should be immediately accessible, with instructions for use. Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use.

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Color	Red
Odor	Odorless	Odor Threshold	No data available
General Properties			
Boiling Point	214 F(101.1111 C)	Melting Point	No data available
Decomposition Temperature	No data available	pH	5.5 to 6.5
Specific Gravity/Relative Density	= 1.03 Water=1	Density	1.03 g/mL
Water Solubility	Soluble	Viscosity	No data available
Volatility			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
Flammability			
Flash Point	No data available	UEL	No data available
LEL	No data available	Autoignition	No data available
Flammability (solid, gas)	None		
Environmental			
Octanol/Water Partition coefficient	No data available	Bioaccumulation Factor	None

Section 10: Stability and Reactivity

Reactivity

- Hydrogen peroxide decomposes to release oxygen.

Chemical stability

- This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Excess heat.

Incompatible materials

- Hydrogen peroxide decomposes to release oxygen. Keep away from combustible and flammable materials.

Hazardous decomposition products

- Hydrogen peroxide decomposes to release oxygen. Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes)

Section 11 - Toxicological Information

Information on toxicological effects

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation - Classification criteria not met; Acute Toxicity - Oral - Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met
Skin corrosion/Irritation	OSHA HCS 2012 • Classification criteria not met
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
STOT-RE	OSHA HCS 2012 • Classification criteria not met
STOT-SE	OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Serious eye damage/Irritation	OSHA HCS 2012 • Eye Irritation 2

Medical Conditions Aggravated by Exposure
- None known.

Potential Health Effects

Inhalation

Acute (Immediate)
- Classification criteria not met.

Chronic (Delayed)
- No data available

Skin

Acute (Immediate)
- Classification criteria not met.

Chronic (Delayed)
- No data available

Eye

Acute (Immediate)
- Causes serious eye irritation.

Chronic (Delayed)
- No data available

Ingestion

Acute (Immediate)
- May cause burns of the gastrointestinal tract if swallowed.

Chronic (Delayed)
- No data available

Section 12 - Ecological Information

Toxicity
- No data available

Persistence and degradability
- No data available

Bioaccumulative potential
- No data available

Mobility in Soil
- No data available

Other adverse effects
- According to test data on the components and the classification criteria for mixtures, this product has no known adverse effects on aquatic organisms.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations.

Packaging waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Empty containers pose a fire risk, evaporate the residue under a fume hood. Rinse with an appropriate solvent.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	Not regulated	NDA	NDA	NDA	NDA
TDG	Not regulated	NDA	NDA	NDA	NDA
IMO/IMDG	Not regulated	NDA	NDA	NDA	NDA
IATA/ICAO	Not regulated	NDA	NDA	NDA	NDA

Special precautions for user	• No data available
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	• No data available
Other information	• Transportation status: The listed Transportation Classification does not address all regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

Note: The above regulatory prescriptions are those valid on the date of the publication of this sheet. Given the possible evolution of transportation regulations for Hazardous materials, it would be advisable to check their validity with your sales office.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • Acute

United States

Environment

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities		
• Hydrogen peroxide	7722-84-1	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs		
• Hydrogen peroxide	7722-84-1	1000 lb EPCRA RQ (concentration >52%)
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs		
• Hydrogen peroxide	7722-84-1	1000 lb TPQ (concentration >52%)
U.S. - CERCLA/SARA - Section 313 - Emission Reporting		
• Hydrogen peroxide	7722-84-1	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List		
• Hydrogen peroxide	7722-84-1	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
• Hydrogen peroxide	7722-84-1	Not Listed

Other Information

• All components of this product are listed on the following:

- US TSCA Inventory.

Section 16 - Other Information

Last Revision Date	• 16/April/2015
Preparation Date	• 16/April/2015
Disclaimer/Statement of Liability	• The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport,

dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but does not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
IARC = International Agency for Research on Cancer
MSHA = Mine Safety and Health Administration
NIOSH = National Institute of Occupational Safety and Health
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
STEL = Short Term Exposure Limits are based on 15-minute exposures
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name Plexslick 957

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses advised against

- For industrial use only.

1.3 Details of the supplier of the safety data sheet

Company

Chemplex, Solvay Group
506 CR 137
Snyder, TX 97549
Phone: (325) 573-7298

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture

HCS 2012 (29 CFR 1910.1200)

- Not a hazardous product according to Globally harmonized System (GHS)

2.2 Label elements

HCS 2012 (29 CFR 1910.1200)

- Not a hazardous product according to Globally harmonized System (GHS)

2.3 Other hazards which do not result in classification

- Slightly irritating to eyes.
- Aspiration of the swallowed or vomited product can cause severe pulmonary complications.
- No specific risk when handled in accordance with good occupational hygiene and safety practice.
- Does NOT present any particular fire hazard.
- Hazardous reactions may occur on contact with certain chemicals. (Refer to the list of incompatible materials section 10: "Stability-Reactivity").

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

- Chemical nature: Emulsion of petroleum distillate and aqueous solution.

Hazardous Ingredients and Impurities

Chemical Name	Identification number CAS-No.	Concentration [%]
Distillates (petroleum), hydrotreated light	64742-47-8	14 - 19

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

- Show this material safety data sheet to the doctor in attendance.
- First responder needs to protect himself.
- Place affected apparel in a sealed bag for subsequent decontamination.

In case of inhalation

- Remove to fresh air.
- If breathing is difficult, give oxygen.
- If breathing has stopped, apply artificial respiration.
- Consult a physician if necessary.

In case of skin contact

- Wash off with soap and plenty of water.
- Remove contaminated clothing and shoes.
- Wash contaminated clothing before re-use.
- Call a physician if irritation develops or persists.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Consult a physician if necessary.

In case of ingestion

- Do NOT induce vomiting.
- Do not give anything to drink.
- Seek medical advice.
- Do not leave the victim unattended.
- Vomiting may occur spontaneously
- Risk of product entering the lungs on vomiting after ingestion.
- Lay victim on side.

4.2 Most important symptoms and effects, both acute and delayed

Effects

- No information available.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

SECTION 5: Firefighting measures

Flash point	> 200 °F (> 93 °C) closed cup
	Flammability class: Will burn
Autoignition temperature	no data available
Flammability / Explosive limit	no data available

5.1 Extinguishing media

Suitable extinguishing media

- Water mist
- Carbon dioxide (CO2)
- Foam
- Dry chemical

Unsuitable extinguishing media

- Do not use a solid water stream as it may scatter and spread fire.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- Under fire conditions:
- Will burn
- (following evaporation of water)
- Harmful or toxic vapors are released.

Hazardous combustion products:

- Hazardous combustion products
- Carbon oxides
- Nitrogen oxides (NOx)
- Sulfur oxides

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

Specific fire fighting methods

- Cool closed containers exposed to fire with water spray.
- Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Avoid contact with the skin and the eyes.
- Wear suitable protective equipment.
- For personal protection see section 8.
- Stop the leak. Turn leaking containers leak-side up to prevent the escape of liquid.

6.2 Environmental precautions

- Do not let product enter drains.
- Prevent product from entering sewage system.
- Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies

6.3 Methods and materials for containment and cleaning up

Recovery

- Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).
- Sweep up and shovel into suitable containers for disposal.
- Never return spills in original containers for re-use.

Decontamination / cleaning

- Clean contaminated surface thoroughly.
- Wash off with plenty of water.
- Recover the cleaning water for subsequent disposal.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.

Disposal

- Dispose of in accordance with local regulations.

Additional advice

- Material can create slippery conditions.

6.4 Reference to other sections

- no data available

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Avoid inhalation, ingestion and contact with skin and eyes.
- Handle in accordance with good industrial hygiene and safety practice.

Hygiene measures

- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

- Keep in a dry, cool and well-ventilated place.
- Keep container tightly closed.
- Do not freeze.

- Keep away from open flames, hot surfaces and sources of ignition.
- Keep away from incompatible materials to be indicated by the manufacturer

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Ingredients	Value type	Value	Basis
Distillates (petroleum), hydrotreated light	TWA	200 mg/m3	American Conference of Governmental Industrial Hygienists
	Danger of cutaneous absorption Expressed as :as total hydrocarbon vapor		
Distillates (petroleum), hydrotreated light	TWA	500 ppm 2,000 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.		

8.2 Exposure controls

Control measures

Engineering measures

- Effective exhaust ventilation system

- Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures :

Individual protection measures

Respiratory protection

- Use a respirator with an approved filter if a risk assessment indicates this is necessary.
- When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Hand protection

- Where there is a risk of contact with hands, use appropriate gloves
- Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.
- Gloves must be inspected prior to use.

- Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Eye protection
- Safety glasses with side-shields
- Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material.
- Eye contact should be prevented through the use of:

Skin and body protection
- Remove and wash contaminated clothing before re-use.
- Choose body protection according to the amount and concentration of the dangerous substance at the work place.
- Protective suit
- Boots

Hygiene measures
- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

Protective measures
- Ensure that eyewash stations and safety showers are close to the workstation location.
- The protective equipment must be selected in accordance with current local standards and in cooperation with the supplier of the protective equipment.
- Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Physical state: liquid Color: white
Odor	oily
Odor Threshold	no data available
pH	not determined
Boiling point/boiling range	no data available
Flash point	> 200 °F (> 93 °C) closed cup

	Flammability class: Will burn
Evaporation rate (Butylacetate = 1)	no data available
Flammability (solid, gas)	no data available
Flammability (liquids)	no data available
Flammability / Explosive limit	no data available
Autoignition temperature	no data available
Vapor pressure	no data available
Vapor density	no data available
Density	1.02 - 1.11 g/cm3 (25 °C)
Solubility	no data available
Partition coefficient: n-octanol/water	no data available
Thermal decomposition	no data available
Viscosity	no data available
Explosive properties	no data available
Oxidizing properties	no data available

9.2 Other information

no data available

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Polymerization

- Hazardous polymerization does not occur.

10.4 Conditions to avoid

- Heat, flames and sparks.

10.5 Incompatible materials

- Strong oxidizing agents

10.6 Hazardous decomposition products

- On combustion or on thermal decomposition (following the evaporation of water) releases:
- Carbon oxides
- Nitrogen oxides (NOx)
- Sulfur oxides

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	no data available
Acute inhalation toxicity	no data available
Acute dermal toxicity	no data available
Acute toxicity (other routes of administration)	no data available
Skin corrosion/irritation	Not classified as irritating to skin According to the data on the components
Serious eye damage/eye irritation	slight irritation
Respiratory or skin sensitization	Not classified as sensitizing by skin contact According to the data on the components

Mutagenicity

Genotoxicity in vitro	no data available
Genotoxicity in vivo	no data available
Carcinogenicity	no data available

Ingredients	CAS-No.	Rating	Basis
Distillates (petroleum), hydrotreated light	64742-47-8	Confirmed animal carcinogen with unknown relevance to humans	ACGIH

This product does not contain any ingredient designated as probable or suspected human carcinogens by:

NTP
IARC
OSHA

Toxicity for reproduction and development

Toxicity to reproduction / fertility	no data available

Developmental Toxicity/Teratogenicity	no data available

STOT

STOT-single exposure	no data available
STOT-repeated exposure	no data available
Aspiration toxicity	no data available

SECTION 12: Ecological Information

12.1 Toxicity no data available

12.2 Persistence and degradability

Biodegradation

Biodegradability	The product itself has not been tested.

12.3 Bioaccumulative potential no data available

12.4 Mobility in soil no data available

12.5 Results of PBT and vPvB assessment This mixture contains no substance considered to be persistent, bioaccumulating, and toxic (PBT).
This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).

12.6 Other adverse effects no data available

Ecotoxicity assessment

Acute aquatic toxicity	This product has no known ecotoxicological effects. According to the data on the components
Chronic aquatic toxicity	This product has no known ecotoxicological effects. According to the data on the components

SECTION 13: Disposal considerations

13.1Waste treatment methods

Product Disposal

- Chemical additions, processing or otherwise altering this material may make the waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

Waste Code

- Environmental Protection Agency
- Hazardous Waste – NO

Advice on cleaning and disposal of packaging

- Completely empty the packaging prior to decontamination.
- Rinse with an appropriate solvent.
- Dispose of in accordance with local regulations.

Measure for waste avoidance or recovery

- Do not dispose of the product at a dump.

SECTION 14: Transport information

DOT
not regulated

TDG
not regulated

NOM
no data available

IMDG
not regulated

IATA
not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	On TSCA Inventory
Canadian Domestic Substances List (DSL)	All components of this product are on the Canadian DSL.
Australia Inventory of Chemical Substances (AICS)	On the inventory, or in compliance with the inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	On the inventory, or in compliance with the inventory
Korea. Korean Existing Chemicals Inventory (KECI)	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	On the inventory, or in compliance with the inventory

15.2 Federal Regulations

US. EPA EPCRA SARA Title III

SARA Hazard Designation Sections 311/312 (40 CFR 370)

Fire Hazard	no
Reactivity Hazard	no
Sudden Release of Pressure Hazard	no
Acute Health Hazard	no
Chronic Health Hazard	no

Section 313 Toxic Chemicals (40 CFR 372.65)

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)

Ingredients	CAS-No.	Reportable quantity
Oxirane	75-21-8	10 lb
Formaldehyde	50-00-0	100 lb

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)

Ingredients	CAS-No.	Reportable quantity
Oxirane	75-21-8	10 lb
Formaldehyde	50-00-0	100 lb

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Ingredients	CAS-No.	Reportable quantity
Diethanolamine	111-42-2	100 lb
Oxirane	75-21-8	10 lb
1,4-Dioxane	123-91-1	100 lb
Formaldehyde	50-00-0	100 lb
Methanol	67-56-1	5000 lb
Acetaldehyde	75-07-0	1000 lb

15.3 State Regulations

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

WARNING! This product contains a chemical known in the State of California to cause cancer.

Ingredients	CAS-No.
Diethanolamine	111-42-2
Oxirane	75-21-8
Acetaldehyde	75-07-0
1,4-Dioxane	123-91-1
Formaldehyde	50-00-0

WARNING: This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

Ingredients	CAS-No.
Methanol	67-56-1
Oxirane	75-21-8

SECTION 16: Other information

NFPA (National Fire Protection Association) - Classification

Health	0 minimal
Flammability	1 slight
Instability or Reactivity	0 minimal

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health	0 minimal
Flammability	1 slight
Reactivity	0 minimal
PPE	Determined by User; dependent on local conditions

Further information

- Product classified under the US GHS format.

Date Prepared: 03/13/2015

Key or legend to abbreviations and acronyms used in the safety data sheet

- TWA	8-hour, time-weighted average
- ACGIH	American Conference of Governmental Industrial Hygienists
- OSHA	Occupational Safety and Health Administration
- NTP	National Toxicology Program

- IARC — International Agency for Research on Cancer
- NIOSH — National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Safety Data Sheet

Chemplex
SOLVAY GROUP

Section 1: Identification

Product identifier

Product Name • Claymax

Synonyms • Product number: 00601

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Potassium chloride substitute in oil well treatment

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net

Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Classification criteria not met

Label elements

OSHA HCS 2012

Hazard statements • No label element(s) required

Other hazards

OSHA HCS 2012 • This product is not considered hazardous under the U.S. OSHA 29 CFR 1910.1200 Hazard Communication Standard.

Canada

According to WHMIS

Classification of the substance or mixture

WHMIS • Classification criteria not met

Label elements

WHMIS

- No label element(s) required

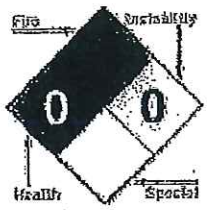
Other hazards

WHMIS

- In Canada, the product mentioned above is not considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

Other information

NFPA



See Section 12 for Ecological Information.

Section 3 - Composition/Information on Ingredients

Substances

Mixtures

Composition					
Chemical Name	**Identifiers**	**%**	**LD50/LC50**	**Classifications According to Regulation/Directive**	**Comments**
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	CAS:67-48-1	40% TO 70%	Ingestion/Oral-Rat LD50 • 3400 mg/kg	OSHA HCS 2012: Not Classified - Criteria not met	NDA
Water	CAS:7732-18-5	15% TO 40%	Ingestion/Oral-Rat LD50 • >90 mL/kg	OSHA HCS 2012: Not Hazardous	NDA

- Material does not meet the criteria of a mixture.

See Section 11 for Toxicological Information.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- Move victim to fresh air. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing.

Skin

- IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

Eye

- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes.

Ingestion

- Do NOT induce vomiting. Get medical attention immediately.

Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Notes to Physician	• All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media	• LARGE FIRE: Water spray, fog or regular foam. SMALL FIRES: Dry chemical, CO2, water spray or regular foam.
Unsuitable Extinguishing Media	• No data available.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards	• No unusual fire and explosion hazards known.
Hazardous Combustion Products	• No data available.

Advice for firefighters

• Structural firefighters' protective clothing will only provide limited protection.
Wear positive pressure self-contained breathing apparatus (SCBA).

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions	• Wear appropriate personal protective equipment. Do not walk through spilled material.
Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Ventilate closed spaces before entering.

Environmental precautions

• Prevent entry into waterways, sewers, basements or confined areas.

Methods and material for containment and cleaning up

Containment/Clean-up Measures	• Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. SMALL SPILLS: Take up with sand or other non-combustible absorbent material and place into containers for later disposal. LARGE SPILLS: Dike far ahead of liquid spill for later disposal.

Section 7 - Handling and Storage

Precautions for safe handling

Handling	• Wear appropriate personal protective equipment. Avoid contact with skin and eyes. DO NOT ingest. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage	• Keep away from heat, ignition sources and strong oxidizing agents. Store in a cool, dry, well-ventilated place. Keep container closed when not in use. Avoid storing at elevated temperatures and freezing temperatures. Optimal storage temperature: 41-81 F; Ground all equipment containing material.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines	• No applicable exposure limits have been established for the components or the

material.

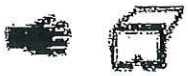
Exposure controls

Engineering Measures/Controls

- Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use. Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Pictograms

- 

Respiratory

- In case of insufficient ventilation, wear suitable respiratory equipment.

Eye/Face

- Wear protective eyewear (goggles, face shield, or safety glasses).

Skin/Body

- Wear appropriate gloves.

General Industrial Hygiene Considerations

- Do not get in eyes or on skin or clothing. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

Environmental Exposure Controls

- No data available

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Colorless to yellow liquid with slight fish odor.
Color	Colorless to pale yellow.	Odor	Slight fish odor.
Odor Threshold	Data lacking		
General Properties			
Boiling Point	> 212 F(> 100 C)	Melting Point	Data lacking
Decomposition Temperature	Data lacking	pH	Near neutral (1% solution with water)
Specific Gravity/Relative Density	1.0866 Water=1	Water Solubility	100 %
Viscosity	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Not Defined
Evaporation Rate	Data lacking		
Flammability			
Flash Point	> 200 F(> 93.3333 C) Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

Section 10: Stability and Reactivity

Reactivity

- No dangerous reaction known under conditions of normal use.

Chemical stability

- Stable

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- No data available.

Incompatible materials

- No data available.

Hazardous decomposition products

- No data available.

Section 11 - Toxicological Information

Information on toxicological effects

Components		
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride (40% TO 70%)	67-48-1	**Acute Toxicity:** Ingestion/Oral-Rat LD50 • 3400 mg/kg; *Sense Organs and Special Senses:Eye:***Chromodacyroffhea**; *Behavioral:***Excitement**; *Lungs, Thorax, or Respiration:***Respiratory depression**

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	OSHA HCS 2012 • Classification criteria not met
Skin corrosion/irritation	OSHA HCS 2012 • Classification criteria not met
Skin sensitization	OSHA HCS 2012 • Classification criteria not met
STOT-RE	OSHA HCS 2012 • Classification criteria not met
STOT-SE	OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 • Classification criteria not met
Serious eye damage/irritation	OSHA HCS 2012 • Classification criteria not met

Route(s) of entry/exposure
- Inhalation, Skin, Eye, Ingestion

Potential Health Effects

Inhalation

Acute (Immediate)
- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)
- No data available.

Skin

Acute (Immediate)
- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)
- No data available.

Eye

Acute (Immediate) • Under normal conditions of use, no health effects are expected.

Chronic (Delayed) • No data available.

Ingestion

Acute (Immediate) • Under normal conditions of use, no health effects are expected.

Chronic (Delayed) • No data available.

Key to abbreviations
LD = Lethal Dose

Section 12 - Ecological Information

Toxicity

• Material data lacking.

Persistence and degradability

• Material data lacking.

Bioaccumulative potential

• Material data lacking.

Mobility in Soil

• Material data lacking.

Other adverse effects

• No studies have been found.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	NDA	Not regulated	NDA	NDA	NDA
TDG	NDA	Not regulated	NDA	NDA	NDA
IATA/ICAO	NDA	Not regulated	NDA	NDA	NDA

Special precautions for user • None known.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code • Not relevant.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • None

State Right To Know				
Component	CAS	MA	NJ	PA
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	No	No	No
Water	7732-18-5	No	No	No

Inventory				
Component	CAS	Canada DSL	Canada NDSL	TSCA
Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Yes	No	Yes
Water	7732-18-5	Yes	No	Yes

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Uncontrolled product according to WHMIS classification criteria (including 60%, 70%)
• Water	7732-18-5	Uncontrolled product according to WHMIS classification criteria

Canada - WHMIS - Ingredient Disclosure List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Environment

Canada - CEPA - Priority Substances List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed

• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - Pennsylvania

Labor

U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

United States - Rhode Island

Labor

U.S. - Rhode Island - Hazardous Substance List

• Ethanaminium, 2-hydroxy-N,N,N-trimethyl-, chloride	67-48-1	Not Listed
• Water	7732-18-5	Not Listed

Section 16 - Other Information

Revision Summary

Date	MSDS No.	Changes
18/August/2014		• Section 1 changed. Changes include Company Name Change.

Last Revision Date
- 18/August/2014

Preparation Date
- 27/November/2013

Disclaimer/Statement of Liability
- The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations
NDA = No data available

Safety Data Sheet

Chemplex
SOLVAY GROUP

Section 1: Identification

Product identifier

Product Name • **Ferriplex 66**
Synonyms • Acetic Acid Solution
Product Code • 00307
Chemical Category • Organic acids

Relevant identified uses of the substance or mixture and uses advised against

Recommended use • Petrochemical industry

Details of the supplier of the safety data sheet

Manufacturer • Chemplex | Solvay USA Inc. | Novecare Division
506 CR 137
P.O. Box 1071 Snyder, TX 79550
United States
www.chemplex.net
SDS@chemplex.net
Telephone (General) • 325.573.7298

Emergency telephone number

Manufacturer • 800.424.9300 - CHEMTREC

Section 2: Hazard Identification

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

OSHA HCS 2012 • Skin Corrosion 1A
Serious Eye Damage 1

Label elements

OSHA HCS 2012

DANGER

Hazard statements • Causes severe skin burns and eye damage.
Causes serious eye damage

Precautionary statements

Prevention
- Keep container tightly closed.
Keep only in original container.
Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
In case of inadequate ventilation wear respiratory protection.

Response
- IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
Wash contaminated clothing before reuse.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.

Storage/Disposal
- Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Other hazards

OSHA HCS 2012
- Acetic acid concentrated at elevated temperature may be corrosive to metals and evolve flammable hydrogen gas. Mists of weak acid solution in water may be irritating to the respiratory system.

Canada

According to: WHMIS

Classification of the substance or mixture

WHMIS
- Corrosive - E
Other Toxic Effects - D2B

Label elements

WHMIS

- Corrosive - E
Other Toxic Effects - D2B

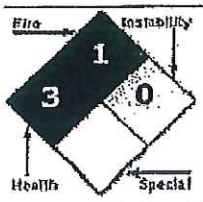
Other hazards

WHMIS
- No other WHMIS hazards than those reported above.

Other information

- One should be specifically trained before communicating or using the following National Fire Protection Association (NFPA) and or Hazardous Materials Identification System (HMIS) categories since the definition and scales applied do not match US OSHA GHS and HAZCOM 2012 definitions and rules.

NFPA



- Health Hazard: 3 - Warning: Corrosive or toxic. Avoid skin contact or inhalation.
  Flammability: 1 - Combustible if heated
  Reactivity: 0 - Stable: Not reactive under normal conditions

HMIS

- HMIS Health - 2: Moderate Hazard
  HMIS Flammability - 1: Slight Hazard
  HMIS Physical Hazard - 0: Minimal Hazard

Section 3 - Composition/Information on Ingredients

Substances

- Not applicable. This material is a mixture.

Mixtures

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

Composition			
Chemical Name	**Identifiers**	**%**	**Hazardous**
Acetic acid	CAS:64-19-7	40% TO 50%	Yes
Citric acid	CAS:77-92-9	25% TO 30%	Yes

- This product is considered hazardous according to the OSHA Hazard Communication Standard 29 CFR 1910.1200. Under Canadian regulations (Workplace Hazardous Materials Information System (WHMIS) - Hazardous Products Act (HPA), this material is hazardous.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- Get medical attention immediately if symptoms occur. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin

- Get medical attention immediately if symptoms occur. Rinse skin immediately with plenty of water for 15-20 minutes. Take off contaminated clothing and wash before reuse.

Eye

- Flush eyes with water for at least 15 minutes while holding eyelids open. Get medical attention immediately. If easy to do, remove contact lenses, if worn.

Ingestion

- Vomiting may occur spontaneously. To prevent aspiration of swallowed product, lay victim on side. Do NOT induce vomiting. Get medical attention immediately. Give nothing to drink.

Most important symptoms and effects, both acute and delayed

- Pain, irritation, redness or blistering of skin. May cause severe irritation and eye damage.

Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically. There is no specific antidote available. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.

Section 5: Fire-Fighting Measures

Extinguishing media

Suitable Extinguishing Media
- LARGE FIRES: Dry chemical, CO2, alcohol-resistant foam or water spray.
  SMALL FIRES: Dry chemical, CO2, water spray or alcohol-resistant foam.

Unsuitable Extinguishing Media
- DO NOT use high volume water jet.

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- Corrosive
  When heated to decomposition it emits acrid smoke and irritating fumes.

Hazardous Combustion Products
- Carbon monoxide (CO), and Carbon dioxide (CO2)
  Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes).

Advice for firefighters

- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.
  Standard procedures for chemical fires.
  Collect contaminated fire extinguishing materials separately. This must be not be discharged into drains.
  Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
  Cool closed containers exposed to fire with water spray.
  Refer to Section 8 - Exposure Controls/Personal Protection.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Contact may cause burns to skin and eyes. Wear suitable protective clothing.
  Ventilate the area. Refer to Section 8 - Exposure Controls/Personal Protection.

Emergency Procedures
- Keep unauthorized personnel away. Avoid all contact. Strict hygiene. Ventilate closed spaces before entering. Stop leak if you can do it without risk.

Environmental precautions

- Spills may be reportable to the National Response Center (800-424-8802) and to state and or local agencies. Do not flush to sewer or allow to enter waterways. Take all necessary measures to avoid accidental discharge of products into drains and waterways due to the rupture of containers or transfer systems.

Methods and material for containment and cleaning up

Containment/Clean-up Measures
- Dike to collect large liquid spills.
  Contain and recover liquid when possible.
  Neutralize the residue with dilute solution of sodium carbonate.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
  Wash remainder with plenty of water.
  Water will make area slippery.
  Repeat cleaning process until the contaminated surface is no longer slippery.
  Refer to Section 13 - Disposal Considerations.

Prohibited Materials
- Strong alkalines and oxidizing materials. Sources of ignition - heat, sparks and open flames.

Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection.

Section 7 - Handling and Storage

Precautions for safe handling

Handling
- Do not breathe (dust, vapor or spray mist). Avoid contact with skin and eyes. Wash thoroughly after handling. Use only in well ventilated areas. Do not breathe (dust, vapor or spray mist)

Conditions for safe storage, including any incompatibilities

Storage
- Store locked up. Keep only in the original container/package in a cool well-ventilated place. Store away from alkali(bases)and oxidizing agents. Avoid excessive heat.

Incompatible Materials or Ignition Sources
- Reactive with strong bases and oxidizing agents. May be corrosive to metals.

Refer to Section 8 - Exposure Controls/Personal Protection.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines
- Use only with adequate ventilation. Avoid all contact. Strict hygiene.

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Acetic acid (64-19-7)	TWAs	10 ppm TWA	10 ppm TWA; 25 mg/m3 TWA	10 ppm TWA; 25 mg/m3 TWA

Exposure controls

Engineering Measures/Controls
- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protective Equipment

Respiratory
- When respirators are required, use NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face
- Wear tightly fitting safety goggles to protect from serious eye damage.

Skin/Body
- Wear protective gloves/protective clothing/eye protection/face protection.

General Industrial Hygiene Considerations
- Avoid all contact. Strict hygiene. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Keep away from food, drink and animal feeding stuffs.

Environmental Exposure Controls
- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Additional Protection Measures
- The protective equipment must be selected in accordance with local standards and in cooperation with the supplier of the protective equipment. Selection of the appropriate personal protective equipment should be based upon an evaluation of the performance characteristics of the protective equipment relative to the tasks to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use. Emergency equipment should be immediately accessible, with instructions for use. Facilities using or storing this material should be equipped with an eyewash and safety shower in close proximity to areas of storage and use.

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Color	Clear Colorless .
Odor	Pungent, Vinegar-like.	Odor Threshold	0.48 ppm acetic acid
General Properties			
Boiling Point	None	Melting Point	None

Decomposition Temperature	None	pH	2 to 4
Specific Gravity/Relative Density	= 1.18 @ 25 C(77 F) Water=1	Density	9.67 lbs/gal
Water Solubility	Soluble	Viscosity	None
Volatility			
Vapor Pressure	None	Vapor Density	1.45 Air=1
Evaporation Rate	No data available		
Flammability			
Flash Point	> 200 F(> 93.333 C) closed cup	UEL	None
LEL	None	Autoignition	463 C(865.4 F) acetic acid
Flammability (solid, gas)	None		
Environmental			
Octanol/Water Partition coefficient	None	Bioaccumulation Factor	None

Section 10: Stability and Reactivity

Reactivity

- Strong Bases, Strong oxidizing agents, Strong reducing agents.

Chemical stability

- This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Excess heat.

Incompatible materials

- Strong alkalines and oxidizing materials. Acetic acid concentrated at elevated temperature may be corrosive to metals and evolve flammable hydrogen gas.

Hazardous decomposition products

- Carbon monoxide (CO), and Carbon dioxide (CO2) Hazardous combustion products may include a complex mixture of airborne solid and liquid particulates and gases (acrid smoke and irritating fumes)

Section 11 - Toxicological Information

Information on toxicological effects

GHS Properties	Classification
Acute toxicity	**OSHA HCS 2012** • Acute Toxicity - Dermal - Classification criteria not met; Acute Toxicity - Inhalation - Classification criteria not met; Acute Toxicity - Oral - Classification criteria not met
Aspiration Hazard	**OSHA HCS 2012** • Classification criteria not met
Carcinogenicity	**OSHA HCS 2012** • Classification criteria not met
Germ Cell Mutagenicity	**OSHA HCS 2012** • Classification criteria not met

Skin corrosion/irritation	OSHA HCS 2012 - Skin Corrosion 1A
Skin sensitization	OSHA HCS 2012 - Classification criteria not met
STOT-RE	OSHA HCS 2012 - Classification criteria not met
STOT-SE	OSHA HCS 2012 - Classification criteria not met
Toxicity for Reproduction	OSHA HCS 2012 - Classification criteria not met
Respiratory sensitization	OSHA HCS 2012 - Classification criteria not met
Serious eye damage/irritation	OSHA HCS 2012 - Serious Eye Damage 1

Medical Conditions Aggravated by Exposure
- None known.

Potential Health Effects

Inhalation

Acute (Immediate)
- Classification criteria not met. Mists of weak acid solution in water may be irritating to the respiratory system.

Chronic (Delayed)
- No data available

Skin

Acute (Immediate)
- Causes severe skin burns and eye damage.

Chronic (Delayed)
- No data available

Eye

Acute (Immediate)
- Causes serious eye damage.

Chronic (Delayed)
- No data available

Ingestion

Acute (Immediate)
- May cause burns of the gastrointestinal tract if swallowed.

Chronic (Delayed)
- No data available

Section 12 - Ecological Information

Toxicity
- No data available

Persistence and degradability
- No data available

Bioaccumulative potential
- No data available

Mobility in Soil
- No data available

Other adverse effects
- According to test data on the components and the classification criteria for mixtures, this product has no known adverse effects on aquatic organisms.

Section 13 - Disposal Considerations

Waste treatment methods

Product waste
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Please be advised that state and local requirements for

waste disposal may be more restrictive or otherwise different from federal laws and regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Empty containers pose a fire risk, evaporate the residue under a fume hood. Rinse with an appropriate solvent.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class (es)	Packing group	Environmental hazards
DOT	UN2790	ACETIC ACID SOLUTION	8	II	NDA
TDG	UN2790	ACETIC ACID SOLUTION	8	II	NDA
IMO/IMDG	UN2790	ACETIC ACID SOLUTION	8	II	NDA
IATA/ICAO	UN2790	ACETIC ACID SOLUTION	8	II	NDA

Special precautions for user

- No data available

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- No data available

Other information

- Transportation status: The listed Transportation Classification does not address all regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

DOT

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

This product contains one or more ingredients identified as a hazardous substance in Appendix A of 49 CFR 172.101. The product quantity, in one package, which triggers the RQ requirements under 49 CFR for each ingredient is as follows:

Reportable quantities: RQ substance: Acetic acid RQ limit for substance: 5,000 lbs.

The Emergency Response Guidebook (ERG) number for the assigned proper shipping name is 153.

TDG

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

The Emergency Response Guidebook (ERG) number for the assigned proper shipping name is 153.

IMO/IMDG

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

IATA/ICAO

- Dangerous Good Description: UN 2790 ACETIC ACID SOLUTION, 8, II

Note: The above regulatory prescriptions are those valid on the date of the publication of this sheet. Given the possible evolution of transportation regulations for Hazardous materials, it would be advisable to check their validity with your sales office.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications

- Acute

United States

Environment

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Acetic acid	64-19-7	5000 lb final RQ; 2270 kg final RQ
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Acetic acid	64-19-7	Not Listed
• Citric acid	77-92-9	Not Listed

Section 16 - Other Information

Last Revision Date
- 03/March/2015

Preparation Date
- 03/March/2015

Other Information
- All components of this product are listed on the following:

US TSCA Inventory

Canada Domestic Substance List (DSL)

Australia Inventory of Chemical Substances (AICS)

China Inventory of Existing chemical Substances in China (IECSC)

Japan Inventory of Existing and New Chemicals (ENCS)

Korea Existing Chemical Inventory (KECI)

Disclaimer/Statement of Liability
- The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but does not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
IARC = International Agency for Research on Cancer
MSHA = Mine Safety and Health Administration
NIOSH = National Institute of Occupational Safety and Health
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
STEL = Short Term Exposure Limits are based on 15-minute exposures
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Attachment B
Heat and Cold Stress Guidelines

Attachment B Heat Stress Guidelines

1.1 Introduction

A majority of project activities are performed in outdoor locations and, as such, employees occasionally perform these activities in temperature extremes. In light of this, it's important that all employees understand the signs and symptoms of potential injuries associated with working in temperature extremes.

1.2 Heat Stress

Heat stress occurs when the body's physiological processes fail to maintain a normal body temperature because of excessive heat. The body reacts to heat stress in a number of different ways. The reactions range from mild, such as fatigue, irritability, anxiety, and decreased concentration, to severe, such as death. Heat related disorders are generally classified into four basic categories: heat rash, heat cramps, heat exhaustion, and heat stroke. Symptoms and treatment are described below:

Heat Rash

- Description: Heat rash is caused by continuous exposure to heat and humid air and is generally aggravated by coarse clothing. This condition decreases the ability to tolerate heat. Heat rash is the mildest of heat related disorders.
- Symptoms: Mild red rash which is generally more prominent in areas of the body in contact with PPE.
- Treatment: Decrease the amount of time in PPE and use powder to help absorb moisture.

Heat Cramps

- Description: Heat cramps are caused by perspiration that is not off-set with adequate fluid intake. This condition is the first sign of a situation that can lead to heat stroke.
- Symptoms: Acute, painful spasms occurring in the voluntary muscles (e.g., abdomen and extremities).
- Treatment: Remove victim to a cool area and loosen clothing. Have victim drink 1 to 2 cups of water immediately and every 20 minutes thereafter until the symptoms subside. Total water consumption should be 1-2 gallons per day. Consult with a physician.

Heat Exhaustion

- Description: Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is more severe than heat cramps.
- Symptoms: Pale, clammy, moist skin with profuse perspiration and extreme weakness. Body temperature is generally normal and the pulse is weak and rapid. Breathing is shallow. The victim may show signs of dizziness and may vomit.
- Treatment: Remove the victim to a cool, air conditioned atmosphere. Loosen clothing and require that the victim lay in a flat position with the feet slightly elevated. Have the victim drink 1 to 2 cups of water or other rehydrating fluid(s) (e.g., Gatorade) by taking frequent, small sips if not nauseated. Rehydrating fluids should be diluted in half before administering to workers experiencing heat exhaustion. Seek medical attention, particularly in severe situations.

Heat Stroke

- Description: Heat stroke is an acute and dangerous situation. The victim's temperature control system shuts down completely, resulting in a rise in body core temperature to levels that can cause brain damage and can be fatal if not treated promptly and effectively.
- Symptoms: Red, hot, dry skin, with no perspiring. Rapid respiration, high pulse rate, and extremely high body temperature are other symptoms.
- Treatment: Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death can result. The victim should be soaked in cool water. Get medical attention as soon as possible.

1.2.1 Preventive Measures

There are a number of steps that can be taken to minimize and/or eliminate the potential for heat stress disorders when working in hot atmospheres. Some of these are as follows:

- Acclimate employees to working conditions by slowly increasing workloads over extended periods of time. Do not begin site work activities with the most demanding physical expenditures.
- Where possible, conduct strenuous activities during cooler portions of the day, such as early morning or early evening.
- Provide and encourage all employees to drink lots of tempered water during the course of the work shift and discourage the use of alcohol during nonworking hours. It's essential that fluids lost due to perspiration get replenished.
- During hot periods, use administrative controls to limit exposure.
- Provide cooling devises when appropriate. Mobile showers and/or hose down facilities, powered air purifying respirators, and ice vests have all proven effective in reducing heat stress potential.

1.2.2 Heat Stress Monitoring

For strenuous HVHHF activities that are part of on-going site work activities in hot weather, the following procedures are used to monitor the body's physiological response to heat. These procedures are implemented when employees are required to wear impervious clothing in atmospheres exceeding 70 degrees Fahrenheit (°F).

- Monitor Heart Rate: Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The measurement at the beginning of the rest period should not exceed 110 beats/minute.

If the heart rate is in excess, the next work period should be shortened by 33 percent, with the length of the rest period remaining the same. If the heart rate is still in excess at the beginning of the next rest period, the following work cycle should be shortened by 33 percent. This procedure continues until the rate is maintained below 110 beats/minute.

- Monitor Body Temperature: Body temperature is measured with an ear probe temperature sensor with a disposable probe cover as early as possible in the resting period. Temperatures should not exceed 99.6□F. If it does, the next work period should be shortened by 33 percent. If the oral temperature at the end of the next work period still exceeds 99.6□F, the following work cycle is shortened by another 33 percent. This procedure continues until the body temperature is maintained below 99.6□F.

The Wet-Bulb Globe Temperature (WBGT) Index is a method of monitoring environmental factors that most nearly correlate to an individual's physiological response to heat. This method uses a black globe thermometer, a natural wet-bulb thermometer, and a dry-bulb thermometer. From measurements with these instruments, the WBGT can be calculated. The WBGT is then compared with work load categories with the result being the establishment of recommended work - rest regimens. Examples of permissible heat exposure TLV are described in the following table.

Examples of Permissible Heat Exposure TLV
(Values are given in °C and (°F) WBGT)

	Work Load		
Work - Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous Work	30.0 (86)	26.7 (80)	25.0 (77)
75% work - 25% rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% work -50% rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% work -75% rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

Notes: As workload increases, the heat stress impact on a worker is exacerbated. For workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 25 percent.

1.3 Cold Stress

Persons working outdoors in low temperatures, especially below freezing, or in wet or snowy weather are potentially subject to cold stress disorders. Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Individual susceptibility to cold stress disorders can vary widely. Individual physical factors that can affect a person's response to cold work environments include a person's general fitness and age. The following guidelines should be considered when working in ambient air temperatures below 40°F, especially when other contributing weather conditions such as snow, rain, or wind are present. The descriptions, symptoms, and treatment for cold related disorders are described as follows.

Hypothermia

Hypothermia results from a cooling of the body's core temperature and if left unattended can become a serious condition. Hypothermia can result in the loss of physical skills and impair judgment thereby contributing to the potential for other accidents. Severe hypothermia can result in death. Hypothermia can occur at temperatures above freezing as well as below.

- Symptoms include shivering, teeth chattering, fumbling hands, slurred speech, and loss of coordination. Eventually, the pulse and respiratory rate may slow. The victim may appear blue or lose color in the face.
- Treatment for hypothermia is to catch symptoms early and move the individual to a warm environment indoors or in a vehicle. If a warm location is not immediately available, the victim should be sheltered from the wind and provided extra clothing such as coats or blankets and observed to determine if their condition is improving. If the victim continues to deteriorate and becomes colder, they should be transported to a medical facility for assistance.

Frostbite

Frostbite is a condition in which the fluids around cells of body tissue freeze. The condition can lead to body tissue damage. The most vulnerable parts of the body are the nose, ears, cheeks, fingers, and toes.

- Symptoms of frostbite include body parts becoming white, firm, cold to the touch, and may feel waxy. The victim will not feel pain in the affected area.
- Treatment of frostbite requires that the victim be brought to a warm environment and the affected areas be allowed to thaw and warm. If frostbite has progressed beyond small patches of skin and affects whole body parts such as a hand, foot, or ear, the victim should be transported to a medical facility for treatment and observation.

1.3.1 Cold Stress Monitoring

Personnel should monitor themselves and each other for signs and symptoms of frostbite and/or hypothermia. If symptoms are observed in an employee or subcontractor, steps should be taken to treat the symptoms by having the individual go to a warm environment either in a nearby structure or vehicle.

1.3.2 Cold Stress Control and Prevention

Cold stress can easily be prevented with proper planning and prevention. Some basic controls and preventative measures are listed below:

- Forecasted conditions. Consider the effect of wind chill (Table on following page).
- Dress in layers and stay dry. Avoid cotton clothing such as socks or T-shirts. Bring extra clothing.
- Wear hardhat liners and gloves. Wear rain gear in rain and snow.
- Curtail work if extreme weather conditions such as a blizzard, extreme wind chill (e.g., less than 0°F), torrential cold rains, or wind is expected.
- For long-term projects in cold environments, consider setting temporary structures with portable heaters.
- Take warming breaks as needed.
- Avoid beverages with caffeine, alcohol, or medications that restrict blood flow.
- Drink warm non-caffeine beverages such as hot chocolate or soups on breaks.

WIND CHILL FACTOR CHART

COOLING POWER OF WIND EXPRESSED AS AN EQUIVALENT CHILL TEMPERATURE (UNDER CALM CONDITIONS)

ESTIMATED WIND SPEED (IN MPH)	ACTUAL THERMOMETER READING (F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURES (F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-21	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

Winds greater than 40 MPH have little additional effect.	**LITTLE DANGER** (For properly clothed person) Maximum danger of false sense of security.	**INCREASING DANGER** Danger from freezing of exposed flesh.	**GREAT DANGER**
	Trench foot and immersion foot may occur at any point on this chart.		

Attachment C
Field Health and Safety Meeting Record

Field Safety and Health Meeting Record

Trainer: _____ **Date:** _____ **Time:** _____

Site: _____

Review:

Health & Safety Plan - Buddy Teams - Hospital Route/Nearest Phone Location
Weather Concerns - Potential Problems - Problems Previously Occurred

Protective Clothing/Equipment: _____

_____

Special Equipment: _____

_____

Chemical Hazards: _____

_____

Physical Hazards: _____

_____

Emergency Actions: _____

_____

Other Issues: _____

_____

Check:

H&S Monitoring Equipment/Calibration - Fire Extinguisher/Communications
First Aid Kit/Eye Wash Station - H&S Plan

Name (Print):	**Signature:**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Attachment D
Signature Form

HEALTH AND SAFETY PLAN FORM Woolsey Health and Safety Project No.: Woodrow #1H-410308-193	This document is for the exclusive use of Woolsey and its subcontractors.	Woolsey Operating Company, LLC

The following personnel have read and fully understand the contents of this SSHP and further agree to all requirements contained herein.

Name	Affiliation	Date	Signature

Attachment E
Fugitive Dust Control Plan

WOODROW #1H-310408-193
HYDRAULIC FRACTURING WELL

STATE OF ILLINOIS
HYDRAULIC FRACTURING PERMIT APPLICATION

FUGITIVE DUST PREVENTION AND CONTROL PLAN

Prepared for Submittal to
Illinois Department of Natural Resources

Prepared by
Shawnee Professional Services

On behalf of
Woolsey Operating Company, LLC

November 8th 2016

WOODROW #1H-310408-193
Fugitive Dust Control Plan

1.0 Introduction

This Fugitive Dust Prevention and Control Plan (FDPCP) was prepared in accordance with the Hydraulic Fracturing Regulatory Act (225 ILCS 732/ 1-75) for controlling fugitive dust particles by request of Woolsey Operating Company (WOC). The purpose of the plan is to reduce short-term impacts to air quality during the mobilization, construction, and demolition activities needed to support the final design, construction, and operation of the Woodrow #1H-310408-193 Hydraulic Fracturing Well Site (Woodrow #1H). The Woodrow #1H Project includes work activities at two locations: the Woodrow #1H Well Site and the #1 Class 2 well operated by TrueFlo Solutions LLC (TrueFlo) at 987 IL Highway One. An alternate disposal site is located at the Rankin #1 well operated by Haggard Well Services near Calvin, IL. This FDPCP is submitted to the Illinois Environmental Protection Agency as Appendix X of the Hydraulic Fracturing Permit Application.

2.0 Definition

Fugitive dust is not emitted from a definable point source, but is emitted from several sources and escapes beyond the property boundary, right-of-way, or easement. In the case of the Woodrow #1H Project, fugitive dust may be emitted from the roadway, material storage piles, and other construction activities, including drilling operations and transportation activities. Other possible sources of fugitive dust and the associated dust control methods are summarized in Attachment E.1, Fugitive Dust Control Plan Matrix. This FDPCP is a tool to help prevent, reduce, control, and manage the production of fugitive dust in the project area during construction and operation. An environmental representative for Woolsey Operating Company will implement this FDPCP. This representative will be a member of the Woolsey Environmental Team listed in Table E.1. The inspection and monitoring requirements within the FDPCP are expected to fall under the responsibilities of the Woolsey Environmental Compliance Inspector (WECI), or designated representative, on fugitive dust control relative to specific work activities. The Woolsey Environmental Team recognizes that periodic review of construction activities and conditions are important to the success of implementing this plan and remaining in compliance with the Hydraulic Fracturing Regulatory Act (225 ILCS 732/ 1-75). It is recognized that fugitive dust can be a nuisance that interferes with the enjoyment of life and property, and can be a safety hazard and harmful to human health or the environment. Procedures to address these issues are provided below.

2.0 Requirements for Dust Control

2.1 SITE INSPECTIONS, ASSESSMENTS, AND RECORDKEEPING: WOC staff will conduct weekly erosion control inspections (or more often as necessary, depending on rainfall) and dust control issues will be included as part of those inspections. Any observation of substantial fugitive dust will be noted as part of the regular inspections and recorded on the Fugitive Dust Control Monitoring Log (Attachment E.2). This log will also be used by the WECI to document other occurrences of fugitive dust witnessed outside of the regular inspections and any occurrences of fugitive dust reported by other construction personnel. In addition, the WECI, or other persons supervising the site, will conduct monthly effectiveness assessments of the project site, including all erosion and fugitive dust control issues.

2.2 PERSONNEL TRAINING: All project employees (including subcontractors) will be trained on the contents of this FDPCP, including potential dust sources and fugitive dust control measures, as summarized in the Fugitive Dust Control Plan Matrix (Attachment E.1). This training will occur at the start of the project. For any new subcontractors or new WOC employees that are hired, training will occur prior to starting work on-site.

2.3 GENERAL RESPONSIBILITIES FOR ON-SITE PERSONNEL: All project personnel have responsibility for fugitive dust control. Any WOC employee or subcontractor who notices fugitive dust will respond as appropriate based on their training. They will implement a defensive strategy by ceasing the activities generating the fugitive dust and immediately notify their supervisor who will respond based on his or her capabilities and who will notify the responsible Site Superintendent. The Site Superintendent will notify the WECI to complete the Self-Inspection Checklist: Fugitive Dust Control Monitoring Log (Attachment E.2), as required, to document the fugitive dust occurrence.

2.4 RESPONSIBILITIES OF THE CONSTRUCTION MANAGER: The designated person responsible for assessing fugitive dust and implementing this FDPCP at the Woodrow #1H well site with WOC. The alternate is the WECI. Incidents involving fugitive dust emissions shall be reported to the WECI.

2.5 GENERAL REQUIREMENTS: WOC is required to provide dust control measures for all areas disturbed by construction. The measures listed below will be required, as necessary, to control fugitive dust. Dust issues located outside of the project limits but identified as originating from the project will be handled similarly. Dust control will be implemented as appropriate by WOC within the project limits, regardless of whether active construction is occurring or not. Dust control is required any time dust is substantially visible in the air. Dust control will be achieved primarily through application of water, and by covering soils, stockpiled materials, and debris. The source of water may be from storm water, fire

hydrants, and/or proposed freshwater wells on the site or near the work area (as permits allow), supplied by a contracted sweeping/cleaning service, or other approved means.

2.6 ON-SITE DUST CONTROL ON UNPAVED ROADS: During mobilization, construction, operation, maintenance, and demobilization of the project, WOC will suppress dust by applying water. WOC will apply water to the active construction work area as needed and if applicable to the work site, without creating unnecessary muddy areas and problems with track-out. WOC will also construct stabilized construction entrances for ingress and egress points, such as County Road 1675 North, to prevent tracking of mud and soil onto paved roads. Use of process waters to control fugitive dust is strictly prohibited.

2.7 DUST CONTROL ON PAVED ROADS: WOC will implement the following requirements on paved roads:

- Construction entrances and exits will be established for all construction-related traffic in order to prevent tracking of mud and soil onto paved roads from the use of unstable ingress or egress points.
- Procedures for removing dirt from wheels and truck exteriors will be used, and will include a wheel wash at the entrance/exit from the site to County Road 1675 North if necessary. Dirt, dust, and debris will be removed from this area on a regular basis to prevent and minimize the transport of soils or dirt off-site.
- Spills of transported material onto public roads will be cleaned up immediately.

2.8 ON-SITE DUST CONTROL ON DISTURBED AREAS: During construction, operation, and maintenance of the project, WOC will suppress dust by applying water. WOC will apply water to active construction work areas, as needed, to control fugitive dust without creating unnecessary muddy areas and problems with track-out. Stabilization best management practices (BMPs; as listed in Attachment E.1) to be used for disturbed areas not supporting construction traffic or active work may also include vegetation, plastic covering, erosion control fabrics and matting, and the early application of a gravel base on areas to be paved. During grading, excavation, and other construction activities, water sprays will be used to keep the soil damp to minimize fugitive dust. Any trucks leaving the site locations with soils or materials that could result in fugitive dust will be covered with a tarpaulin to ensure that there are no emissions during transit. If materials are at any time stockpiled, they may be dampened by water sprays as needed or covered by secured tarpaulins to minimize fugitive dust, if necessary.

2.9 DUST CONTROL DURING DEMOLITION AND DEMOBILIZATION ACTIVITIES: Demolition and demobilization activities for the site locations will be limited to demolition and removal of site infrastructure improvements. Dust control methods during demolition activities include the same methods described above including general dust control methods, methods for disturbed areas, and unpaved roads. Additional BMPs may include the following, if necessary, to meet the general requirements listed above:

• Use of shop vacuums.

• During demolition, water will be used to dampen the area that is being demolished prior to starting the demolition. During the demolition process a water spray will be used to minimize the fugitive dust. The ground will be sprayed with water either by water truck or some type of water spray to minimize fugitive particulate emissions from haul trucks and demolition equipment.

• During the loading of trucks with demolition debris a water spray will be used to minimize fugitive particulate matter emissions. The trucks will have tarpaulins installed to cover their loads prior to leaving the site to ensure that there are no emissions while the trucks are in transit.

2.10 CONTROL OF OTHER AIR EMISSIONS: Other emission-generating activities related to operations and maintenance may include sandblasting or other abrasives, painting, and coating in contained areas shrouded either with plastic or fabric, and general operation of diesel equipment. The following BMPs may be implemented to limit unnecessary generation of air pollutants:

• Appropriate emission-control devices on equipment powered by gasoline or diesel fuel can reduce CO and NOx emissions in vehicular exhaust. Low-sulfur diesel will be used when possible. • Sandblasting materials will be stored inside a building.

• Non-slag (inert) sandblasting abrasives will be used when feasible.

• Sandblasting will be conducted on days when the wind will not transport the material off-site or in a confined area to limit emissions.

• Spent material will be immediately contained and disposed of at an appropriate facility.

• Lids will be kept on all containers of paints and coatings.

• Methods will be implemented for efficient paint application to reduce over spraying, including proper training for painters.

• When possible, paint types such as waterborne paints, powder coatings, ultraviolet light or electron beam curable coatings, or higher solids paints will be used.

• When possible, cleaners with low hazardous air pollutant and volatile organic compound content such as water-based, alkaline, or microbial cleaners may be used.

Table E.1
WOC Environmental Compliance Team Duties and Responsibilities

Team Member	Environmental Compliance Team Duties and Responsibilities
WOC Environmental Manager/ IL District Landman	
Ryan Kelley Phone: (618) 751-9206	Coordinates with WECI, Project Director, and Construction/Demolition Manager • Has stop-work authority • Oversees job-specific environmental compliance program • Provides environmental compliance training and work plan reviews • Develops permit matrix with WECI • Ensures permit compliance and fulfillment of project environmental commitments. • Specialized Training:
WOC Environmental Manager/ Production Forman Illinois Basin	
Mike Lyke Phone: (618) 554-7221	Coordinates with WECI, Project Director, and Construction/Demolition Manager • Has stop-work authority • Oversees job-specific environmental compliance program • Provides environmental compliance training and work plan reviews • Develops permit matrix with WECI • Ensures permit compliance and fulfillment of project environmental commitments. • Specialized Training:

ATTACHMENT E.1
FUGITVE DUST CONTROL PLAN MATRIX

Potential Source	Applicable Dust Control Methods	Schedule/Rate of Application	Backup Plan
Temporary construction Haul Road (work site only)	• Water haul roads • Control haul routes • Control haul road speeds	• As needed • Follow the Work Plan	• Chemical dust suppressants or surfacing haul roads • Schedule construction trucks
Tracking	• Tire wash (drive-through, if needed)	• Wash prior to leaving site	• Wash road with water in compliance with TESCP (i.e. only

	• Stabilized construction entrances • Sweep roads	• Place per plan and adjust and maintain as necessary • Sweep daily or as needed	after sediment if removed)
Stockpiles	• Cover piles • Water stockpiles	• As needed	• Wet stockpiles during active work
Sawing/Grinding	• Use water assisted saws and grinders	• As needed	• Use sweeper tuck
Haul Trucks	• Ensure adequate truck bed freeboard while on haul roads, including local public roads	• Always	• Cover loads on scheduled construction trucks
Grading Activities	• Pre-wet soils before excavating • Avoid activity during high winds • Minimize time frames between operations • Minimize areas of clearing and grubbing to manageable sizes	• As needed • As weather dictates	• Post-wetting
Rain/Wind	• Keep cleared areas covered for major rain/wind events • During dry weather, spray exposed soil with water	• Prevent the mud-to-dust scenario	• Use sweeper truck
Exposed Soils	• Apply BMPs such as: plastic covering, erosion control fabrics and matting, and the early application of a gravel base on areas to be paved	• For all areas not being worked and that contain erodible soils	• N/A

ATTACHMENT E.2
SELF-INSPECTION CHECKLIST: FUGITVE DUST CONTROL MONITORING LOG

Date/Time	Location	Fugitive Dust Source	Control Method	Comments

*May be copied as needed

Attachment F
Respiratory Protection Program

Woolsey Operating Company Respiratory Protection Program

1. General

It is necessary to protect employees who may be exposed to harmful mists, smoke, vapors, etc. or to an oxygen enriched or deficient atmosphere. Whenever possible, engineering controls should be utilized to provide this protection. When engineering controls are not possible, respiratory protection must be provided and used.

2. Purpose

Any person required to wear a respirator on the job needs instruction and training prior to using the equipment. In part, the training should include the nature, extent, and effects of the respiratory hazards to which a person may be exposed as well as signs and symptoms of exposure. Before a person is required to wear a respirator on the job, a determination should be made that he/she is physically fit and able to wear a respirator. The respiratory protective program should be evaluated annually to determine its effectiveness.

3. Definitions

Air Purifying Respirator – means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminates by passing ambient air through the air-purifying element.

Assigned Protection Factor – means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by OSHA 29 CFR 1910.134

Atmosphere Supplying Respirator – means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Canister or Cartridge – means a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminates from the air passed through the container.

Demand Respirator – means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Emergency Situation – means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee Exposure – means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-service-life indicator (ESLI) – means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only Respirator – means a respirator intended to be used only for emergency exit.

Filter or Air Purifying Element – means a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering Facepiece (Dust Mask) – means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Factor – means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit Test – means the use of protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual

Helmet – means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

High Efficiency Particulate Air (HEPA) Filter – means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter.

Hood – means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulder and torso.

Immediately Dangerous to Life and Health (IDLH) – means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Loose-fitting facepiece – means a respiratory inlet covering that is designed to form a partial seal with the face.

Negative Pressure Respirator – means a respirator in which the pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen Deficient Atmosphere – means an atmosphere with an oxygen content below 19.5% by volume.

Oxygen Enriched Atmosphere – means an atmosphere with an oxygen content above 23.5% by volume.

Positive Pressure Respirator – means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Qualitative Fit Test – means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative Fit Test – means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator

Self-Contained Breathing Apparatus (SCBA) – means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Supplied Air Respirator – means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

User Seal Check – means an action conducted by the respirator user to determine if the respirator is properly seated to the face.

4. Responsibilities

Management will:

a. Assist in determining if respiratory protection is needed

b. Assist in the selection of appropriate respiratory protection

c. Provide fit testing and respirator training

d. Monitor program compliance

The department supervisors will:

a. Determine if respiratory protection is needed

b. Identify employees requiring respiratory protection

c. Provide proper respirators

d. Maintain fit test and training records

The employee will:

a. Use the respirator in accordance with guidelines described in this policy

b. Inform his/her supervisor if a respirator is lost or damaged

c. Report to his/her supervisor any illness or change in physical condition that may interfere with the safe use of a respirator

5. Respirator Selection

Respiratory protection is only as good as the respirator in use. Therefore, it is very important to select the right respirator for the right job. The selection of a respirator will be made in accordance with the most current ANSI Z88.2 standard. Only respirators which are approved by NIOSH/MSHA or the U.S. Department of Interior, Bureau of Mines should be used.

a. Selection Considerations

The selection of a respirator is dependent on many factors.

i. The characteristics of the hazardous operation:

1. Work area characteristics

2. Materials used

3. Worker activities

ii. The nature of the respiratory hazard:

1. Type of hazard: a contaminant or an oxygen deficient atmosphere

2. Physical and chemical properties of the contaminant

3. Physiological effects on the body

4. Actual concentration of the contaminant (as determined by sampling or actual knowledge of the concentration) established Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs)

5. Immediately Dangerous to Life and Health (IDLH) concentration

6. Warning properties of the contaminant

iii. The location of the hazardous area in relation to the nearest area having respirable air; this needs to be considered when planning for:

1. Emergency escape
2. Entry of workers
3. Rescue operations

iv. The period of time for which respiratory protection must be provided:

1. Routine use
2. Emergency use

v. The activities of workers in the hazardous area:

1. Light, medium, or heavy work rate
2. Intermittent or continuous work

vi. The physical characteristics, functional capabilities, and limitations of the various respirators: (certain conditions require a specific respirator)

1. An oxygen deficient atmosphere requires use of a respirator which provides an independent, respirable atmosphere, a Self-Contained Breathing Apparatus (SCBA) or airline; for breathing purposes, air must contain at least 19.5% oxygen; less than 19.5% oxygen is considered to be oxygen deficient.
2. An IDLH atmosphere requires use of a SCBA or an airline respirator with continuous flow and escape provisions.

vii. Respirator protection factor

1. A measure of the degree of protection which is provided by a respirator
2. Based on the concentration of the contaminant outside the mask divided by the concentration found inside the mask
3. Helps determine maximum concentration of the contaminant in which a particular respirator can be used
4. Takes into account the capabilities and limitations of the type of respirator

For example: the protection factor for a half-face piece air purifying respirator is 50; with proper cartridges, etc., this type of respirator is suitable in an atmosphere that contains a contaminant at a concentration that is 50 times higher than the TLV or PEL

b. Respirator Descriptions

There are many types of respirators. Respirators can be classified according to whether they use an air source or the ambient air; whether they operate under a negative or positive pressure; and the configuration of the mask. See Figure 1 for respirator illustrations.

i. Supply Air Respirators:

Self-contained breathing apparatus (SCBA)

1. Use supply air from a cylinder carried by the user airline
2. Use supply air from a source which is located away from the user

3. Require a compressor or cylinder(s) and an airline hose and must be used in an oxygen deficient atmosphere.

ii. Air Purifying Respirators:

1. Use ambient air; cannot be used in an oxygen deficient atmosphere.

2. Purify the ambient air by use of a chemical cartridge or canister, or a particulate filter.

3. Powered air-purifying respirators (PAPRs) operate in a positive-pressure continuous-flow mode utilizing filtered ambient air

iii. Disposable or single use respirators:

1. Cloth or paper construction

2. Primarily used as a particulate filter for nuisance dusts

iv. Air Flow:

Positive pressure respirators maintain positive pressure in the face piece during both inhalation and exhalation. Negative pressure respirators draw air into the face piece by the negative pressure created by inhalation (these are demand type respirators).

1. Pressure-demand respirators maintain the mask's positive pressure except during high breathing rates.

2. Continuous-flow respirators send a continuous flow of air into the mask at all times.

MASKS

Full facepiece mask covers the face from the hairline to below the chin; this type of mask does provide eye protection.

Half mask covers the face from above the nose to below the chin; this type of mask does not provide eye protection.

Quarter mask covers the face from above the nose to above the chin; this type of mask does not provide eye protection

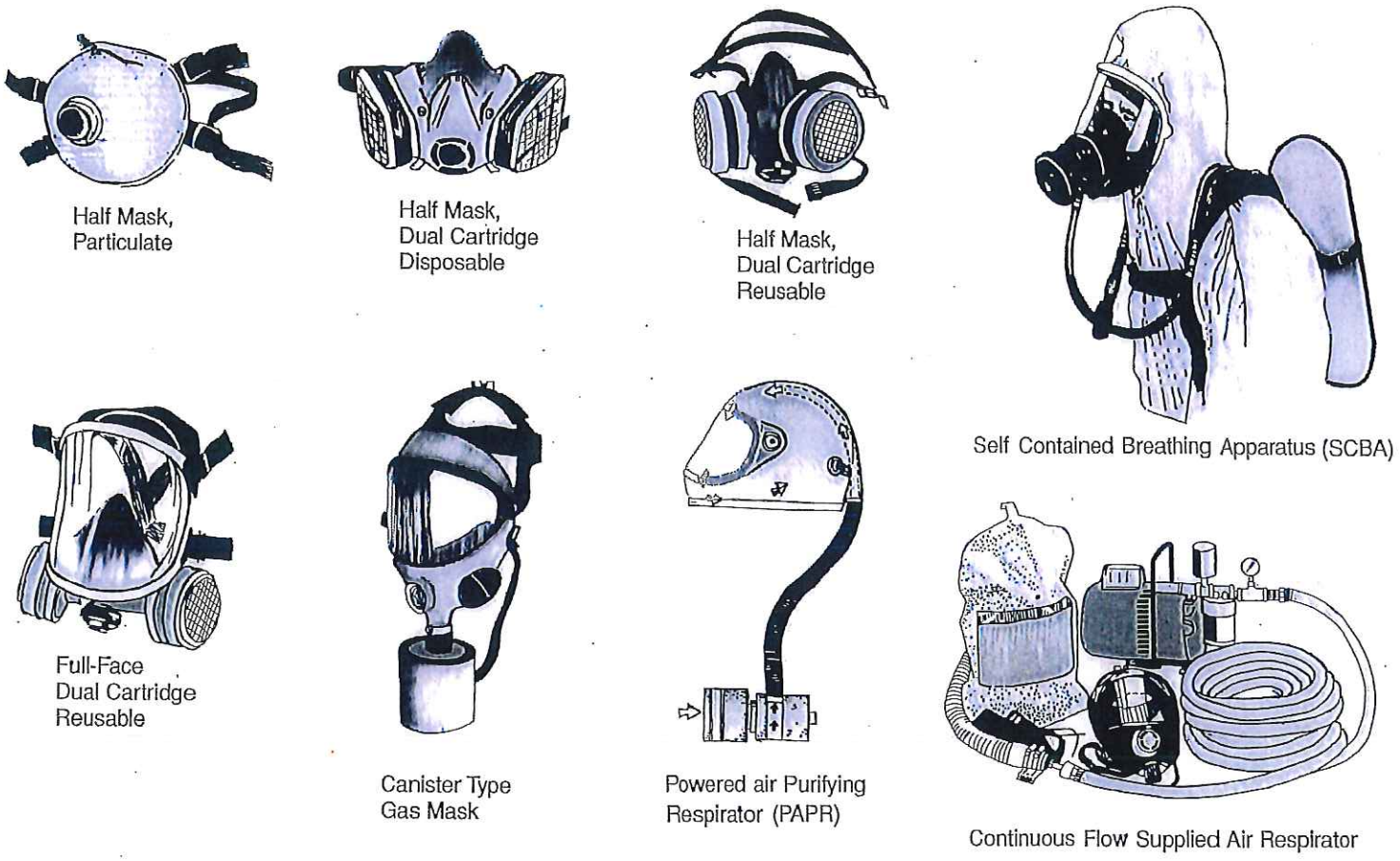


Figure 1: Types of Respiratory Protection

c. Different Protection for Different Hazards

i. Filter respirators

1. Provide protection against particulate matter such as dust, fumes, mists, smoke, microorganisms, and asbestos.

2. Do not provide protection against chemical vapors or gases, or oxygen deficiency.

ii. Chemical cartridge/canister respirators

1. Provide protection against certain gases and vapors up to a particular concentration.

2. Do not provide protection against oxygen deficiency or particular matter.

iii. Air supply respirators

1. Dependent on the type, can provide protection against particulates, chemical vapors and gases, as well as oxygen deficiency.

d. Selection Guidelines

To aid in the selection of an appropriate respirator consider the following:

iv. If the contaminant is of a biological nature, e.g., a spill of viable bacteria, a High Efficiency Particulate Air (HEPA) filter respirator must be used.

v. Identity and concentration of the contaminant should be known in order to select a respirator.

vi. If the identity and concentration of the contaminant is not known, then an air supply respirator must be used.

vii. When the identity and concentration is known, a respirator must be selected with a protection factor that is high enough to ensure that the user will not be exposed to a chemical level in excess of the PEL or TLV.

viii. If an oxygen deficient atmosphere is known or suspected to be present, an air supply respirator must be used.

ix. If an IDLH condition exists, an air supply respirator must be used.

Respirators are available in different sizes; the correct size for the wearer will be determined by a fit test (See Fit Testing Section).

If it is possible that an airline could be damaged or degraded by chemicals, then an SCBA should be used instead of an airline respirator.

6. Inspection

Prior to and after each use, the respirator should be inspected to ensure that it is in good operating condition. Inspect a respirator that is stored for emergency or rescue use at least monthly. A respirator inspection should be tailored to the type of respirator, as follows:

a. Disposable Respirators

1. Integrity of the filter - check for holes or tears
2. Elastic strips - check for loss of elasticity, tears, etc.
3. Metal nose clip - check for breakage

b. Air Purifying Respirators

i. Rubber face piece, check for:

1. Excessive dirt
2. Cracks, tears, or holes
3. Distortion from improper storage
4. Cracked, scratched or loose fitting lens
5. Broken or missing mounting clips
6. Worn threads in filter holder
7. Missing or worn gaskets in filter holder

ii. Head straps, check for:

1. Breaks
2. Loss of elasticity
3. Broken or malfunctioning buckles or attachments

iii. Inhalation and Exhalation Valve, check for:

1. Detergent residue, dust particles, dirt
2. Cracks, tears, or distortion
3. Missing or defective valve cover

iv. Chemical canisters and/or particulate filters, check for:

1. Proper filter or canister for the hazard
2. Approval designation
3. Worn threads on filter housing
4. Cracks or dents in the filter housing
5. Deterioration of harness (gas mask canister)
6. Service life indicator, expiration date (if applicable)

v. Corrugated breathing tube (gas masks), check for:

1. Cracks
2. Missing or loose hose clamps
3. Broken or missing connectors

c. Atmosphere Supplying Respirators

i. Check facepiece, head straps, valves, and breathing tube as described for air purifying respirators

ii. Hood, helmet, blouse, or full suit (if applicable), check for:

1. Rips and torn seams
2. Headgear suspension
3. Cracks or breaks in face shield

iii. Air supply system, check for:

1. Low volume of air cylinders
2. Incorrect gas in cylinders
3. Breaks or kinks in air supply hoses and end fitting attachments
4. Loose connections
5. Improper setting of regulators and valves (consult manufacturer recommendations)
6. Incorrect operation of air purifying elements and carbon monoxide
7. High temperature alarms (for air compressors)

iv. Self-contained breathing apparatus (SCBA), check for:

1. Air or oxygen cylinders that may not be fully charged according to manufacturer's instructions

7. Cleaning and Disinfecting

Proper maintenance of respirator equipment is essential to ensure its effectiveness. Whenever possible, each individual should be assigned a respirator for his/her exclusive use. Proper cleaning of a respirator reduces the potential for contamination and dermatitis.

Proper cleaning guidelines include:

a. Frequently clean and disinfect personal respirators

b. Thoroughly clean and disinfect shared respirators between users

c. Clean and disinfect emergency use respirators after each use

d. Ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

Procedure for Cleaning Respirator:

i. Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

ii. Wash components in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

iii. Rinse components thoroughly in clean, warm, preferably running water. Drain.

iv. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1. Hypochlorite solution (chlorine) made by adding approximately one milliliter of laundry bleach to one liter of warm water; or,

2. Aqueous solution of iodine made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of warm water; or,

3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

v. Rinse components thoroughly in clean, warm preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepiece may result in dermatitis. In addition, some disinfectants may cause premature deterioration of rubber or corrosion of metal parts if not completely removed.

vi. Components should be hand-dried with a clean lint-free cloth or air-dried.

vii. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

viii. Test the respirator to ensure that all components work properly.

8. Storage

Respirators need to be stored properly to prolong their life and to maintain their effectiveness.

a. Do not store around dust, sunlight, heat, extreme cold, excessive moisture, and chemicals.

b. Do not store respirators unprotected in lockers or tool boxes.

c. Store respirators with the facepiece and exhalation valve resting in a normal position.

d. Routinely used respirators may be placed in plastic bags.

e. Store emergency use respirators in an accessible, clearly marked compartment.

9. Proper Use of Equipment

It is essential that a person who is required to wear a respirator be informed and made aware of conditions and factors which might interfere with a respirator's performance. Listed below are some Do's and Don'ts regarding respirator use:

a. DO

i. Make sure you have the correct respirator for the job.

ii. Have an additional person present in dangerous atmospheres.

iii. Determine a means of communication between respirator wearers prior to using the respirators in the field (hand signals are acceptable).

iv. Use a respirator which has been approved by NIOSH/MSHA or U.S. Department of Interior, Bureau of Mines.

v. Check a respirator each time before use.

vi. Shave (if applicable) before wearing a respirator.

vii. Be aware that some contaminants may enter or damage the body by means other than the respiratory tract (protective clothing may be required).

viii. Return to fresh air if: the canisters or cartridges need replacing; you feel nauseous, dizzy, or ill; or if you experience difficulty breathing.

ix. Wear eye protection if the contaminant concentration causes eye irritation (a full facepiece respirator may be used).

x. Be aware that some environmental conditions can compromise a respirator's performance, i.e. high temperatures can cause a person to sweat, breaking the face to facepiece seal; freezing temperatures can ice clog an exhalation valve and regulator; at high breathing rates, positive pressure may not be maintained in positive pressure SCBAs.

xi. Be alert to signs and symptoms of heat stress.

b. DON'T

i. Remove a respirator in a contaminated atmosphere.

ii. Use a respirator without the proper training.

iii. Talk unnecessarily or chew gum while wearing a respirator.

iv. Overexert yourself.

v. Wear contact lenses while using a respirator.

vi. Mistakenly use a filter respirator for protection against gases or vapors.

vii. Allow hair or temple bars from glasses to pass between the face and facepiece of the respirator.

10. Air Purifying Respirators

Air purifying respirators remove specific contaminants from the air by passing the air through a filter, cartridge, or canister. Air purifying respirators are limited in the protection they provide, so it is necessary to understand their limitations, how to select the correct type, and how to use them.

a. Limitations of Air Purifying Respirators

The following limitations must be considered when using an air purifying respirator:

i. Cannot be used in atmospheres containing less than 19.5% oxygen.

ii. Cannot be used in IDLH atmospheres (except escape gas masks).

iii. Cannot be used when the identity of the contaminant is not known.

iv. Cannot be used when contaminant concentrations are unknown or when established maximum levels have been exceeded.

v. Proper cartridge must be selected for the contaminant.

vi. Relative humidity might reduce the effectiveness of the sorbent.

vii. Cartridges/canisters should only be used for chemicals having adequate warning properties (odor, taste, or irritant effects are detectable below the TLV or PEL) or the cartridge/canister has an approved end-of-service-life indicator.

viii. Cartridges/canisters are specific to the brand of respirator (e.g. 3M cartridges must be used with a 3M mask).

b. Classes of Air Purifying Respirators

i. Disposable dust respirators

1. Made of cloth or paper

2. NIOSH/MSHA approved dust respirators provide protection against nuisance dusts (i.e. a TLV of 10 mg/cubic meter or greater)

3. difficult to fit test and to obtain a good facepiece-to-face seal

ii. Mouthpiece respirators

1. Approved for escape only

2. Mouthpiece held by teeth; clamp used to close nostrils

3. Only used when hazard is identified and respirator is approved for that hazard

iii. Quarter mask respirator

1. Used with cartridges or particulate filters

2. Not suitable for protection against dusts with TLVs less than 0.05 mg/cubic meter

iv. Half mask respirator

1. Uses one or two cartridges

2. Approved for vapors, dusts, fumes, mists, gases, and combinations thereof

v. Full-face mask respirator

1. Provides more protection than half mask respirators (e.g. eye protection and a higher protection factor)

2. Approved for same contaminants as half mask respirators, but at higher concentrations

vi. Powered respirators

1. Have no breathing resistance

2. Can be used with half masks, full-face masks, and helmets

c. Air Purifying Element Considerations

Air purifying elements must be properly selected, stored, maintained, and replaced in order to provide adequate protection to the user.

i. Canisters

1. Remove vapors and gases from the air

2. Have a large sorbent volume and provide protection against higher concentrations of vapors and gases

3. A component of gas masks

ii. Cartridges

1. Contain less sorbent than a canister

2. Lifetime is short

iii. Cartridge selection

1. Cartridges are color-coded to indicate the contaminants which they protect against

2. The cartridge selected must be made by the same manufacturer and be compatible with the respirator in use.

3. Chemical and HEPA filter cartridges can be combined to provide protection against particulates and gases and vapors.

4. Some cartridges can be combined to provide protection against more than one chemical.

5. If a worker is exposed to two or more chemicals and a combination cartridge is not available, then a supply air respirator should be used.

d. Cartridge/Canister must be replaced if any of the following conditions occur:

i. Cartridge/canister develops an uncomfortably high temperature (due to chemical absorption reaction)

ii. Wearer detects an odor or taste, or feels eye or throat irritation

iii. Shelf-life date is expired

iv. The end-of-service-life indicator changes color (if applicable)

v. Cartridge/canister becomes wet or is grossly contaminated

vi. Physical damage is noticed

vii. In addition, it is recommended to replace the cartridge/canister at the end of each day, especially if the respirator is not stored properly (clean and bagged to prevent exposure to humidity and chemical vapors).

e. Filters (HEPA Cartridges, Dust Pads, or Disposable Dust Respirators) must be replaced if any of the following conditions occur:

i. Breathing becomes difficult

ii. Filter or dust respirator becomes physically damaged (tears, holes, etc.)

iii. Filter or dust respirator is visibly dirty

iv. Filter or dust respirator becomes wet

v. The inside of the dust respirator becomes contaminated

vi. In addition, disposable dust respirators should be disposed of after use

11. AIR SUPPLY RESPIRATORS

Air supply respirators require a separate source for breathing air, this source could be a cylinder which is carried by the user (self-contained breathing apparatus), a compressor or cylinders which provide air to the user from a distant location via an airline (airline device), or breathing air from a distant location which is directed to the user via a hose (hose mask).

a. Self-Contained Breathing Apparatus (SCBA)

There are two basic designs of self-contained breathing apparatus (SCBA):

i. Closed circuit

1. a.k.a. "re-breather"

2. Mixes oxygen with exhaled breath which has had the carbon dioxide removed by a scrubber

3. Have a longer service time than open circuit SCBA (1-4 hr use)

4. During inhalation, a negative pressure is present in the facepiece

5. Generally not acceptable for use in atmospheres immediately dangerous to life and health

6. Not commonly used.

ii. Open circuit

1. Most common type used

2. Requires a supply of compressed breathing gas (almost always air, but can be oxygen) which is in a cylinder carried on the user's back

3. If using compressed oxygen, it CANNOT be used in a device designed for compressed air

4. Air is exhaled, not recycled

5. Amount of air is limited: generally allows for 30 or 60 minutes of air; 5 minute units are available for escape purposes

6. Air must meet at least Grade D specifications

7. Consists of: cylinder, high-pressure hose, alarm, regulator, breathing hose, facepiece, backpack and harness

8. Principle of operation: air from a cylinder passes through a regulator where pressure is reduced, then through the breathing tube and into the facepiece where it is inhaled by the user

9. Function in one of two modes of operation: demand and pressure demand

10. Demand: air flows into facepiece only when user inhales; during inhalation there is a negative pressure inside the facepiece which could allow contaminants inside if a leak would develop; should not be used in atmospheres immediately dangerous to life and health

11. Pressure demand: maintains a positive pressure in the facepiece at all times; if a leak would develop in the facepiece, contaminants would not enter and harm the user; should be used in atmospheres immediately dangerous to life and health.

b. Airline Device

Airline devices deliver air to the wearer via a high pressure airline hose up to 300 feet in length. The air source can be a compressor or compressed air cylinders, thereby allowing longer use time than SCBAs. These devices can be equipped with a half or full-face mask, helmet, hood, or a complete suit. Airline devices cannot be used in atmospheres immediately dangerous to life and health because of the dependence on the air source and airline, which may become impaired. There are three types of airline devices:

i. Demand

1. Air only enters the facepiece when wearer inhales

2. A negative pressure is present in the facepiece during inhalation

ii. Pressure demand

1. Air flows continuously into facepiece

2. A positive pressure is maintained in the facepiece

3. Provides more protection than the demand type device

iii. Continuous flow

1. Uses an airflow control valve or orifice instead of a regulator

2. Air flows continuously into facepiece

3. A positive pressure is maintained in the facepiece

c. Hose Mask

i. Hose masks allow air to the wearer via a large diameter hose, but do not use compressed air.

ii. Hose masks are not widely used.

iii. The hose extends to a non-contaminated air space.

iv. The user either breathes with the aid of a blower or breathes against the resistance to airflow in the hose.

v. Depending on the manufacturer, a hose mask with a blower may have a hose length up to 300 feet and may have a facepiece, helmet, or hood.

vi. Depending on the manufacturer, a hose mask without a blower may have a hose length up to 75 feet and must have a tight fitting facepiece.

vii. With or without a blower, hose masks cannot be used in atmospheres immediately dangerous to life and health.

d. Limits of Air Supplying Respirators

The following limitations must be considered when using an air supply respirator:

i. SCBA

1. These respirators are bulky and heavy and may not be suitable for strenuous work or for working in constricted spaces

2. The use time is limited by the amount of air contained in the cylinder (normally 30 or 60 minutes)

3. The air in the cylinder must be at least Grade D as determined by the compressed Gas Association Commodity Specification for Air, G-7.1

4. Heat stress and worker fatigue need to be considered

ii. Airline device

1. The air supply line restricts the wearer's mobility

2. Protection may be lost due to: cutting, kinking, or crushing of the air supply line; air compressor failure; the depletion of the air in the cylinder(s)

3. Only an airline device with an additional self-contained air supply (which can be used for escape) is allowed for atmospheres that are immediately dangerous to life and health

4. If using a compressor: it must be located in a safe, non-contaminated environment; it must be equipped with in-line air-purifying sorbent beds and filters; it must have alarms to indicate compressor failure and overheating; it must have an alarm that indicates the presence of carbon monoxide or the air must be tested for carbon monoxide

5. If using a cylinder(s): it must be tested and maintained as prescribed by the Department of Transportation (49 CFR 178); it must be marked in accordance with ANSI Z48.1-1954 or other applicable standard

6. Airline couplings must be incompatible with outlets for other gas systems

iii. Hose mask

1. Cannot be used in atmospheres immediately dangerous to life and health

2. The air supply hose limits mobility

3. The hose mask without a blower is limited to a 75 foot hose and the wearer must inhale against resistance to airflow which can cause worker fatigue

4. Source of contaminant free breathing air must be nearby

e. Donning a SCBA

There are different methods to don an SCBA. The wearer needs to find a method that feels comfortable. The following describes one method (from the Fire Protection Training Division, Texas Engineering Extension Service) which can be used to don a SCBA:

i. Remove SCBA from the case, open cylinder valve and check the air pressure.

ii. Position the SCBA with the cylinder down, arms toward the wearer, and cylinder control valve pointing toward the body (the SCBA can be placed on the ground or preferably on a table).

iii. Grasp shoulder strap on which the regulator is mounted with the right hand.

iv. Pick up SCBA, place left arm through the strap supported by the right hand, placing strap on left shoulder.

v. Remove right hand from the left shoulder strap, place right arm into the remaining strap.

vi. Grasp both shoulder straps near the shoulders and complete positioning of the SCBA, lock snaps, and adjust the straps.

f. The following method can be used to don the face mask:

i. Position the adjustable straps (fully extended) to the outside of the mask

ii. Place hands between the straps and the mask, with the straps laying on the back of the hands

iii. Place mask on the face, inserting chin first, working the mask up on the face

iv. Raise hands away from the mask, continue movement around the sides of the face until the straps are in place

v. Adjust straps until the mask fits tightly on the face (this is done by pulling the straps straight back toward the ears), the bottom straps should be adjusted first

vi. Test the mask by holding the end of the air tube against the palm of the hand, inhale, if a leak is noted, readjust the straps

g. Care and Use of an SCBA

In addition to the general requirements found in the Proper Use of Respirator Equipment and Proper Care of Respirator Equipment sections, there are specific requirements and considerations which must be followed by all SCBA wearers.

i. OSHA requires that SCBA used for emergency use be inspected once a month and records must be maintained of the inspection.

ii. NIOSH recommends all stored SCBA's be inspected weekly.

iii. After each use, air or oxygen cylinders should be fully charged according to the manufacturer's instructions.

iv. Determine at least monthly that the regulator and warning devices on the SCBA function properly.

v. Follow the "Use and Care" instructions for the SCBA which are usually mounted inside the carrying case lid.

vi. Frequently monitor the pressure gauge on the SCBA which indicates the volume of air remaining in the cylinder.

vii. Warning devices will signal an alarm when 20-25% of service time remains.

12. Respirator Use in Dangerous Atmospheres

Only full-face pressure demand respirators are acceptable for use when toxic or oxygen deficient atmospheres may be present or if the identity of the contaminant is unknown. Personnel who may encounter dangerous atmospheres in normal operations or emergencies must be familiar with the following procedures:

a. One additional person must be present in areas where, if a respirator fails, the respirator wearer could be overcome by a toxic or oxygen deficient atmosphere.

b. Communications must be maintained between the individuals present; the communications can include visual, voice, or signal line.

c. An additional person equipped with rescue equipment including a SCBA must be in a nearby safe area where he can assist the others in case of an emergency.

d. When a SCBA is used in an atmosphere immediately dangerous to life and health, standby personnel must be present with rescue equipment.

e. Any respirator wearers in an atmosphere immediately dangerous to life and health must be equipped with safety harnesses and safety lines so they can be removed if they are overcome.

13. Fit Testing

There is not one style or size of respirator available which will properly fit every person who needs to wear one. This is why it is so important that every respirator be fit tested before it is used. The OSHA Standard, 29 CFR 1910.134 states that respirators shall be fitted properly and shall be tested for their facepiece-to-face-seal. Fit testing can be accomplished by one of two methods: quantitative or qualitative. Both methods are described below.

a. Quantitative Fit Test

This method of fit testing is very accurate, but costly. This method exposes the respirator wearer to a test atmosphere, e.g. an aerosol, vapor, or gas. An instrument is used to measure the test atmosphere as well as the air inside the respirator. A quantitative fit factor is calculated which indicates how well the respirator fits the wearer. This test is expensive and requires highly trained personnel to administer.

b. Qualitative Fit Test

This method of fit testing is inexpensive, fast, and easily performed. It is the most commonly used method. The test atmosphere is an easily detected substance such as isoamyl acetate (banana oil) and/or an irritant smoke. The respirator used for the test must provide protection against the test substance (e.g. an organic vapor chemical cartridge must be used for the isoamyl acetate and a HEPA cartridge must be used for the irritant smoke test). Please note:

i. Disposable dust masks cannot be fit tested.

ii. Refer to the Respirator Training and Fit Test Form (Figure 3).

iii. Test will be performed annually or when a different respirator is used.

iv. Records must be kept for every fit test performed.

The qualitative fit test involves having the test subject don a respirator, exposing the employee to the test substance, requiring him to perform some task (such as reciting the

alphabet), moving head from side to side and determining whether the test subject can detect the test substance:

1. If the test substance is detected, then the respirator does not fit well and the test is repeated after some adjustments have been made to the respirator, or a new respirator may be tested.

2. If the test substance is not detected, then a satisfactory fit is assumed to be achieved.

14. Training

Any person assigned a task requiring respiratory protection must receive adequate training regarding the safe and proper use of the respirator. This training should include the following:

a. Reasons for the need for respiratory protection

b. Nature, extent and effects of respiratory hazards to which the person may be exposed

c. Selection of appropriate respirator for the hazard

d. Explanation of the operation, capabilities, and limitations of the selected respirator

e. Instructions in inspecting, donning, fit testing and wearing the respirator

f. Directions for maintenance and storage of the respirator

g. Hands-on training to allow actual handling of the respirator

h. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.

i. Choose respirators certified for use to protect against the contaminant of concern. A label or statement of certification should appear on the respirator or respirator packaging.

j. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against.

k. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

RESPIRATOR TRAINING COMPLETION FORM

Company: _____

Location: _____

Fit Test Conducted By: _____
(Print) (Signature)

Name: _____

Signature: _____

	SCBA Size: S M L Brand: Model:	Cartridge Full-face Size: S M L Brand: Model:	Cartridge Half-face Size: S M L Brand: Model:
1. I understand why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.			
2. I understand what the limitations and capabilities of the respirator are.			
3. I understand how to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.			
4. I understand how to inspect, put on and remove, use, and check the seals of the respirator.			
5. I understand what the procedures are for maintenance and storage of the respirator.			
6. I wore this respirator equipment in a test atmosphere generated by smoke or other means.			
7. I know how to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.			

15. Medical Evaluations

Woolsey will provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace. Administration of the medical questionnaire and examination shall be provided confidentially during the employee's normal working hours or at a time and place convenient to the employee.

a. Initial medical examination procedures

i. Woolsey has designated ____TBD_____ as the PLHCP.

ii. _____TBD_____ will use the OSHA Respirator Medical Evaluation Questionnaire and Physician Approval Form (refer to Appendix A).

b. Follow-up medical examinations

i. The employer shall ensure that a follow-up medical examination is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of the OSHA Respirator Medical Evaluation Questionnaire or whose initial medical examination demonstrates the need for a follow-up medical examination.

ii. The follow-up medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

c. Additional medical examinations

At a minimum, the employer shall provide additional medical evaluations if:

i. employee reports medical signs or symptoms that are related to ability to use a respirator;

ii. A PLHCP, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated;

iii. Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or

iv. A change occurs in workplace conditions that may result in a substantial increase in the physiological burden placed on an employee.

Woolsey will discontinue the employee's medical evaluations when the employee is no longer required to use a respirator.

APPENDIX A

OSHA Respirator Medical Evaluation Questionnaire And Physician Approval Form

OSHA Respirator Medical Evaluation Questionnaire (Appendix C to 29 CFR 1910.134)

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1 (Mandatory): The following information must be provided by every employee who has been selected to use any type of respirator (please print).

Can you read? ..... Yes ☐ No ☐

Date: _____

Name: _____

Age: _____ Height: _____ Weight: _____ Sex: Male ☐ Female ☐

Job title: _____

A phone number where you can be reached by the licensed health care professional (LHCP) who is reviewing this questionnaire (include area code): _____

What is the best time to reach you at this number: _____ a.m. _____ p.m.

Has your employer told you how to contact the LHCP reviewing this questionnaire: .....Yes ☐ No ☐

What type of respirator will you use? (select all that apply):

a. ☐ N, R or P disposable respirator (filter-mask, non-cartridge type only)

b. ☐ Half or full-face type, powered air-purifying, self-contained breathing apparatus or supplied air

Have you ever worn a respirator? ..... Yes ☐ No ☐

If "yes", what type(s)? _____

Part A. Section 2 (Mandatory): Every employee selected to use any type of respirator must answer questions 1 through 9 below (please select yes or no).

1. Do you *currently* smoke tobacco, or have you smoked tobacco in the last month? .....Yes ☐ No ☐

2. Have you *ever* had any of the following conditions?

a. Seizures (fits)..... Yes ☐ No ☐

b. Diabetes (sugar disease)..... Yes ☐ No ☐

c. Allergic reactions that interfere with your breathing ..... Yes ☐ No ☐

d. Claustrophobia (fear of closed in places)..... Yes ☐ No ☐

e. Trouble smelling odors ..... Yes ☐ No ☐

3. Have you *ever* had any of the following pulmonary or lung problems?

a. Asbestosis ..... Yes ☐ No ☐

b. Silicosis ..... Yes ☐ No ☐

c. Asthma ..... Yes ☐ No ☐

d. Pneumothorax (collapsed lung) ..... Yes ☐ No ☐

e. Chronic bronchitis ..... Yes ☐ No ☐

f. Lung cancer ..... Yes ☐ No ☐

g. Emphysema ..... Yes ☐ No ☐

h. Broken ribs ..... Yes ☐ No ☐

i. Pneumonia ..... Yes ☐ No ☐

j. Any chest injuries or surgeries ..... Yes ☐ No ☐

k. Tuberculosis ..... Yes ☐ No ☐

l. Any other lung problem that you have been told about ..... Yes ☐ No ☐

4. Do you *currently* have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath ..... Yes ☐ No ☐

b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline ..... Yes ☐ No ☐

c. Shortness of breath when walking with other people at an ordinary pace on level ground ..... Yes ☐ No ☐

d. Have to stop for breath when walking at your own pace on level ground ..... Yes ☐ No ☐

e. Shortness of breath that interfered with your job ..... Yes ☐ No ☐

f. Shortness of breath when washing or dressing yourself ..... Yes ☐ No ☐

g. Coughing that produces phlegm ..... Yes ☐ No ☐

h. Coughing that wakes you early in the morning ..... Yes ☐ No ☐

i. Coughing that occurs mostly when you are lying down ..... Yes ☐ No ☐

j. Coughing up blood in the last month ..... Yes ☐ No ☐

k. Wheezing ..... Yes ☐ No ☐

l. Wheezing that interferes with your job ..... Yes ☐ No ☐

m. Chest pain when you breathe deeply ..... Yes ☐ No ☐

n. Any other symptoms that you think may be related to lung problems ..... Yes ☐ No ☐

5. Have you *ever* had any of the following cardiovascular or heart problems?

a. Heart attack ..... Yes ☐ No ☐

b. Stroke ..... Yes ☐ No ☐

c. Angina ..... Yes ☐ No ☐

d. Heart failure ..... Yes ☐ No ☐

e. Swelling in your legs or feet (not caused by walking) .....Yes ☐ No ☐

f. Heart arrhythmia (irregular heart beat) .....Yes ☐ No ☐

g. High blood pressure .....Yes ☐ No ☐

h. Any other heart problems that you have been told about .....Yes ☐ No ☐

6. Have you *ever* had any of the following cardiovascular or heart symptoms?

a. Frequent pain or tightness in the chest .....Yes ☐ No ☐

b. Pain or tightness in the chest during physical activities .....Yes ☐ No ☐

c. Pain or tightness in the chest which interfered with your job .....Yes ☐ No ☐

d. Have you noticed you heart skipping or missing a beat in the last 2 years .....Yes ☐ No ☐

e. Heartburn or indigestion that is not related to eating .....Yes ☐ No ☐

f. Any other symptoms that you think my be related to heart or circulation problems .....Yes ☐ No ☐

7. Do you *currently* take medication for any of the following problems?

a. Breathing or lung problems .....Yes ☐ No ☐

b. Heart trouble .....Yes ☐ No ☐

c. Blood pressure .....Yes ☐ No ☐

d. Seizures (fits) .....Yes ☐ No ☐

8. If you have used a respirator, have you *ever* had any of the following problems? (If you have *never* used a respirator continue to question 9)

a. Eye irritation .....Yes ☐ No ☐

b. Skin allergies or rashes .....Yes ☐ No ☐

c. Anxiety .....Yes ☐ No ☐

d. General weakness of fatigue .....Yes ☐ No ☐

e. Any other problem that interferes with your respirator use .....Yes ☐ No ☐

9. Would you like to discuss your answers with the health care professional who will review your questionnaire .....Yes ☐ No ☐

Questions 10 – 15 must be answered if you will use either a self-contained breathing apparatus (SCBA) or full-face respirator.

10. Have you *ever* lost vision in either eye temporarily or permanently .....Yes ☐ No ☐

11. Do you *currently* have any of the following vision problems?

a. Wear contact lenses .....Yes ☐ No ☐

b. Wear glasses .....Yes ☐ No ☐

c. Color blind .....Yes ☐ No ☐

d. Any other eye or vision problem .....Yes ☐ No ☐

12. Have you *ever* had an injury to your ears, including a broken ear drum?.....Yes ☐ No ☐

13. Do you currently have any of the following hearing problems?

a. Difficulty hearing .....Yes ☐ No ☐

b. Wear a hearing aid .....Yes ☐ No ☐

c. Any other hearing or ear problems .....Yes ☐ No ☐

14. Have you ever had a back injury? .....Yes ☐ No ☐

15. Do you currently have any of the following musculoskeletal problems?

a. Weakness in any of your arms, hands, legs, or feet .....Yes ☐ No ☐

b. Back pain .....Yes ☐ No ☐

c. Difficulty fully moving your arms or legs .....Yes ☐ No ☐

d. Pain or stiffness when you lean forward or backward at the waist .....Yes ☐ No ☐

e. Difficulty fully moving your head up and down .....Yes ☐ No ☐

f. Difficulty fully moving your head side to side .....Yes ☐ No ☐

g. Difficulty bending at your knees .....Yes ☐ No ☐

h. Difficulty squatting to the ground .....Yes ☐ No ☐

i. Climbing a flight of stairs or ladder with 25 pounds.....Yes ☐ No ☐

j. Any other muscle or skeletal problem that interfered with using a respirator .....Yes ☐ No ☐

Part B. Section 1. The health care professional who will review this questionnaire may add these questions and any other questions not listed at their discretion.

1. In your job are you working at high altitudes (5,000 ft.) or in a place that has lower than normal amounts of oxygen .....Yes ☐ No ☐

If "yes", do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions .....Yes ☐ No ☐

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g. gases, fumes, or dust), or have you come into contact with hazardous chemicals .....Yes ☐ No ☐

If "yes", name the chemicals if you know them:

3. Have you ever worked with any of the materials, or under any of the conditions listed below?

a. Asbestos .....Yes ☐ No ☐

b. Coal (for example, mining) .....Yes ☐ No ☐

c. Silica (e.g. sandblasting) ..... Yes ☐ No ☐

d. Iron ..... Yes ☐ No ☐

e. Tungsten/cobalt (grinding or welding this material) ..... Yes ☐ No ☐

f. Tin ..... Yes ☐ No ☐

g. Dusty environments ..... Yes ☐ No ☐

h. Beryllium ..... Yes ☐ No ☐

i. Any other hazardous exposures ..... Yes ☐ No ☐

j. Aluminum ..... Yes ☐ No ☐

If "yes", describe the exposure(s):

4. List any second jobs or side businesses you have:

5. List your previous occupations:

6. List your current and previous hobbies:

7. Were you ever in the military service? ..... Yes ☐ No ☐

If "yes", were you exposed to biological or chemical agents (training or combat)? ..... Yes ☐ No ☐

8. Have you ever worked on a HAZMAT team? ..... Yes ☐ No ☐

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications) ..... Yes ☐ No ☐

If "yes", name the medications:

Part B. Section 2. Supplemental information for the health care professional filled out by the employer.

10. Will the employee use any of the following items with your respirator?

a. HEPA filter ..... Yes ☐ No ☐

b. Canisters (i.e. gas masks) ..... Yes ☐ No ☐

c. Cartridges ..... Yes ☐ No ☐

11. How often will the employee use the respirator(s)? Mark all that apply

a. Escape only (no rescue) ..... Yes ☐ No ☐

b. Less than 2 hrs. per day ..... Yes ☐ No ☐

c. Emergency rescue only ..... Yes ☐ No ☐

d. 2 to 4 hrs. per day ..... Yes ☐ No ☐

e. Less than 5 hrs. per week ..... Yes ☐ No ☐

f. Over 4 hrs. per day ..... Yes ☐ No ☐

12. When the employee uses the respirator(s), is their work effort:

a. Light (less than 200 kcal per hour) ..... Yes ☐ No ☐

If "yes", how long does this period last per shift _____ hrs. _____ min.

Examples of light work are sitting while writing, typing, drafting, performing light assembly work, or standing while controlling machines

b. Moderate (200 to 350 kcal per hour) ..... Yes ☐ No ☐

If "yes" how long does this period last per shift _____ hrs. _____ min.

Examples of moderate work are sitting while nailing or filing, driving a truck, drilling, nailing, performing assembly work, transferring a moderate load (about 35 lbs.) at trunk level, or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. Heavy (above 350 kcal per hour) ..... Yes ☐ No ☐

If "yes", how long does this period last per shift _____ hrs. _____ min.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder, working on a loading dock, shoveling, standing while bricklaying or chipping casting, or climbing stairs with a heavy load (about 50 lbs.).

13. Will the employee wear protective clothing and /or equipment (other than the respirator) while using the respirator ..... Yes ☐ No ☐

14. Will they be working in hot conditions (above 77 degrees F) ..... Yes ☐ No ☐

15. Will they be working in humid conditions ..... Yes ☐ No ☐

16. Describe the work they will be doing while using the respirator:

_____

17. Describe any special or hazardous conditions they may encounter when using a respirator:

_____

18. Provide the following information, if you know it, for each toxic substance that they will be exposed to when using their respirators:

Name of the first toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

Name of the second toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

Name of third toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

Name of any other toxic substance that they will be exposed to while wearing their respirator:

_____

19. Describe any special responsibilities they will have while using their respirator that may affect the safety and wellbeing of others (i.e. rescue, security):

_____

Physician Approval Form

Date: _____

To whom it may concern:

I have performed a standard medical evaluation for _____. It is my medical opinion that this individual shall be able to wear a respirator:

Without any limitations: _____

With limited restrictions (Note Below): _____

_____

_____

Not authorized for use: _____

_____
(Print)

_____
(Signature)

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: ContainmentPlan

Please save attachment and use the file name above.

Containment Plan §1-35(b)(13); 245.210(a)(13), 245.820, 245.825, 245.830.
Describe the containment practices and equipment to be used and the area of the well site where containment systems will be employed. If any part of the well or well site is in an area identified by the U.S. Geological Service as having a 2% or greater probability of exceedance in 50 years of peak ground acceleration of 0.4 standard gravity or more, identify measures you will take to protect the components in this plan against earthquakes of M4.5 or more. *NOTE: review 245.820; also locate the containment systems on the overhead sketch required under section (g) of the WellSiteSetbackPlan.*

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

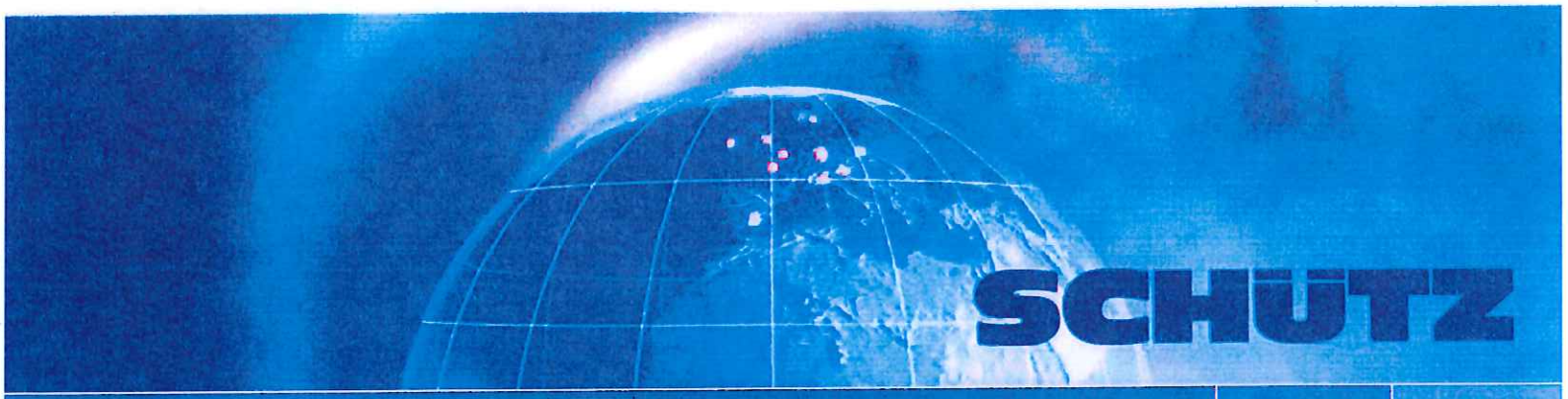
Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Containment Plan

The operator plans to have a minimum amount of "fracturing fluid" within the common containment area. The fracturing fluid will be mixed on-the-fly just ahead of the well head. The constituent chemicals used (see Chemical Disclosure Report for full description) in the makeup of the "fracturing fluid" will be stored in manufacturer provided tanks which meet the requirements set out in 245.825 and Section 1-75(c)(4) of the Act. Tanks containing these chemicals will be stored within a diked containment area capable of holding 150% of the total volume of the single largest container or tank within a common containment area. No stationary fueling tanks will be used. At the conclusion of HVHHF operations any remaining unused chemicals will be returned to the manufacturer in the same container. As the chemicals are mixed "on-the-fly" only fresh water will be left in the makeup tanks save for one lined acid tank. Residual acid will be removed and hauled to an approved facility. All such Hydraulic Fracturing Chemicals will be removed from the well site within 60 days of the completion of HVHHF operations.

During flow back operations the tanks located within the area of the wellsite will also be surrounded by a dike capable of holding 150% of the total volume of the single largest container or tank within a common containment area. The fracturing treatment fluids will be flowed into a purpose built lined and closed flow back tank having a capacity of approximately 500 barrels (see attached manufacturer's product description). This tank will be used to separate any gas or proppant in the flow back fluid and measure the flow back fluid volume. Up to five (5) additional closed storage tanks will be connected to the primary flow back tank for temporary storage of the flow back fluid. The flow back will be monitored by Company personal on a 24 hour basis. Should there be any reason that the flow back cannot be safely accommodated the well will be shut in. It should be noted that "flow back" fluid is primarily make up fresh water with only minor amounts of Potassium Chloride (salt) and a very small percentage of chemical additives.

The wellsite lies outside of the area identified by the U.S. Geological Survey as having a 2% or greater probability of exceedance in 50 years of ground acceleration of 0.4 standard gravity or more.

Refer to Well Site Setback Plan, the Well Pad Detail exhibit, exhibit G-1 and exhibit G-2 for the areas of the well site where containment systems will be employed.



IBC Handling Guide

SCHÜTZ ECOBULK MX 1000 UN –
For Use with Hazardous Filling Goods

MX-EX

ECOBULK MX-EX
antistatic

SCHÜTZ INDUSTRIAL PACKAGING
The Future's Technology. Today.

www.schuetz.net

Safe in ex-zones.
The antistatic
ECOBULK MX-EX.

- Suitable for utilisation on explosive endangered operation premises classified as zone 1 and zone 2 (while complying with statutory and company-specific safety precautions and regulations)
- The antistatic outer layer protects the container from hazardous electrostatic charge
- The earthed outlet valve discharges the electrostatic charge of the filling product
- Electrostatically safe within the context of the Cenelec Report CENELEC TR50404 (2003) and TRBS 2153

Please do not hesitate to contact us regarding any technical comments or questions.

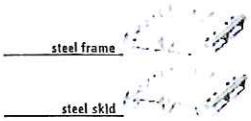
MATERIAL

Inner bottle
- Inner and intermediate layer: high-molecular, high-density polyethelene (HDPE)
- Antistatic outer layer
- Additional UV and light protection of the filling product (optional)

Outer container
- Welded tubular steel grid, galvanized

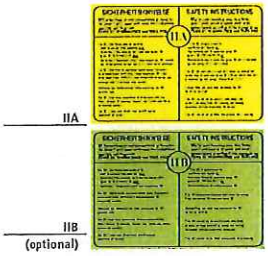
Bottom plate
- Made of steel plate to provide stability and to facilitate minimum residual contents from the inner container

PALLETS (4-way entry)



CERTIFICATIONS

UN 31 HA1/Y (optional)
- Maximum density 1.6
- Tested for electrostatic safety
- Suitable for use in ex-zones 1 & 2



FDA (optional)
- Safe for food products

CAPACITY

MX-EX antistatic 1000
- 1,000 litres (275 gal)

OUTLET VALVES

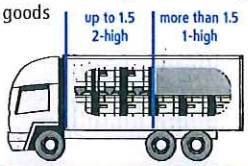
- Earthed screwable butterfly valve DN 50

FILLING OPENING

- DN 150 with screw cap
- DN 225 with screw cap

DYNAMIC LOAD

Filled ECOBULK according to the specific weight of the filling goods



DIMENSIONS

- 1,200 x 1,000 x 1,160 (L x W x H)

WEIGHT

MX-EX 1000
- 57 kg with steel pallet

STATIC LOAD

Max.
4-high

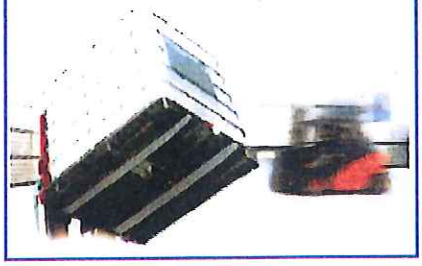
Performance Tests

Design type test descriptions

Bottom Lift Test

The filled IBC with a load that is 1.25 times the maximum permissible gross mass is raised and lowered by a forklift truck with the forks centrally positioned and penetrate to three quarters of direction of entry.

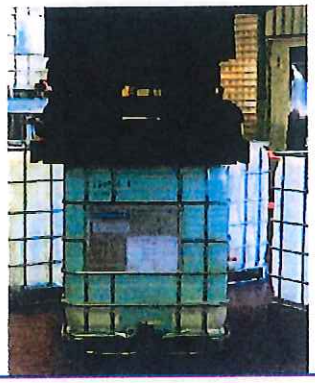
Criteria for passing the test
No deformation which renders the IBC including base pallet unsafe for transport and no loss of content.



Stacking Test

The IBC is filled with the maximum permissible gross mass and is placed on level hard ground. Then a load is placed on top of the IBC for a period of 24 hours.

Criteria for passing the test
No permanent deformation which renders the IBC including base pallet unsafe for transport and no loss of content.



Performance Tests

Design type test descriptions

Leakproof Test

The IBC is tested for a period of at least 10 minutes using air under a gauge pressure of min. 20kPa. The air tightness of the IBC shall be determined by a suitable method (e.g. immersing the IBC in water).

Criteria for passing the test
No leakage of air.

Hydraulic Pressure Test

The IBC is tested for a period of at least 10 minutes applying a hydraulic pressure of min. 100kPa. The IBC shall not be mechanically restrained during the test.

Criteria for passing the test
No leakage and no deformation which would render the IBC unsafe for transport.

Design type test descriptions

Cold Drop Test

The IBC is filled to not less than 98% of its maximum capacity for liquids. The testing is carried out when the temperature of the IBC and its contents has been reduced to minus 18°C or lower. The IBC is then dropped from a height of maximum 1,9 m to its weakest structural point.

Vibration Test

This test applies to design types for IBCs manufactured as from 1 January 2011.

The IBC is filled to not less than 98% of its maximum capacity for liquids and then placed in the centre of the test machine platform with a vertical sinusoidal, double amplitude of 25mm +/- 5%. The test is carried out over a period of one hour.

Criteria for passing the test
No leakage or rupture shall be observed. In addition, no breakage or failure of structural components, such as broken welds or field fastenings, shall be observed.

SCHUTZ

Labels

Basic information on the label plate

Standard label

0208 / 0208	First visual check and first leakproof test
4006230	Article number
MX1000	IBC type
17.02.08	Production date
S1	Production location
B	Shift number
58	Number of IBC per order
1011178787	intern production-/ order number

UN - marking example

31HA1	Coding system for the identification of the IBC
Y	Packaging group
MMYY	Production date (month and year)
D	State authorizing the allocation
BAM0380	UN approval number
SCHÜTZ1	Production location
4056	Max. Stacking weight in kg
2037	Max. Gross weight in kg
1060l	Max. Overflow volume in litre
60kg	Approved weight in kg (valid for all types of the approval)
100kPa	Test pressure in kPa

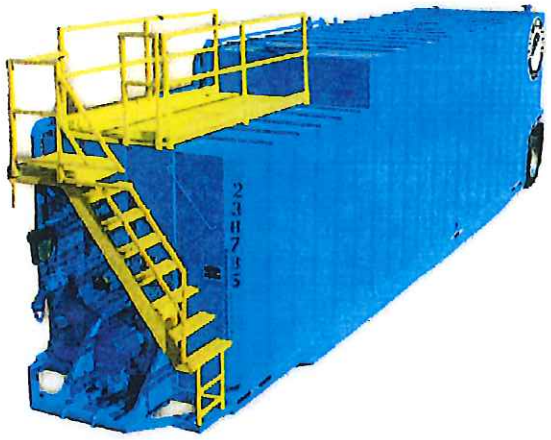
SCHÜTZ

Steel Tank

Bi-Level Coated

Overview:

21,000 gallon bi-level tanks from Rain for Rent have a standard "V" shaped floor for ease of draining all stored liquids completely through a 4" butterfly valve with Buna seals standard. This tank also has a standard vacuum pressure relief valve.



Features:

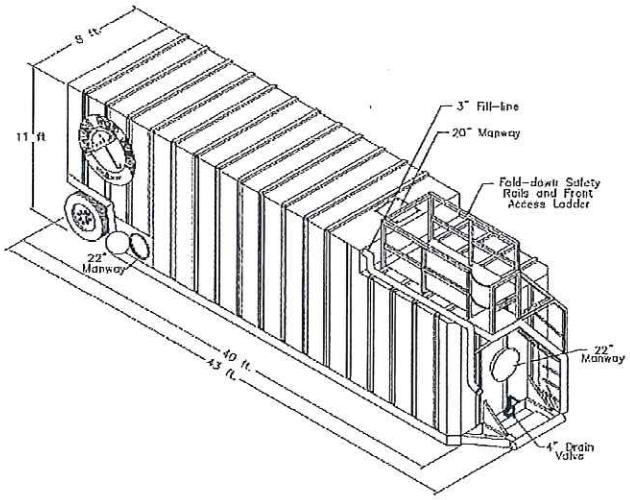
Store liquids with confidence with Rain for Rent's 21,000 gallon bi-level tank. Permanently attached axels for maximum maneuverability allow this 21,000 gallon tank to be moved with ease on the jobsite and a safety staircase ensures proper protection for workers on site. Epoxy coating offers chemical resistance and additional cleanliness for sensitive environmental applications.

Specs:

Manways	Four 22" hatches
Material	Steel, Coated
Capacity	21,000 gallons
Dry weight	26,000 lbs.
Footprint (LxWxH):	516" x 96" x 141"

Accessories:

- Spillguard
- Suction and discharge piping
- Vapor tight features
- Level gauges
- Steam coils



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ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: TrafficManagementPlan

Please save attachment and use the file name above.

Traffic Management Plan §1-35(b)(15), 245.210(a)(15).

(a) Identify anticipated roads, streets, and highways that will be used during construction, drilling operations, HVHF operations, production, and operations of the site

(b) Attach a scaled map of the routes listed above, including but not limited to any access roads, for at least a 10 mile radius, identifying all highway jurisdictions impacted, as well as any structures or property lines relevant to demonstrating compliance with Section 245.410 and 765 ILCS 530;

(c) state the anticipated start and end dates for construction of the well site, the drilling operations, the HVHF operations, and any other high traffic operations;

(d) identify the management measures used to minimize, mitigate, or compensate for stress to local roads and/or impact on regular traffic flow;

(e) provide the contact information for a person responsible for the traffic management plan;

(f) provide contact information for a representative of each impacted highway authority;

(g) did you submit copies of the traffic management plan to the impacted highway authorities?

☑ YES ☐ NO

Traffic Management Plan:

Well Site:	Woodrow 1H-310408-193
Site Manager:	Ryan Kelley
Health and Safety Representative:	Ryan Kelley
Company preparing TMP:	Shawnee Professional Services
Date of Plan:	10-31-2016
Date of Plan Review:	08-23-2017

INTRODUCTION

This Traffic Management Plan has been prepared for Woolsey Operating Company to describe how they will safely and effectively control, maintain and minimize impacts during the drilling, construction, high volume horizontal hydraulic fracking, production and continued operations ("Operations") of the Woodrow 1H-310408-193 the area of the well site and also along vehicular routes utilized for material and equipment delivery, employee commutes, and hauling of brine waters from the well site. This plan has also been developed to satisfy requirements of the Hydraulic Fracturing Regulatory Act (Section 1-35(b)(15)). A copy of this plan will be kept on site for periodic review and training of site personnel with route maps given to all drivers to minimize adverse impact on roadways and to local users in the vicinity of the site and haul routes.

TRAFFIC MITIGATION MEASURES

Motorist Information and Operation Area Signs
Informing the road users is one way to help reduce the impacts from Operations. Drivers would be informed about the Operations and any major delays and/or detours, allowing them to modify their travel choices. Static signs can be used to inform users coming from each direction that there may be increased traffic due to Operations to the north and south of County Road 1675N along U.S. Route 45.

Operation Staging
To mitigate any traffic impacts attributable to the Operation workforce during the project, Operation start times could be staggered during peak times such that the entire workforce required for each day could arrive/leave at different times.

Carpooling
While not expected, if needed, carpooling could be used during peak Operation periods to reduce the total number of trips entering/leaving the site, and in turn, reduce any traffic congestion. The site manager can coordinate with the workforce to determine the best location and time to coordinate carpooling if needed. Another possible option would be to organize a shuttle that could take the workers from a centralized point.

Public Information and the Media
Updates to the local communities through the local newspaper could provide information to the current local users who could be impacted by Operations of the Proposed Project. Newspaper bulletins could also provide information on the upcoming work and areas of impact to local users. Stakeholders such as Illinois Department of Transportation, White County Highway Department, and the Village of Enfield will be informed with outreach letters prior to Operation. The letter will provide a description of the project and the time frame as well as outline any short-term restrictions that may impact the stakeholders. The letters will also provide contact information for any stakeholders who may have questions.

Off-Peak Hour Activities
To minimize adding trips during the daily workforce commute, deliveries would attempt to be scheduled during the off-peak hours as feasible.

POTENTIAL ADVERSE EFFECTS TO THE PUBLIC

Noise
County Road 1725 N, County Road 125 E, and County Road 1675 N will be travelled for access from the well site to U.S. Route 45. There are no residences along these roads so there will be minimal noise impact to local residents. The site manager shall ensure that all vehicles are fitted with well-maintained engine mufflers. Engine breaking is also prohibited for all haul trucks to and from the site.

Bicycles and Pedestrians
Bicycles and pedestrians are rare in the vicinity of the Proposed Project but could occasionally be present. The existing routes can accommodate bicycles or pedestrians during Operations similarly as the current condition.

Delivery and Service Vehicles
US Route 45 is classified as a minor arterial roadway. It serves commercial trucking and delivery and service vehicles (approximately 525 trucks per day) with a full traffic count of 2000 vehicles per day. Most traffic is from the local area using it as the main connector to the I-64 corridor and the City of Fairfield. The Proposed Project may cause increased traffic volumes on US route 45, but delays are not expected. If delays were to occur, they would be expected to have a minor effect on delivery and service vehicles and local commuters.

Emergency Services
Emergency vehicles dispatched through 911 services for ambulance, sheriff, State Highway Patrol, and the local Fire Departments use the routes within the Project vicinity. The Village of Enfield Fire Department provides fire protection and White County Ambulance Department provides emergency medical services in the vicinity of the well site. Emergency services will not be interrupted by the proposed project. Both entities can be kept informed of Operation progress at the site.

Roadway Conditions
During times of high truck traffic to and from the site, roadway condition can deteriorate quickly and cause unsafe conditions for users. Roadway conditions along County Road 1725 N, County Road 125 E, and County Road 1675 N will be monitored periodically by visual inspection of the site manager. Periodic videoing of the road surfaces will also be performed by an outside party to document roadway conditions throughout the project. Any roadway deficiencies caused by traffic related to the Operations will be addressed by the site operator (or its contractor) and/or the local jurisdiction.

School Transportation
Local elementary and high schools utilize the roadways for bus transportation to and from their facilities. Drivers shall be extra cognizant and aware of the need to take extreme caution during the hours of 7:00 to 8:00 AM and 2:00 to 4:30 PM when the presence of bus transportation is most possible. There shall be no overtaking of school busses unless flagged to do so by the driver of the bus.

RESPONSIBILITY

Site Manager Responsibilities
- Educating all transport operators the requirements of this transportation management plan.
- Enforcing the requirements of this transportation management plan.
- Investigating any community complaints.
- Recording and investigating any transport related accidents, incidents, or near misses.
- After proper investigation, inform transport operators of legitimate community complaints, and modified procedures to be followed to prevent repeat complaints.
- Make changes to procedures, transportation management plan, and/or signage to precent repeat transport related accidents, accidents, or near misses.
- Following inspection of road and safety signage, undertake maintenance as necessary.

Transport Operators (Driver) Responsibilities
- Understanding and following the transportation management plan.
- Reporting any accidents, incidents or near misses to the Site Manager.

ADDITIONAL TRANSPORTATION ITEMS

Roadway information for Primary Route to/from Well Site
The following information is intended to ensure that the transportation of materials to/from the well site is

undertaken in a manner that is not excessively harmful to local and state roadways:

- County Road 1725 N (Woodrow #1H-310408-193 to County Road 125 E)
  - Gravel road, local/agriculture traffic only. Weight restrictions: None Posted.
- County Road 125 E (County Road 1725 N to County Road 1675 N)
  - Gravel road, local/agriculture traffic only. Weight restrictions: None Posted
- County Road 1675 N (County Road 125 E to U.S. Route 45)
  - Gravel road, local/agriculture traffic only. Weight restrictions: None Posted
- U.S. Route 45 (County Road 1675 N to IL Route 1)
  - Paved road, local and non-local traffic. Weight restrictions: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs.
- Illinois Route 1 (U.S. Route 45 to Tru Flow Facility)

Bituminous (High Type), local and non-local traffic. Weight restrictions: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs

Pick up/drop off points for materials and speed restrictions *(e.g. vehicles, trucks, etc):*

The following safety features are recommended to ensure that the collection and disposal of materials to/from the well site is undertaken in a safe manner:

- Truck entry and exit signage to the well site should be located at:
  - Entry location to County Road 1675 N on U.S. Route 45.
- Designated loading and unloading areas are located at:
  - Well Site (Woodrow #1H-310408-193)
  - Tru Flo #1 Class II Injection Well (987 Illinois Highway 1, Carmi, IL)
- Speed restriction signage is clearly displayed at the following locations:
  - Upon entering the city limits of Enfield
  - Within Enfield just south of Logan Street
  - School Zone restriction from E Hosick Street to E Main Street
  - Within Enfield: Designated Pedestrian Crossing at E North Street
  - Four-Way stop intersection within Enfield city limits
  - Four-Way stop intersection with Illinois Route 14
  - Upon entering the city limits of Norris City
  - Norris City south of Orchard Street
  - Four-Way stop intersection within Norris City limits.

Bridge information for Primary Route to/from Well Site.

The following information is intended to ensure that the transportation of materials to/from the well site is undertaken in a manner that is not excessively harmful to local and state bridge structures:

- Bridge #097-3242:
  - Located 1.5 miles north of Enfield on County Road 125 N; prestress concrete structure; maximum roadway width 24.0 feet; crosses drainage ditch; weight limit:
- Bridge #097-0024:
  - Located in the town of Enfield on U.S. Route 45; steel structure; maximum roadway width 32.0 feet; crosses L & N Railroad; weight limit: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs
- Bridge #097-2012:
  - Located 1.5 miles south of Enfield on U.S. Route 45; concrete structure; maximum roadway width 32.0 feet; crosses Seven Mile Creek; weight limit: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs
- Bridge #097-2007:
  - Located in the town of Sacramento on U.S. Route 45; concrete structure; approx. roadway width 24.0 feet; crosses stream; weight limit: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs
- Bridge #097-0012:
  - Located 3 miles south of Brownsville on Illinois Route 1; concrete structure; maximum roadway width 33.0 feet; crosses Lick Creek; weight limit: Single Axle: 20,000 lbs; Tandem Axle: 34,000 lbs

Special Events Along the Haul Routes *(e.g. Fairs, Church Gatherings, Sporting Events etc)*

Traffic control requirements for special events may vary. Specific control measures will need to be determined through a risk assessment process taking into consideration learning's from previous special events.

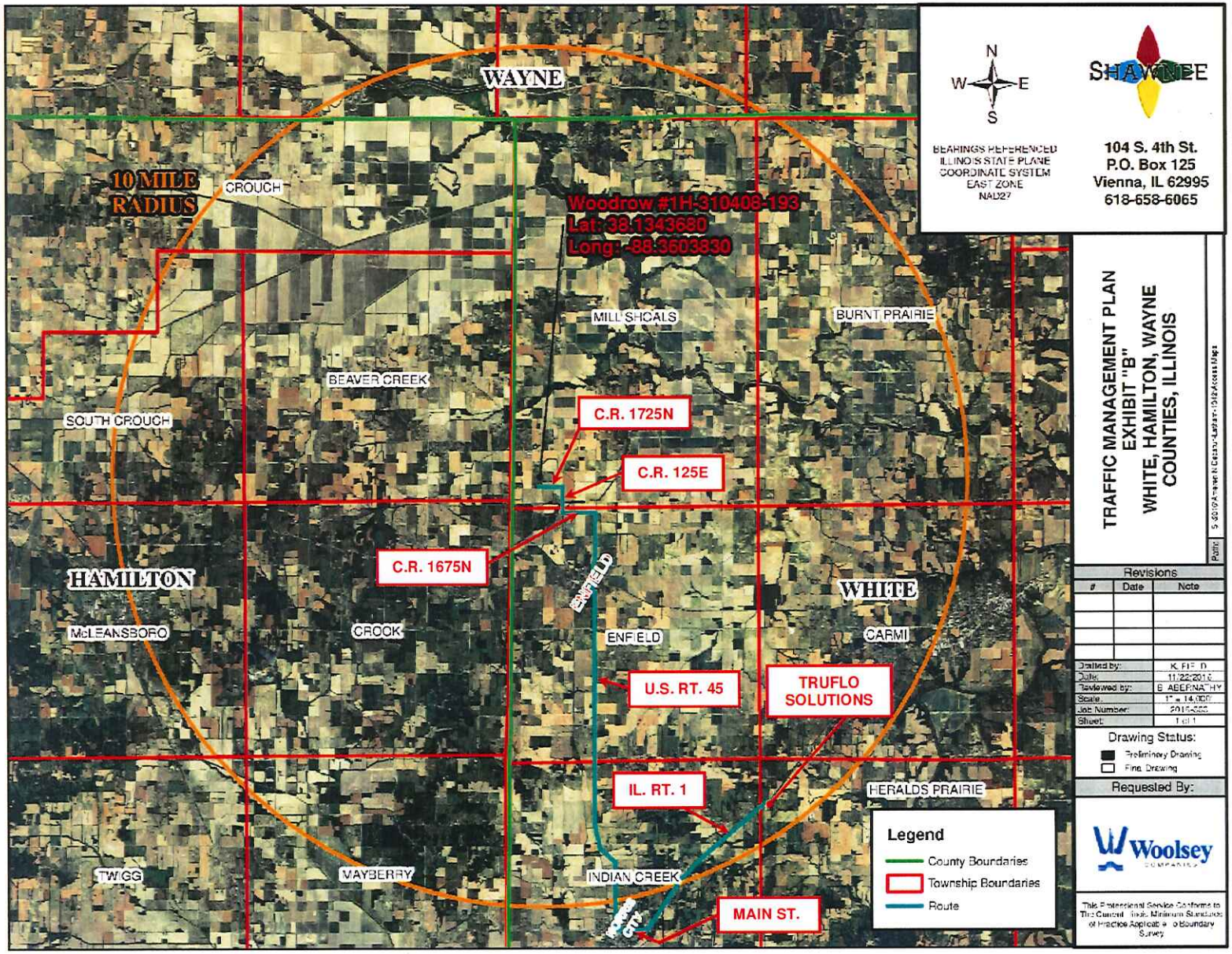
The following broad safety arrangements and features are in place to minimize the risks associated with special events in conjunction with previously documented control measures:

- Appropriate numbers of traffic controllers will be in place for all special events to restrict/direct traffic along the haul routes;
- Additional signage.
- Additional public notice through local newspaper or other means.

Affected Road Jurisdictions

Name	Address	Phone	Point of Contact
IDOT Region 4 District 7	400 W. Wabash Effingham, IL 62401	(217) 342-3951	Jeffrey M. South
IDOT Region 5 District 9	2801 W. Murphysboro Rd. Carbondale, IL 62901	(618) 549-2171	n/a
Hamilton Co. Highway Dept.	100 S. Jackson St. Rm 2 McLeansboro, IL 62859	(618) 643-2714	Kevin Phillips
Beaver Township (Hamilton)		618-383-1387	Vuel York
Crook Township (Hamilton)		618-516-2096	Gene Wheeler
Crouch Township (Hamilton)		618-927-7709	James Coy
Mayberry Township (Hamilton)		618-926-4559	Leeroy Sarris
White Co. Highway Dept.	1103 E. Main St. Carmi, IL 62821	(618) 382-4811	Brian Ray
Mill Shoals Township (White)		618-384-9690	Dennis Woodrow
Enfield Township (White)		618-262-1263	Joe Allen
Indian Creek Township (White)		618-384-7610	Jimmy Hoskins
Wayne Co. Highway Dept.	1309 E. Main St. Fairfield, IL 62837	(618) 847-7343	Dennis Seidel
Barnhill Township		618-842-3123	Ray Smuthers
Big Mound Township		618-847-5404	John Jones

Route Map *[Insert site map below]*



[redacted]
Site Manager

8-23-17
Date

[redacted]
Health & Safety Representative

8-23-17
Date

Prepared by: Shawnee Professional Services

[redacted]
Billy J. Abe[redacted]E – License No. 062-057174

8-23-17
Date

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Traffic Management Plan (c)

The following is anticipated start and end dates. Due to the unknowns of weather, surface conditions, farming operations, etc. dates ranges shown may overlap.

ACTIVITY	START DATES	END DATES
Well Site Construction	Sep 1, 2017 to Jan. 15, 2018	Sep. 1, 2017 to Jan. 15, 2018
Drilling Operations	Sep. 1, 2017 to Jan. 15, 2018	Sep. 1, 2017 to Jan. 15, 2018
HVHHF Operations	November 1, 2017	May 31, 2018

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Traffic Management Plan

Copies of the traffic management plan have been submitted to the impacted highway and road authorities as required under 245.210(a)(15).

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: TopsoilPreservationPlan

Please save attachment and use the file name above.

Topsoil Preservation Plan §1-35(b)(20); 245.210(b)(2), 245.410(d).
Please detail the plan to stockpile, stabilize, store, and segregate any topsoil and subsoil stripped from the site, as well as the proposed timeframe during which the site will be disturbed.

WOOLSEY OPERATING COMPANY, LLC
125 NORTH MARKET, SUITE 1000, WICHITA, KANSAS 67202-1775
(316) -267-4379 FAX (316) 267-4383

Woolsey Operating Company, LLC
Woodrow #1H-310408-193
White County, Illinois
High Volume Horizontal Hydraulic Fracturing Permit Application
HVHHF-10: Topsoil Preservation Plan

ATTACHMENT: Topsoil Preservation Plan

At the time of construction of the well pad and well site, topsoil will be stripped following vegetation removal, be stored separately from subsoil or other excavated material to avoid mixing during construction, storage and restoration. Topsoil will include all suitable growth medium present at site, as indicated by color or texture or supporting any sprigs of vegetation.

Topsoil will be wind-rowed to shallowest practical depth around the entire perimeter of well pad to create a berm that infiltrates/redirects/manages storm water while extending the viability of the topsoil.

Erosion control will be installed if necessary to ensure soil stays within the stockpile footprint. Stockpiles will be stabilized to avoid erosional losses using re-established native grasses and/or erosion mats. If topsoil stockpiles will remain longer than a growing season, the pile will be seeded with a cover crop.

Topsoil, subsoil, and underlying materials will be stored in separate piles. The portion of the site used for drilling and completion will be disturbed from between 6 months and one year and topsoil will be reclaimed on that portion upon remediation. The portion of the site that will be used for operations and production will be disturbed during the production phase of the well. Upon plugging and abandoning the well all topsoil will be reclaimed with either the topsoil removed or with topsoil of similar characteristics.

Access roads to the well site will not include the removal of topsoil or subsoil. A layer of rock will be added on the topsoil. The access road will remain in place through the production phase of the well. To restore the access road the rock added will be removed from the road and any topsoil removed during that process will be reclaimed with topsoil of similar characteristics of the topsoil removed.

On April 22, 2016, 62 Ill. Adm. Code 240.1181 was repealed and the requirements found in that Section were incorporated into 62 Ill. Adm. Code 240.1180. As it is now impossible to comply

with 62 Ill. Adm. Code 240.1181, the well site will be restored with the restoration requirements found in 62 Ill. Adm. Code 240.1180 and Section 1-95 of the Hydraulic Fracturing Regulatory Act, 225 ILCS 732/1-95.