

Appendix I

Drilling Mud Information

Baroid Drilling Fluids Products

AQUAGEL GOLD SEAL®

Premium Untreated Bentonite for Geotechnical Drilling

AQUAGEL GOLD SEAL® premium high-yield bentonite is mined from deposits located in Wyoming. AQUAGEL GOLD SEAL bentonite contains no polymer additives or chemical treatments of any kind. Only the highest quality bentonite is used for the product AQUAGEL GOLD SEAL. Wyoming bentonite is composed predominantly of sodium montmorillonite (a layered aluminosilicate) and is a completely naturally occurring clay.

AQUAGEL GOLD SEAL bentonite acts as a viscosifier and filtrate reducer for drilling fluids. The clay particles through positive and negative charged surfaces form gel structures and develop viscosity. The clay is structured in flat plate-like layers which overlap and form a thin impermeable filter cake on the face of a borehole.

AQUAGEL GOLD SEAL bentonite is a dry powdered clay and can be added directly to fresh water or freshwater drilling fluids. For use in salty or brackish water (less than 8000 ppm chloride), AQUAGEL GOLD SEAL is first hydrated in fresh water and then added to the salty or brackish water.

AQUAGEL GOLD SEAL bentonite when used in the treatment levels and manner recommended is an **environmentally safe** product.

Recommended Uses:

- Improving hole-cleaning capacity of fluid
- Reducing water seepage or filtration into permeable formations.
- Rapidly forming a thin filter cake with low permeability
- Promoting hole stability in poorly consolidated formations
- Preventing loss of fluids to circulation zones

Major Advantages:

- No polymer or chemical additives
- All naturally occurring clay material
- Quality controlled and manufactured to **exceed API standards** — yield 92+ bbl/ton of 15 centipoise fluid
- Environmentally acceptable product
- AQUAGEL GOLD SEAL is non-polluting and non-toxic when used as recommended. It has been analyzed by an independent testing laboratory and passed the EPA's protocol on Toxicity Characteristic Leaching Procedure (TCLP). Test data available on request.

Typical Properties:

Dry Screen Analysis (Ground Material)

80% through 200 mesh (74 microns)

X-Ray Analysis (Typical Wyoming Bentonite)

85% Montmorillonite
5% Quartz
5% Feldspars
2% Cristobalite
2% Illite
1% Calcite and Gypsum

Chemical Analysis

(All Elements Reported as Oxide Form)

SiO ₂	55.44%
Al ₂ O ₃	20.14%
Fe ₂ O ₃	3.67%
CaO	0.49%
MgO	2.49%
Na ₂ O	2.76%
K ₂ O	0.60%
Bound water	5.50%
Moisture (220° F)	8.00%
TOTAL	99.09%

Packaging:

AQUAGEL GOLD SEAL® premium bentonite is packaged in multiwall, water resistant paper bags containing 50 pounds (22.7 kg) or 40 kg (for Canada), or 100 pounds (55.4 kg).

Availability:

AQUAGEL GOLD SEAL® premium bentonite can be purchased through any QUIK-GEL® retailer, Baroid Service Center, or from the Houston customer service department.

Recommended Treatment

Approximate amount of AQUAGEL GOLD SEAL Premium Bentonite
Added to Fresh Water or to Freshwater Drilling Fluid

	lb/100 gal	lb/bbl*	kg/m ³
Added to Fresh Water:			
Under normal drilling conditions	30-50	13-22	35-60
To stabilize caving formations	60-80	25-35	70-100
To stop circulation loss	70-95	30-40	85-110
Added to Freshwater Mud:			
Under normal drilling conditions	10-25	4-10	11-28
To stabilize caving formations	20-45	9-18	25-50
To stop circulation loss	25-50	10-20	28-56

Method of addition: mix slowly through a jet mixer or sift slowly into the vortex of a high-speed stirrer.

*1 bbl = 42 U.S. Gallons

Because the conditions of use of this product are beyond seller's control, the product is sold without warranty either express or implied and upon condition that purchaser make its own tests to determine the suitability for purchaser's application. Purchaser assumes all risk of use and handling of this product.

This product will be replaced if defective in manufacture or packaging or if damaged. Except for such replacement, seller is not liable for any damages caused by this product or its use.

The statements and recommendations made herein are believed to be accurate. No guarantee of their accuracy is made, however.

Baroid

Drilling Fluids Products

QUIK-GEL®

Viscosifier

QUIK-GEL® viscosifier is a finely ground, premium-grade western sodium bentonite, specially processed to promote ease of mixing and superior mud-making qualities in fresh water.

Recommended Uses:

In Fresh Water or In Freshwater-based Drilling Fluids

Improved hole-cleaning capabilities.

Forms on permeable sections of the well bore a thin impermeable filter cake that can be removed easily by backflushing.

Promotes hole stability in poorly consolidated and caving formations.

Reduces water seepage in permeable formations.

Avoids or overcomes loss of circulation.

In Fresh Water Fluids

Making an economical, single-sack, low-solids drilling fluid.

Making gel-foam for air drilling.

Major Advantages:

Effectiveness. QUIK-GEL viscosifier makes more than twice as much mud of the same viscosity as an equal weight of API-standard bentonite.

Fast yield. QUIK-GEL viscosifier reaches high viscosity quickly.

Easy mixing. QUIK-GEL viscosifier saves time and effort in making mud.

Convenience. The sturdy 50-pound (22.7 kg) bag is easy to handle.

Environmental acceptability. QUIK-GEL viscosifier does not ferment, and passed the EPA's suggested protocol for Toxicity Characteristic Leaching Procedure (TCLP) in *Federal Register*, Vol. 51, No. 114. Independent lab findings are available on request.

National Sanitation Foundation (NSF) certified product.

Recommended Treatment:

See table below.

Approximate Amounts of QUIK-GEL Viscosifier Added to Fresh Water or to Freshwater Drilling Fluids

	lb/100 gal	lb/bbl	kg/m ³
Added to Fresh Water			
Under normal drilling conditions.	15-25	6-11	15-30
In gravel or other poorly consolidated formations.	25-40	12-18	35-50
To stop loss of circulation.	35-45	15-20	40-55
Added to Freshwater Mud			
To improve performance; for better hole cleaning, thinner filter cake, and increased hole stability.	5-10	2-5	6-14

Method of addition: Preferably, mix by adding slowly through a jet mixer or high-speed stirrer. If such mixing equipment is not available, sift QUIK-GEL viscosifier slowly into the liquid close to the pump suction while circulating.

Packaging:

QUIK-GEL® viscosifier is packaged in multiwall, water-resistant paper bags containing 50 pounds (22.7 kg).

Availability:

QUIK-GEL viscosifier may be purchased through any Baroid Service Center, QUIK-GEL Retailer or from the Houston Customer Service Department.

Physical Characteristics:

Appearance	Beige to tan powder
Specific Gravity	2.5 to 2.6
Moisture	Less than 10%
Bulk Density	72 lb/ft ³ , compacted 47 lb/ft ³ , uncompacted

This product has been certified by NSF to contribute no adverse health problem to ground water when used as the manufacturer recommends.

In accordance with National Sanitation Foundation (NSF) certification requirements and good well development practices, as much product as practical should be flushed from the finished well resulting in a turbidity level below 1 NTU, before completing as a drinking water source.

Mineralogical Analyses (Typical)

85%	Montmorillonite
5%	Quartz
5%	Feldspars
2%	Cristobalite
2%	Illite
1%	Calcite and Gypsum

Chem

20.14%	Al ₂ O ₃
3.67%	Fe ₂ O ₃
0.49%	CaO
2.49%	MgO
2.76%	Na ₂ O
0.60%	K ₂ O
5.50%	Bound Water
8.00%	Moisture at 220°F
99.09%	TOTAL

QUIK-GEL contains a small amount of non-toxic organic polymer of the type approved by the U.S. Food and Drug Administration for use in packages for food and other consumer products.

Because the conditions of use of this product are beyond seller's control, the product is sold without warranty either express or implied and upon condition that purchaser make its own tests to determine the suitability for purchaser's application. Purchaser assumes all risk of use and handling of this product.

This product will be replaced if defective in manufacture or packaging or if damaged. Except for such replacement, seller is not liable for any damages caused by this product or its use.

The statements and recommendations made herein are believed to be accurate. No guarantee of their accuracy is made, however.

Baroid Drilling Fluids, Inc.

National Sanitation Foundation Certified Products for Water Well and Geotechnical Drilling

The following Baroid water well drilling and grouting products have been certified by the National Sanitation Foundation (NSF). The NSF certification means that these products have passed stringent laboratory procedures designed to ensure that the products pose no adverse health risks when used according to manufacturer's recommendations. Please refer to usage and dosage chart on the reverse side of this sheet.

AQUAGEL®

Material: Wyoming bentonite, sodium montmorillonite

Use: gel-forming colloidal clay used to adjust viscosity and gel strength, and reduce filtrate loss

Features: industry standard bentonite clay, 2.7 specific gravity, 200-mesh grind, yields 92 barrels of 15-centipoise drilling mud per ton, environmentally compatible

Container: 50-pound (22.7 kg) or 100-pound (45.5 kg) multiwall paper bag

AQUAGEL® GOLD SEAL®

Material: Wyoming bentonite, non-treated sodium montmorillonite

Use: gel-forming colloidal clay used to improve hole cleaning, reduce filtrate loss, form a thin impermeable filter cake on borehole

Features: premium quality containing only ground sodium bentonite clay, no polymers or chemical additives or treatments, 2.7 specific gravity, 200-mesh grind, environmentally compatible, yields 91 barrels of 15 centipoise mud per ton

Container: 50-pound (22.7 kg) or 100-pound (45.5 kg) multiwall paper bag

AQUA-GROUT™

Material: inorganic catalyst used with BENSEAL for pumpable grout

Use: added to water for retarding set-time of BENSEAL product to allow placement in annular space

Features: inorganic, non-fermenting, white powder, easily dispersible in water, environmentally safe when used as manufacturer recommends

Container: 30-pounds (13.6 kg) contained in 5-gallon plastic pail

BENSEAL®

Material: Wyoming bentonite, sodium montmorillonite

Use: with AQUA-GROUT catalyst forms a pumpable grouting slurry for sealing and plugging boreholes, and grouting steel and plastic pipe; can be applied dry as a plug and seal for boreholes

Features: non-treated, granular 8-mesh high quality sodium bentonite, environmentally compatible, will rehydrate after atmospheric drying cycle to reform plug

Container: 50-pound (22.7 kg) multiwall paper bag

HOLEPLUG®

Material: Wyoming bentonite, sodium montmorillonite

Use: plug and abandon boreholes, forms a semi-rigid plug between hole and production tubing

Features: non-treated, two sizes - 3/8" and 3/4" chunks, naturally occurring so has not been mechanically stressed, does not bridge easily downhole, will fall through column of standing water, rehydrates after atmospheric drying cycle to reform semi-plastic plug

Container: 50-pound (22.7 kg) multiwall paper bag

QUIK-GEL®

Material: high-yield Wyoming bentonite, sodium montmorillonite

Use: forms high viscosity mud faster than ordinary bentonite clays, used particularly in drilling seismic shot holes and water wells where small mixing equipment necessitates fast yielding mud

Features: easily and rapidly mixed, low cost, will not ferment, high yield of 200 barrels of 15-centipoise drilling fluid per ton, 2.7 specific gravity, 200-mesh grind size

Container: 50-pound (22.7 kg) multiwall paper bag

SHURGEL®

Material: calcium-tolerant, sodium bentonite clay, Wyoming bentonite

Use: added to drilling fluid systems as a stabilizer and viscosity enhancer for abandonment of exploration holes

Features: semi-rigid plastic plugs formed in 8-15 days, prevents fluid migration in holes, premium-grade bentonite

Container: 50-pound (22.7 kg) multiwall paper bag

USAGE AND DOSAGE CHART FOR NSF CERTIFIED PRODUCTS

PRODUCT	FUNCTIONS p – PRIMARY s – SECONDARY				RECOMMENDED USAGE			RECOMMENDED APPLICATION			USE LEVEL
	Viscosifier- thickener	Filtrate reducer	Lost circulation material	Formation stabilizer	Fresh water	Brackish water	Low solids	Grouting & plugging	Drilling	Stemming shot holes	
AQUAGEL	p	p	s	p	p	s			p		20–50 pounds/ 100 gallons
AQUAGEL GOLD SEAL	p	p	s	p	p	s			p		20–50 pounds/ 100 gallons
AQUA-GROUT					p	s		p			as per Product Data Sheet
BENSEAL			s					p	s		as per Product Data Sheet
HOLEPLUG			s					p		s	as per Product Data Sheet
QUIK-GEL	p	p	s	p	p		p		p		15–20 pounds/ 100 gallons
SHURGEL	p	p		p	p			p	s		as per Product Data Sheet

All information, recommendations and suggestions appearing herein concerning our products are based upon tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity, and suitability for his own use of the products described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by Baroid Drilling Fluids, Inc. as to the effects of such use, the results to be obtained, or the safety and toxicity of the products nor does Baroid

Drilling Fluids, Inc. assume any liability arising out of use, by others, of the products referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

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 **AQUA-GROUT is a trademark of Baroid Technology, Inc.

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Baroid

Drilling Fluids Products

HOLEPLUG®

Graded Bentonite

HOLEPLUG® graded bentonite is a naturally occurring clay which is used to seal and plug drilled holes. The clay is a high-swelling sodium-based Wyoming bentonite (montmorillonite) which has the specific characteristic of swelling in fresh water. The HOLEPLUG graded bentonite is mined from deposits which have the ability to swell at a controlled, slow rate. HOLEPLUG bentonite will fall through a column of standing water and easily reach the bottom of the hole before hydration or water swelling begins. Complete fill of the annular space can be achieved, and this acts to prevent bridging of the particles in the upper hole. Complete fill is a requirement of forming a good plug.

HOLEPLUG graded bentonite is sized in two particle ranges, HOLEPLUG 3/8" and HOLEPLUG 3/4". HOLEPLUG 3/4" bentonite is mined and screened so that 100% will pass through a 3/4" screen, but be retained on a 3/8" screen. HOLEPLUG 3/8" bentonite has 100% passing a 3/8" screen, but 100% is retained on a 1/4" screen. The particles are:

HOLEPLUG 3/4" 3/8" to 3/4" granules

HOLEPLUG 3/8" 1/4" to 3/8" granules

The size of the open annular space will determine which HOLEPLUG bentonite product size to be used.

When annular space is 1-1/2" or more HOLEPLUG 3/4" bentonite is used.

When annular space is 3/4" or more HOLEPLUG 3/8" bentonite is used.

Major Advantages:

- Prevents entry of surface water into borehole
- Prevents vertical movement of fluids in the hole between porous zones
- Forms a permanent, flexible downhole seal
- Easy pipe recovery
- Prevents blowouts and surface cratering in shot hole
- Eliminates post shot clean-up and plugging of shot holes
- Allows hole re-entry
- Superior alternative to pelletized bentonite
- Packaged in easy-to-open sewn sacks
- Simple to apply and no mixing expense
- Weatherproof packaging

Recommended Uses

- Sealing outside casing annulus
- Sealing above gravel packs
- Plugging boreholes
- Sealing around conductor pipe
- Stemming pre-shot and plugging seismic shot holes
- Sealing lost circulation zones
- Shutting off artesian wells

This product has been certified by National Sanitation Foundation (NSF) to contribute no adverse health problems to ground water when used as the manufacturer recommends.

Application Methods:

Plugging and stemming drill holes:

1. Open top of HOLEPLUG® graded bentonite bag
2. Hold bag about two feet above hole
3. Pour HOLEPLUG graded bentonite slowly (2 minutes per bag) into hole
4. Fill hole as required (above static water level or near ground surface)
5. Observe all regulatory specifications

Stopping loss of circulation and stabilizing unconsolidated formations:

1. Pull drill pipe out of hole
2. Pour HOLEPLUG graded bentonite into hole to fill above problem zone
3. Drill ahead slowly with reduced pump pressure

Plugging artesian water flows:

1. Pour HOLEPLUG graded bentonite into hole until water flow subsides or hole is filled to surface

Hole Size and Volume Table

Hole Diameter Inches	Hole Volume cu/ft/foot	Pounds HOLEPLUG Bentonite To Fill One Foot	Feet Filled By One Bag HOLEPLUG Bentonite	Bags HOLEPLUG Bentonite To Fill 100 ft
2	0.022	1.6	31.3	3.2
2-1/2	0.034	2.5	20.0	5.0
3	0.049	3.5	14.3	7.0
3-1/2	0.067	4.8	10.4	9.6
4	0.087	6.3	7.9	12.6
4-1/2	0.110	7.9	6.3	15.8
5	0.136	9.8	5.1	19.6
5-1/2	0.165	11.9	4.2	23.8
6	0.196	14.1	3.5	28.2
6-1/2	0.230	16.6	3.0	33.2
7	0.267	19.2	2.6	38.4
7-1/2	0.307	22.1	2.3	44.2
8	0.349	25.1	2.0	50.2
8-1/2	0.394	28.4	1.8	56.8
9	0.442	31.8	1.6	63.6
9-1/2	0.492	35.4	1.4	70.8
10	0.545	39.2	1.3	78.4
11	0.660	47.5	1.1	95.0
12	0.785	56.5	0.89	113.0
15	1.227	88.3	0.57	176.6
18	1.767	127.2	0.39	254.4
20	2.1817	157.1	0.32	314.2
25	3.409	245.4	0.20	490.8
30	4.909	353.4	0.14	706.8

2. In case of severe flows add BAROID® barite weight material along with HOLEPLUG graded bentonite

Typical Physical Properties:

Bulk Density, uncompacted:

HP 3/4	71.8 lb/ft ³
HP 3/8	68.8 lb/ft ³

Moisture 17%

Permeability of resulting plug:

$K = 1.5 \times 10^{-9}$ cm/sec.

Test data available on request.

Environmental Information:

HOLEPLUG graded bentonite is a natural, unaltered mineral with no added chemicals or contaminants.

HOLEPLUG graded bentonite is non-toxic (96 hour LC_{50} is greater than 100,000 ppm).

HOLEPLUG graded bentonite does not spoil or ferment.

HOLEPLUG graded bentonite is environmentally safe and complies with the EPA's proposed protocol for toxicity characterization by leaching procedure. Lab report available on request.

Packaging:

HOLEPLUG graded bentonite is packaged in multiwall paper bags containing 50 pounds (22.7 kg).

Availability:

HOLEPLUG graded bentonite may be purchased through Baroid Service Centers or from QUIK-GEL® Retailers.

Because the conditions of use of this product are beyond seller's control, the product is sold without warranty either express or implied and upon condition that purchaser make its own tests to determine the suitability for purchaser's application. Purchaser assumes all risk of use and handling of this product.

This product will be replaced if defective in manufacture or packaging or if damaged. Except for such replacement, seller is not liable for any damages caused by this product or its use.

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Baroid

Drilling Fluids Products

BAROID® BENTONITE PELLETS

Sealing and Plugging Agent

BAROID® BENTONITE PELLETS sealing and plugging agent are formed of high yield sodium bentonite which has been processed without organic polymers or other additives. No filler or adulterating agents have been included in BAROID BENTONITE PELLETS. The BAROID BENTONITE PELLETS have been pressure molded into hard tablets which aid in placement in well bores. The hardened tablet form with no polymer coating or mold release agent, retards the swelling characteristic of the bentonite long enough to allow placement in boreholes. BAROID BENTONITE PELLETS can be tremied into the hole when necessary.

BAROID BENTONITE PELLETS when placed into a well bore form a casing grout, an instrument isolation plug or an abandoned hole plugging agent. BAROID BENTONITE PELLETS when properly placed and allowed to hydrate form a semi-solid but flexible seal. The hydraulic conductivity measured in a fixed wall permeameter is less than 1×10^{-9} cm/sec. The hydrated BAROID BENTONITE PELLETS are chemically stable in the presence of water, brines, and waters containing organic hydrocarbons. The BAROID BENTONITE PELLETS are rehydratable to original specifications if the plug is subjected to wet/dry cycles.

BAROID BENTONITE PELLETS are high quality Wyomin bentonite composed primarily of sodium montmorillonite. Sodium montmorillonite is a swelling form of clay which contributes several needed characteristics. BAROID BENTONITE PELLETS have been formed into three sizes: 1/4", 3/8" and 1/2". The bentonite material is stable in storage, not affected by heat or cold, and will not spoil or ferment. The pellets, when placed downhole, will conform to the size and shape of the borehole, and will swell to fill the available space. The BAROID BENTONITE PELLETS require no special handling equipment, are clean to use, and are not soluble in organic solvents.

Recommended Uses:

- Sealing or grouting plastic or steel casing
- Isolating screen intervals, subsurface instrumentation, and sampling zones
- Providing a protective interface between gravel pack and cement grout
- Plugging abandoned earthen boreholes
- Creating a stable, permanent below-grade seal in
 - monitor/observation wells
 - dewatering holes
 - caisson holes
 - soil sampling holes
 - minerals exploration holes
 - water wells

Major Advantages:

- High quality Wyoming bentonite (sodium-based clay) which will swell in the presence of water
- Hardened form eliminates premature swelling and allows use in dry or wet holes
- Forms a below-grade permanent, flexible seal which can be easily removed
- Does not generate heat of hydration
- No organics or chemical treatments associated with the pellets
- Rehydratable to original specification
- Can be tremied into borehole

Montmorillonite	85%
Quartz	5%
Feldspars	5%
Cristobalite	2%
Illite	2%
Calcium and Gypsum	1%

SiO ₂	55.44%
Al ₂ O ₃	20.14%
Fe ₂ O ₃	3.67%
CaO	0.49%
MgO	2.49%
Na ₂ O	2.76%
K ₂ O	0.60%
Bound Water	5.50%
Moisture (220°F/104°C)	8.00%

TOTAL	99.09%
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BAROID BENTONITE PELLETS meet all requirements of EPA and RCRA as a suitable monitoring well agent.

References: Article 46 & 56, EPA Manual of Water Well Construction Practicess (EPA 570/9-75-001)

**Title 40, Code of Federal Regulations,
Part 265, Subpart F**

Usage Levels:

VOLUMES/AMOUNTS FOR GROUTING AND PLUGGING

Nominal Size, In.		Cubic Ft/Ft	Gallons/Ft	Pound/Ft		
Fraction	Decimal			1/4"	3/8"	1/2"
1/2	0.50	0.001	0.010	0.10	0.10	0.09
3/4	0.75	0.003	0.023	0.22	0.22	0.21
1	1.00	0.006	0.041	0.39	0.39	0.37
1-1/2	1.50	0.012	0.092	0.87	0.87	0.83
2	2.00	0.022	0.163	1.54	1.55	1.47
2-1/4	2.25	0.028	0.207	1.95	1.95	1.86
2-1/2	2.50	0.034	0.255	2.40	2.41	2.30
3	3.00	0.049	0.367	3.48	3.48	3.30
4	4.00	0.087	0.651	6.15	6.15	5.86
4-1/2	4.50	0.110	0.823	7.77	7.80	7.41
5	5.00	0.136	1.017	9.63	9.67	9.18
5-1/4	5.25	0.150	1.122	10.59	10.64	10.10
5-1/2	5.50	0.165	1.235	11.66	11.70	11.15
5-3/4	5.75	0.180	1.347	12.72	12.77	12.12
6	6.00	0.196	1.466	13.84	13.90	13.19
7	7.00	0.267	2.00	18.88	18.96	18.00
7-1/4	7.25	0.287	2.145	20.25	20.33	19.31
7-1/2	7.50	0.307	2.295	21.69	21.79	20.68
8	8.00	0.349	2.612	24.66	24.76	23.51
8-1/4	8.25	0.371	2.777	26.21	26.33	24.99
8-1/2	8.50	0.394	2.948	27.83	27.95	26.53
8-3/4	8.75	0.418	3.113	29.48	29.61	28.10
10	10.00	0.545	4.081	38.52	38.69	36.73
10-1/4	10.25	0.573	4.286	40.46	40.63	38.57
11	11.00	0.660	4.938	46.61	46.81	44.44
11-1/2	11.50	0.721	5.378	50.92	51.14	48.54
12	12.00	0.785	5.876	55.47	55.70	52.88
12-1/4	12.25	0.818	6.124	57.81	58.06	55.11
12-1/2	12.50	0.852	6.353	60.17	60.42	57.35
13	13.00	0.922	6.897	65.11	65.38	62.07
13-1/2	13.50	1.000	7.438	70.21	70.51	66.94
15	15.00	1.227	9.182	86.68	87.05	82.64
17-1/4	17.25	1.623	12.143	114.63	115.12	109.29
26	26.00	3.687	27.487	260.30	261.41	248.14
30	30.00	4.909	36.596	346.56	348.03	330.36

To calculate the volume of material needed for filling annular space:

Subtract the volume needed to fill the nominal casing O.D. from the volume needed to fill the nominal drilled hole size.

EXAMPLE

5 inch casing in an 8-3/4" drilled hole, and using 1/4" pellets

Volume Needed = Volume Drilled Hole - Volume Casing O.D.
 = 29.48 pounds - 9.63 pounds
 = 19.85 pounds to fill annular space

Recommended Application:

- Pour slowly from surface to minimize bridging of pellets
- Break up bridges as they occur
- Can be tremied into place when necessary
- Volume needed can vary $\pm 15\%$ in a rotary drilled hole
- Calculate and monitor pellet addition amounts to ensure proper hole fill
- Calculated volume should be applied to bore hole
 - if less than calculated volume is used, indicates bridging or hole collapse
 - if more than calculated volume is used, indicates hole wash out

Packaging:

BAROID® BENTONITE PELLETS are packaged in 5-gallon plastic pails containing 50 pounds each. The 50 pounds will occupy 0.6 cubic feet.

Availability:

BAROID® BENTONITE PELLETS can be purchased through any QUIK-GEL® Retailer, Baroid Service Center or the Baroid Houston Office located at 3000 N. Sam Houston Parkway East, Houston, Texas 77032. The product can be ordered through the Customer Service Department at (713) 987-5067.

Baroid Drilling Fluids, Inc.
Environmental, Safety and Transportation Data Sheet

NATIONAL BENTONITE

HEALTH HAZARD 0 FLAMABILITY 0 REACTIVITY 0

Ratings based on NFPA

'Standard system for the Identification of the Fire Hazards of Materials'

I. PRODUCT IDENTIFICATION

Supplier BAROID DRILLING FLUIDS, INC. Regular Telephone No. 713/987-4970
Address P.O. BOX 1675 HOUSTON, TEXAS 77251 Emergency Telephone No. 713/987-4000
Trade Name NATIONAL BENTONITE
Generic Description WYOMING BENTONITE, SODIUM MONTMORILLONITE, CAS #1302-78-9

II. HAZARDOUS INGREDIENTS

Material or Component	%	Hazard Data
SILICA 14808-60-7	2-6	LOW CONCENTRATIONS OF CRYSTALLINE SILICA (SiO ₂) IN THE FORM OF QUARTZ, CRISTOBALITE, AND TRIDYMITTE MAY BE PRESENT (SEE SECTION V)

III. PHYSICAL DATA

Boiling Point (Deg F)	Melting Point	Freezing Point
NA	ND	ND
Specific Gravity (Water = 1) 2.5	Vapor Pressure (mm Hg) NA	
Vapor Density (Air = 1) NA	Solubility in water, % by wt. NA	
Volatiles, % by Volume NA	Evaporation Rate (Butyl Acetate = 1) NA	
Appearance and Odor LIGHT TAN TO GRAY SOLIDS, NO ODOR	Density @ 20 Deg C 47 LBS CF	
pH NA		

NA = Not Applicable ND = Not Determined

All information recommendations and suggestions herein concerning our product are based upon tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity, and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by Baroid Drilling Fluids, Inc. as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Baroid Drilling Fluids, Inc. assume any liability arising out of use, by others, of the product referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

BEST Sheet

NATIONAL BENTONITE

Page 2

IV. FIRE AND EXPLOSION DATA

NATIONAL BENTONITE IS NOT FLAMMABLE AND NOT EXPLOSIVE. DOES NOT SUPPORT COMBUSTION.

EXTINGUISHING MEDIA: WATER

V. HEALTH HAZARD INFORMATION

Carcinogenicity -SEE ROUTES OF EXPOSURE AND EFFECTS BELOW

Acute Oral (LD50)
ND

Acute Dermal (LD50)
ND

Aquatic Toxicity (LC50)
ND

Routes of exposure and effects

THIS PRODUCT CONTAINS FREE CRYSTALLINE SILICA WHICH ACCORDING TO THE IARC HAS EXHIBITED LIMITED EVIDENCE OF CARCINOGENICITY IN HUMANS.

TLV FOR RESPIRABLE DUST

10 MG/M3

* RESPIRABLE QUARTZ + 2

TLV FOR "TOTAL DUST"

30 MG/M3

* QUARTZ + 2

IF CRISTOBALITE OR TRIDYMITE IS DETECTED, USE ONE-HALF THE VALUE CALCULATED FROM FORMULAE FOR QUARTZ

SKIN: POTENTIAL IRRITANT

EYES: IRRITANT

INHALATION: IRRITATION TO LUNGS, NOSE, AND THROAT; PROLONGED INHALATION OF THE POWDER MAY RESULT IN SILICOSIS, A NONCANCEROUS LUNG DISEASE.

Emergency and First Aid procedures

SKIN: FLUSH SKIN WITH LARGE AMOUNTS OF WATER

EYES: FLUSH EYES WITH WATER AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, CONTACT PHYSICIAN

INHALATION: MOVE TO FRESH AIR

BEST Sheet

NATIONAL BENTONITE

Page 3

VI. REACTIVITY DATA

Conditions contributing to instability
THIS PRODUCT IS STABLE UNDER NORMAL DRILLING CONDITIONS.

Incompatibility
NONE

Hazardous Decomposition Products
NONE

Conditions Contributing to Hazardous Polymerization
NONE

VII. SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled
NORMAL HOUSEKEEPING, CAUSES SLIPPERY SURFACES WHEN WET.

Neutralizing Chemicals
NA

Waste Disposal Method
DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS

VIII. INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements
MECHANICAL, GENERAL ROOM VENTILATION
USE LOCAL VENTILATION TO MAINTAIN TLV (SEE SECTION V)

Specific Personal Protective Equipment
Respiratory
USE A NOISH APPROVED MECHANICAL FILTER RESPIRATOR FOR NON TOXIC DUSTS.
Eye
SAFETY GLASSES, GOGGLES
Gloves
WORK GLOVES
Other Clothing and Equipment
APRON, EYEWASH STATION

BEST Sheet

NATIONAL BENTONITE

Page 4

IX. SPECIAL PRECAUTIONS

Precautionary Statements
AVOID PROLONGED INHALATION.

RECOMMENDED LABEL:

FRONT PANEL: CAUTION
SEE BACK PANEL FOR CAUTION BEFORE USE.

BACK PANEL: CAUTION
THIS PRODUCT CONTAINS FREE SILICA. PROLONGED INHALATION
OF THE POWDER MAY RESULT IN LUNG DISEASE. AVOID CREATING
DUSTY CONDITIONS AND USE A NIOSH APPROVED DUST RESPIRATOR

Other Handling and Storage Requirements
NATIONAL BENTONITE IS NOT HAZARDOUS. NO HAZARDS ARE INVOLVED WITH NORMAL
HANDLING.

STORE IN SHELTERED AREA OR COVER FOR MOISTURE PROTECTION.

X. DEPARTMENT OF TRANSPORTATION INFORMATION

Proper Shipping Name:
NOT REGULATED

Placards:
NONE
Reportable quantity:
-

Hazard Class:
NOT HAZARDOUS
Hazardous Substance:
SILICA
Label:
NONE REQUIRED

ID Number:
NONE

Prepared By: Baroid Drilling Fluids, Inc.
Environmental Services

Date:
08/10/90



Environmental, Safety and Transportation Data Sheet

QUIK-GEL

I PRODUCT IDENTIFICATION		
SUPPLIER NL BAROID	REGULAR TELEPHONE NO. (713) 987-5900 EMERGENCY TELEPHONE NO. (713) 987-4000	
ADDRESS P.O. BOX 1675 HOUSTON, TEXAS 77251		
TRADE NAME QUIK-GEL®		
GENERIC DESCRIPTION HIGH YIELD BENTONITE; SODIUM MONTMORILLONITE		
II HAZARDOUS INGREDIENTS		
MATERIAL OR COMPONENT	%	HAZARD DATA
SILICA 7631-86-9	2-6%	LOW CONCENTRATIONS OF
		CRYSTALLINE SILICA (SiO ₂)
		IN THE FORM OF QUARTZ,
		CRISTOBALITE, AND TRIDYMIT
		MAY BE PRESENT
		(SEE SECTION V)
III PHYSICAL DATA		
BOILING POINT (°F) NA	MELTING POINT NA	FREEZING POINT NA
SPECIFIC GRAVITY (H ₂ O = 1) 2.5	VAPOR PRESSURE (mm Hg) NA	
VAPOR DENSITY (AIR = 1) NA	SOLUBILITY IN H ₂ O, % BY WT. NA	
% VOLATILES BY VOL. NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA	
APPEARANCE AND ODOR GREY, TAN POWDER	Density @ 20°C: 41.6 lbs/ft³ (UNCOMPACTED)	
pH NA		

NA = Not Applicable ND = Not Determined

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QUIK-GEL®

2

HEALTH HAZARD

0

FLAMMABILITY

0

REACTIVITY

Ratings based on NIOSH "Identification System for Occupationally Hazardous Materials" (1974)

BEST Sheet

IV FIRE AND EXPLOSION DATA

NOT FLAMMABLE OR EXPLOSIVE.

EXTINGUISHING MEDIA: WATER

V HEALTH HAZARD INFORMATION

CARCINOGENICITY — SEE ROUTES OF EXPOSURE AND EFFECTS (BELOW)

ACUTE ORAL LD₅₀ ND

ACUTE DERMAL LD₅₀ ND

AQUATIC TOXICITY (LC₅₀) 10,000 mg/l

ROUTES OF EXPOSURE AND EFFECTS

THIS PRODUCT CONTAINS FREE CRYSTALLINE SILICA WHICH ACCORDING TO THE IARC HAS EXHIBITED LIMITED EVIDENCE OF CARCINOGENICITY IN HUMANS. PROLONGED INHALATION OF THE POWDER MAY RESULT IN SILICOSIS, A NONCANCEROUS LUNG DISEASE.

TLV FOR RESPIRABLE DUST

10 mg/m³

% RESPIRABLE QUARTZ + 2

TLV FOR "TOTAL DUST"

30 mg/m³

% QUARTZ + 3

IF CRISTOBALITE OR TRIDYMITTE IS DETECTED, USE ONE-HALF THE VALUE CALCULATED FROM FORMULAE FOR QUARTZ

SKIN: POTENTIAL IRRITANT

EYES: IRRITANT

INHALATION: IRRITATION TO LUNGS, NOSE, AND THROAT; PROLONGED INHALATION MAY CAUSE LUNG INJURY, OR DISEASE

EMERGENCY AND FIRST AID PROCEDURES

NORMAL PERSONAL HYGIENE.

BEST Sheet

VI REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY

STABLE

INCOMPATIBILITY

NONE

HAZARDOUS DECOMPOSITION PRODUCTS

NONE

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

NONE

VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

NORMAL HOUSEKEEPING; CAUSES SLIPPERY SURFACES WHEN WET.

NEUTRALIZING CHEMICALS

NA

WASTE DISPOSAL METHOD

DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

VIII INDUSTRIAL HYGIENE CONTROL MEASURES

VENTILATION REQUIREMENTS

MECHANICAL, GENERAL ROOM VENTILATION
USE LOCAL VENTILATION TO MAINTAIN TLV (SEE SECTION V)

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY

USE A NIOSH APPROVED MECHANICAL FILTER RESPIRATOR FOR NONTOXIC DUSTS.

EYE

SAFETY GLASSES, GOGGLES

GLOVES

NONE REQUIRED

OTHER CLOTHING AND EQUIPMENT

APRON, EYEWASH

BEST Sheet

IX SPECIAL PRECAUTIONS

PRECAUTIONARY STATEMENTS

RECOMMENDED LABELING:

FRONT PANEL: CAUTION
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OTHER HANDLING AND STORAGE REQUIREMENTS

STORE IN SHELTERED AREA OR COVER TO PROTECT FROM MOISTURE

DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME: NOT REGULATED

PLACARDS: NONE

REPORTABLE QUANTITY: NONE

HAZARD CLASS: NOT HAZARDOUS

ID NUMBER: NONE

HAZARDOUS SUBSTANCE: NONE

LABEL: NONE REQUIRED

PREPARED BY NL Barold
ENVIRONMENTAL SERVICES

DATE
JUNE, 1988