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From : Environment, Safety, Health and Regulatory Compliance
WIN : 234-8268
Date : June 6, 1994
Subject: MEETING MINUTES

DA:94:7092

RECEIVED
JUN 7 1994
ENVIRONMENTAL EVALUATION GROUP

To : R. Neill, EEG

Enclosed are the minutes to the meeting held on May 3, 1994, to discuss the location of six proposed new monitoring wells. Your participation and willingness to contribute ideas and concerns during the meeting was greatly appreciated.

Thank you for taking time out of your evening and please feel free to contact me at Extension 8268, if I can be of further assistance.

Steven D. Jones for

J. J. Cotton, Manager
Environmental Monitoring

mw

Enclosures

940604

MEETING MINUTES

Attendees		Distribution	
Name	Organization	Attendees Plus	
Richard L. Beauheim	SNL	Hal Davis	
Mary E. Bennington	DOE/CAO	Kent Hunter	
Chuck Byrum	EPA/Reg 6		
Jeffrey J. Cotton	Westinghouse		
Stewart B. Jones	Westinghouse		
Robert Kehrman	Westinghouse		
Jim Kenney	EEG		
John J. Magyar	Westinghouse		
Richard D. Mayer	EPA/Dallas		
Robert Neill	EEG		
Ron G. Richardson	Westinghouse		
Paul E. Sanchez	NMED		
*Mak Walker	Westinghouse	Prepared By *Mak Walker	Date 05/31/94
Subject or Purpose of Meeting Working meeting to determine the location of six proposed new monitoring wells.		Location Greene Street Office	Date 05/03/94

RECEIVED
JUN 7 1994
ENVIRONMENTAL EVALUATION GROUP

1 Purpose of meeting was agreed upon as the determination of the location of the six new monitoring wells and any testing that could be performed on a non-cost prohibitive basis to aid in site characterization and scientific testing.

2 Overview presented by Jeff Cotton. Basic elements of overview:

- Drivers for wells (DOE Order 5400.1, Performance Assessment)
- Current wells exceeded useful lifespan
- Current wells constructed of cast iron, were drilled to support site preliminary design validation (SPDV), and were not designed to support a monitoring/surveillance program. Additionally, it is hypothesized that iron oxide (rust) causes the data from wells to be skewed because it absorbs certain radiological elements that are sampled for in the WIPP program).
- Current wells are collapsing/cost prohibitive to continue reconditioning. Would require redrilling in order to seal properly (plugging and abandoning) if well were to collapse.
- New wells will be located in areas of flow as noted on the most recent modelling verses the nearest SPDV well to areas of flow (current practice).
- New wells would reduce costs because the site would not require expensive equipment currently employed for pumping (packers, portable laboratory, subcontracts, etc.). Payback to the facility to defray costs of construction would be approximately five years.
- The wells will be built to RCRA specifications in case future RCRA monitoring wells are required (wells will be constructed for the same cost as non-RCRA monitoring wells).

- The new wells sh[illegible]d last approximately 25 years, and [illegible] be constructed in such a way to allow casing replacement, if wells are required for post-decommissioning monitoring.

- The construction of the wells should start immediately to allow two year baseline and required experimentation to approve a dedicated pumping system. A special pump will have to be procured and tested due to the extremely high levels of brine in the water tested at WIPP.

- Both new and existing wells would be tested for an appropriate period of time to establish a cross reference between old and new data acquired from wells.

- The WID/DOE is not prepared to discuss post-decommissioning monitoring or site decommissioning at this meeting. Both of these issues will be satisfied by the generation of documents required by the Land Withdrawal Act to be presented to Congress in October 1997.

- Reiterated that this meeting is to agree upon the location of the six proposed monitoring wells.

3 Discussed that fiberglass casing materials would be adequate to survive at the depth of the monitoring wells. Stated that Arizona has employed fiberglass to 3000 feet verses the WIPP's 700 feet requirement.

4 Discussed gains of new wells as a positive affect:

- Comparative analysis between existing and new wells

- Characterization of soil saturation of Dewey Lake Redbed region

5 Talked to plans of coring the Culebra to allow Sandia National Laboratories (SNL) additional site characterization

6 Stated requirement to have project completed, baseline performed, new methodologies reviewed and approved, and changes made to Environmental Monitoring Plan (as required by DOE Order 5400.1) completed by 1997 to support Operational Readiness Review (ORR) and readiness declaration.

7 Discussed actual proposed locations - located along the flow path from the most recent modelling of flow for the WIPP facility.

8 Discussed that the proposed statement of work for the contract was satisfactory (Chuck Byrum - EPA)

9 RCRA would require monitoring of the Culebra as the most likely path for release. Discussed that WIPP would be a special case as the facility would be monitoring the water **above** the facility verses below. Would require a waiver but should not be a problem.

10 Monitoring for sampling the Dewey Lake was discussed:

- saturation zone - 175 - 230 feet

- possible to take resistivity log or monitor at 20 - 30 foot intervals

- perform TV camera test to have a visual record of Dewey Lake

11 Decided to establish agreement of locations before proceeding. All personnel listed on first page (as attendees) agreed to locations with the following change:

- The northern central well (WQSP-2) will be moved north approximately 1/4 mile to the pipeline road. It was discussed that if the well were located too close to the easement of the pipeline, the well could be moved an additional 100 - 200 feet without affecting sampling.

12 Discussed types of testing that could be performed for Magenta and Dewey Lake regions:

- Determined it would take up to one month to perform a pump test and require a 25 gallons per hour flow rate (deemed as an unacceptable delay in completion of wells).
- Agreed upon that if water was found in another region in sufficient quantity to monitor (and if it was required) that the test/monitoring would be performed by drilling a dedicated well for that purpose. A cluster would be used at the well pads verses using packers and one hole. Costs proposed is for six wells completed in the Culebra.
- Consensus was that the Magenta did not provide sufficient quantities of water (as evidenced at existing well locations) to sustain a monitoring well.
- Neutron logging to check for moisture - indicate moisture but not saturation - inconclusive.
- Gather info from ranchers as to quantity and quality of water from Dewey Lake.
- Induction and Sonic logs discussed.
- Sidewall coring was discussed.

13 Participants agreed to the following with regards to drilling, testing, and characterization:

- Air drill the six wells
- Core the Culebra in all six wells
- Do full logs on the Dewey Lake in wells WQSP-5 & 6 (the two most southwestern wells).
- Stipulate in the contract that logging must be performed for water saturation, permeability, and porosity and allow the contractors to specify the types of tests that can be performed in this area.
- Perform full suite of logs on WQSP-2 (northern central well) for characterization.
- Screen the entire width of the Culebra to allow SNL to perform pump testing (plugs can be added at a later time to comply with RCRA requirements of screening the top 10 - 15 feet of the water bearing zone)
- Use a television camera to record the Dewey Lake Redbed region of wells WQSP-5 & 6

14 It was agreed upon to proceed with contract bidding.

15 Another meeting will be held with the appropriate personnel to approve the correct logging techniques proposed by the subcontractor.

o Attached are the follow

Attendance Sheet
Handout presented to meeting attendees

Meeting adjourned at 7:25pm

Reviewed by: _____
Jeff J. Cotton Date: 5/31/94

Course/Session: WORKING MEETING TO DETERMINE LOCATION OF MONITORING WELLS Course Number/Mat. Code: N/A

Conducted By: JEFFREY J COTTON / ESH&RC / ENVIRONMENTAL MONITORING Date: 5-3-94 Hours: 17:30
Name / Department / Section

Location: WIPP ( ) Offsite (X) WOIC, Large Con. Room Page 1 of 1
Bldg. / Room / Site

Attendee(s): Print the applicable information in black ink and sign. This form is a quality document. Errors should be corrected by drawing a single line through the incorrect information and initial and date the correction.

	Print Name: Last, First, MI	Signature	Social Security Number	Company/Dept.	Mail Stop	TRAINING SECTION USE ONLY Grade	Status	Comments
	J[illegible]es, Stewart B.	[illegible]	585-88-7188	(W)/ESH&RC	195			
	RICHARDSON, RON, G.	[illegible]	585-14-5670	(W)/ESH&RC	195			
	Mayer, Richard D.	Richard D. Mayer	496-68-5637	EPA Dallas	6H-PN			
	Byrum, Chuck	Charles D. Byrum		US EPA Reg 6	6T-ET			
	Kenney, Jim	Jim W. Kenney		EEG				
	Walker, Mak	Mak Walker	585-64-3110	(W) ESH&RC	195			
	Beauheim, Richard L	Richard L. Beauheim	507-64-4268	SNL 6115	1324			
	KETTEMAN, ROBERT	[illegible]	500-48-4076	(W) E&H	090			
	Sanchez, Paul E.	[illegible]	566-12-2442	NMED	—			
0	COTTON, JEFFREY J	[illegible]	134-44-9553	(W)/ESH&RC	195			
1	BENNINGTON, MARY E.	Mary E. Bennington		DOE/CAO	80			
2	Magyar, John J.	John J. Magyar	141-56-6494	(W)	090			
3	Also in attendance was ROBERT NEILL of the EEG	[illegible]			5/3/94			
4								
5								

Q = Qual Card W = Waiver C = Complete, No Exam (attendance) X = Complete, passed L = Complete, Failed D = Retake, failed R = Retake, passed I = Incomplete

The above information is valid and complete. Sign and return this form to the training section.

Trng Name: J.J. COTTON Signature: [illegible] Date: 5/6/94

WP Form 14-TR3005-3 Rev. 1 09/14/93 Page 1 of

Environmental Monitoring
234-8268
May 2, 1994
MEETING TO DISCUSS GROUNDWATER QUALITY SAMPLING WELLS

Distribution:

Attached is a synopsis of the proposal for drilling six new groundwater quality sampling wells in the area surrounding the WIPP. The following headings are discussed:

1. Purpose
2. Justification
3. Proposed Activity Locations
4. Drilling Methods and Materials

A meeting will be held on Wednesday, May 4, 1994 at 4:30 p.m. in the library at the WOIC, located at 101 East Greene Street, in Carlsbad New Mexico. The purpose of this meeting will be to discuss the locations of the proposed sampling wells.

Please use the attached synopsis for your information.

Sincerely,

J.J. Cotton, Manager,
Environmental Monitoring

Purpose

DOE order 5400.1 requires that groundwater that may be potentially affected by DOE operations be monitored to detect and document the effects of such operations on groundwater quality and quantity and to show compliance with applicable Federal and State laws and regulations. DOE order 5400.1 specifically states that Groundwater monitoring programs shall be conducted on-site and in the vicinity of DOE facilities to:

1. Obtain data for the purpose of determining baseline conditions of groundwater quality and quantity;

2. Demonstrate compliance with and implementation of all applicable regulations and DOE orders;

3. Provide data to permit the early detection of groundwater pollution or contamination;

4. Provide a reporting mechanism for detected groundwater pollution or contamination;

5. Identify existing and potential groundwater contamination sources and to maintain surveillance of these sources;

6. Provide data upon which decisions can be made concerning land disposal practices and the management and protection of groundwater resources.

Groundwater quality sampling for radiological and non-radiological surveillance is also required by DOE orders 5400.5, 5820.2a, and 5300.3b. Further, commitments to monitor groundwater specifically at the WIPP are made in the Land Management Plan, Environmental Monitoring Plan, Final Environmental Impact Statement, and the Final Supplemental Environmental Impact Statement.

The current Groundwater Surveillance Program meets the basic requirements of DOE orders and committing documents. The WID wishes to enhance the quality of the data that it provides by replacing the current groundwater quality sampling wells with wells that meet industry standard criteria.

The proposed project consists of clearing and constructing six well pads and drilling six groundwater quality sampling wells. The wells would be constructed in such a manner as to be conducive to implement future regulatory monitoring standards should they become necessary.

Justification

The wells currently used for groundwater quality sampling have exceeded their useful life. The current groundwater Quality Sampling Program utilizes wells that were drilled for the express purpose of aquifer characterization. No consideration was given in the design of these wells to sampling criteria or the life of the project. The wells currently being used for groundwater quality sampling range in age from 8-16 years. Construction materials are such that chemical reactions occur between the groundwater and the casing materials. Additionally, biases created by well construction deficiencies can only be compensated for by initiating labor intensive sampling protocol. This sampling protocol is time consuming, taking two to three times longer to obtain representative samples than is normally required and involves expensive equipment that would normally not be required. Sampling protocol would be more efficient and cost effective with the new wells. Construction of the new wells would meet the criteria set forth in EPA 570/9-75-001 Manual of Water Well Construction Practices. Should the data gathered by the groundwater surveillance activities ever be challenged, data gathered from wells meeting this criteria would be considered more credible than data gathered from the present sampling well system. Deterioration of the current well system due to chemical interaction with the groundwater environment poses the danger that continued use for sampling purposes will cause the casing to collapse. During March and April of 1992 well maintenance was performed to remove scale from the casing wall and to reconstruct wells in which the formation had collapsed due to the stress of pumping and purging. Formation collapse had occurred in six of the wells used for monitoring purposes with one well, H-11b3, showing signs of severe casing deterioration. If the wells are not replaced this, maintenance procedure will have to be repeated every two to four years until the casing collapses. It is unknown exactly when casing failure would occur, however, the severity of scaling on the casing wall indicates that failure could occur at any time. If total casing failure is allowed to take place, the wells would have to be abandoned, plugged, sealed and replaced. By replacing the wells before casing failure occurs, useful groundwater level data may be gathered from these wells under static or recovering conditions for the expected life of the project. This course of action will result in delaying the cost of abandonment procedures until site closure. At that time a comprehensive abandonment program can be initiated that is more cost effective than single well abandonment procedures. Issues regarding well abandonment and plugging and sealing will be addressed in the Decommissioning Plan, scheduled for publication in late 1997.

The new wells are expected to have a life expectancy of 25 years. At the end of this time period the wells will be

evaluated for extended life expectancy and a decision regarding recompletion or continued use will be made. The issue of long term monitoring will be addressed in the Post Decommissioning Environmental Monitoring Plan scheduled to be released in late 1997.

Proposed Activity Locations

The project proposes to install six wells at the outer perimeter of the exclusive use area (see attached map). The approximate well locations and approximate total depths are proposed at the following locations:

1. The North~~east~~ West corner, T22S, R31E, Section 20, 50FNL and 1464FWL with a total depth of approximately 810 feet below ground surface (BGS).

2. The existing WIPP-12 location T22S, R31E, Section 17, 148FSL, 84FEL, with an approximate depth of 840 feet BGS.

3. The Northeast corner of the exclusive use area T22S, R31E, Section 21, 50FNL, 2213FEL, with an approximate total depth of 870 feet BGS.

4. The Southeast corner of the exclusive use area T22S R31E Section 28 1612FSL 2275FEL, with an approximate total depth of 820 feet BGS.

5. Along the H-14/DOE-1 access road T22S R31E Section 29, 300FSL and 350 FEL, with an approximate total depth of 715 feet BGS.

6. The Southwest corner of the exclusive use area T22S R31E Section 29 1667FSL 1392FWL, with an approximate total depth of 650 feet BGS.

With the exception of preexisting roadways and well pads each well would require construction of an access road approximately 20 feet in width and a well pad approximately 100 X 100 feet square. Assuming that the locations are approved as proposed, well pad construction would be required on five of the six locations and access road construction would be required on only three of the well locations. The total excavated area for well pads and access roads would be less than five acres. Access road construction would take place on the northwest well pad from the nearest point from the well location to the pipeline road a distance of approximately 150 feet in length, at the northeast well pad the nearest point from the well pad to the pipeline road approximately 2340 feet in length and the southwest well pad to the nearest point to the DOE-1/H-14 access road a distance of approximately 1520 feet in length.

Drilling Methods and Materials

The new wells would be drilled using air rotary methods. The Casing and screen will be constructed of Fiberglass Reinforced Epoxy and the formation will be gravel packed with silica sand.

The following attachments are included for your convenience:

attachment #1. Casing and Screen Specifications

attachment #2 Comparative Chemical Resistance Chart

attachment #3 Map showing the proposed locations and their relationship to the WIPP site.

ATTACHMENT #1

ENCO.EMC
FIBERGLASS REINFORCED EPOXY
WELL CASING AND SCREENS

TECHNICAL SPECIFICATIONS

11029 SIGNAL HILL DRIVE AUSTIN, TEXAS 78737-2834

TELEPHONE (512) 283-6090 FACSIMILE (512) 283-6091

HISTORY

Fiberglass piping systems have been used successfully in industrial, oil and mining applications for over 35 years, primarily in hostile environments, due to their ability to withstand attack by caustics, acids and other corrosive materials.

Long respected in these industries, they were not used in the environmental industry until the early 1980's when serious questions arose throughout the environmental industry concerning the reliability of field materials, sampling methods and equipment. Due to the rapidly decreasing detection limits available to the laboratories, the data coming from the field was becoming increasingly suspect in many instances of "shadow contaminant" occurrences. This being the case, there was an increasing amount of research conducted in well casing materials.
Many casing materials in use at that time had been conclusively determined to leach or absorb unacceptable amounts of inorganic and organic chemicals.

Fiberglass Reinforced Epoxy casing was investigated extensively due to its 75% glass content, the closed molecular structure of epoxy, the strength, longevity and lack of brittleness.

The results of extensive testing of this product led to a wide acceptance for the use of this casing as an alternative to PVC, TEFLON, and STAINLESS STEEL.

Fiberglass Reinforced Epoxy casing has now been installed in every E.P.A. region over 3000 times, resulting in very extensive consecutive pollution plume sampling with no adverse reports or interpretational difficulties.

In fact, the casing and screen has far surpassed all expectations for rigid environmental specifications.

OVERVIEW

In this technical document, we present detailed descriptions of the physical and chemical qualities of Fiberglass Reinforced Epoxy monitor well casing and screens including the extensive testing protocol and test results.

There are several different types of fiberglass casing and piping materials on the market today, so it is important to differentiate between the product that is outlined in this document and the other available products. ENCO. EMC produces and markets the only fully tested, inert, F.R.E. casing material available.

This F.R.E. casing pipe stock is manufactured by only one company and is protected under U.S. and foreign patent laws. The entire down-hole assembly is made of high purity epoxy with a proprietary HP hardener and continuous filament silica glass reinforcing, providing both the very high strengths characteristic of composite structural materials and the desirable, single chemical assemblage.

THE RATIO OF SILICA GLASS TO EPOXY IS 75/25.

It is unsuitable to use plastic resin materials, such as Polyester or Vinyl Ester, as the absorbance of organics may be extremely high, as is typical of most thermoplastics.

ENCO. EMC casing and screen products contain only fully reacted, epoxy resins and contain no plasticizers, glues or products containing any organic groups which appear on the E.P.A. priority pollution list.

In fact, our products are intrinsically Incapable of leaching any priority pollutants.

TECHNICAL ADVANTAGES

INERT QUALITIES	Constructed of 75% High Silica glass and 25% High Purity,Closed Molecular Epoxy. Certified, Tested 100% Inert. Product Will not compromise the qroundwater sample.
LOWEST SORPTION	Proven the lowest sorption of any tested product., Calculated 1/17th sorption rate of P.T.F.E.
FULLY TESTED	Most stringent testing protocol of any product to date. Short and long term leach tests show no Priority Pollutant leach out.Minimum time to sorption stabilization.
FLUSH JOINT	FLUSH O.D. CASING AND SCREENS ARE AVAILABLE IN 2", 3", 4" AND 6" DIAMETERS FOR HOLLOW STEM AUGER APPLICATIONS. ALL STANDARD LENGTHS FROM 2.5' - 25'.
CHEMICAL RESISTANT	Very high resistance to most chemicals common to the environmental industry, including most solvents, VOC's, Hydrocarbons, organic and inorganic chemicals.(Call ENCO for details).
FULL RANGE	Full range of sizes from 2" through 16" are available including all fittings and accessories, including UL Listed(gasoline distribution piping) and High axial strength for horizontal installations.
PRECISION SLOTTING	Most slot sizes and configurations are available, from .010" - .3".(Custom configurations available)
SUPERIOR QUALITY	High quality control - meets or exceeds all applicable standards. All components precision machined to exact ing tolerances.

ENCO. EMC Casing and Well Screens are Impervious to gasoline, hydrocarbon products and most associated solvents and additives.

They can be used in the most sensitive groundwater investigations with full confidence in their integrity and ability to perform.

AN INDEPENDENT, THIRD PARTY TESTING OF ENCO.EMC F.R.E. CASING HAS BEEN PUBLISHED IN ASTM - STP 963 OF JULY 1988.

PRODUCT SUITABILITY

ENCO. EMC Well Casing and Screens are specifically of use in the following areas:

HORIZONTAL LIQUID AND VAPOR PHASE PRODUCT RECOVERY

ENCO.EMC manufactures a full range of 2" through 8" materials that can withstand the rigors of this type of installation with acceptable bend radii, high range of collapse pressures and axial and tensile strengths.

Field tested and successful in government installations,

ENCO.EMC has provided numerous, cost-effective horizontal well assemblies

Integral threaded coupling with "O" ring seals provide extremely strong joints to enable the material to withstand the high pulling stresses of horizontal installations at a substantial cost savings over Stainless Steel.

SENSITIVE P.P.B. MONITOR WELLS

(Flush Joint or Integral Upset Coupled) ENCO.EMC Monitor Well Casings and Screens are 100% INERT.

They will not leach any priority pollutants into the groundwater. This has been proven in a multitude of tests.

All tests were designated by Region 8 E.P.A. personnel, resulting in their use in sensitive monitoring applications.

Our entire line of Well Casings and Screens are designed to be Chemically inert as well as Cost-Effective in both material and installation cost

UNDERGROUND STORAGE FACILITIES
LEAK DETECTION SYSTEMS

ENCO. EMC Casing and Well Screens are impervious to all components of gasoline, hydrocarbon products and most associated solvents. This casing will remove all suspect materials from the construction of your monitor wells at considerably less cost than either Stainless Steel or Teflon. Shallow wells around underground tanks can be supplied in one piece with any slot configuration at any desired interval. Drive points are available which can be hammered or vibrated into soft backfill areas. ENCO. EMC can supply Chemical Resistance charts covering most organic and inorganic chemicals and their effect on casing and handling systems.

DUAL SCREEN, PRE-PACKED DOUBLE WELL SCREENS

These double wall well screens combine an Inner Well Screen, Graded Silica Sand Pack and an Outer Well Screen in one integral unit. Threaded and complete, these dual units enable the installer to accurately place the Well Screen and Sand Pack in the target zone with no error or bridging, thus saving considerable time and expense in screen placement and well completion.

All outside diameters are flush to allow passage through Hollow Stem Augers and other down hole systems.

AVAILABLE SIZES

2" X 3"	3" X 4"	4" X 6"
2" X 4"	3" X 6"	
2" X 6"		

AVAILABLE LENGTHS

2.5', 5.0' AND 10.0'
(Shoulder to shoulder)

NOTE: Custom lengths are available, however there are weight limitations on the larger sizes.

HORIZONTAL WELL DRILLING

This leading edge technology enables the contractor to place a single horizontal or liquid product recovery well into the contaminated zone in a very narrow vertical plane.

This technology has been used in the Oil Industry extensively, and has now crossed over into the Environmental Industry with overwhelming success.

ENCO.EMC has participated with a major government financed group in the installation of pilot research and development wells that have been placed in high security government facilities. These installations used ENCO.EMC high strength Fiberglass Reinforced Epoxy Well Casing and Screens resulting in recovery systems that successfully met the operating criteria where other materials failed.

ENCO.EMC has a full range of 2" through 8" materials that can withstand the rigors of this type of installation with acceptable bend radii, high range of collapse pressures and axial and tensile strengths. (All specifications to ASTM standards.)

The materials are readily available and very cost-effective for this type of installation.

Material can be factory slotted with slots as small as 0.010" and can be custom configured to the clients' specifications.

PHYSICAL SPECIFICATIONS

Size	Inside Diameter (Inches)	Nominal Wall Tk. (Inches)	Outside Diameter (Inches)	Maximum Box Dia. (Inches)	Weight Lbs/Ft.	Minimum Bend Radius (Feet)
2' EN-800	2.23	.080	2.39	3.25	0.67	80
3' EN-800	3.35	.110	3.57	4.50	1.40	120
4' EN-800	4.33	.145	4.65	5.50	2.20	150
6' EN-800	6.10	.200	6.50	8.10	3.36	250
8' EN-800	8.42	.285	8.90	10.2	6.60	450

PERFORMANCE VALUES

Size	Internal Operating Pressure (PSI)	External Collapse (PSI)	Axial Wall Tensile Strength (Psi)	Axial Thread Load (Lbs)
2' EN-800	800	550	12,000	14,000
3' EN-800	800	550	12,000	24,000
4' EN-800	800	250	12,000	30,000
6' EN-800	800	250	17,000	150,000
8' EN-800	800	220	17,000	250,000

NOTE

THIS IS A CROSS SECTION OF AVAILABLE PIPE AND CASING SYSTEMS THAT IS PRODUCED BY AND FOR ENCO.EMC. THERE ARE MORE THAN 50 DIFFERENT PIPE SYSTEMS AVAILABLE. IF THE PIPE OR CASING LISTED HERE DOES NOT FIT THE OPERATING CRITERIA FOR YOUR PROJECT, PLEASE CALL ENCO.EMC FOR FURTHER INFORMATION ON OTHER SYSTEMS THAT MAY BE ACCEPTABLE.

THE INFORMATION CONTAINED HEREIN IS BASED UPON ENCO.EMC IN HOUSE TESTING AND INDEPENDENT LABORATORY TESTING AND IS A TRUE AND ACCURATE REPRESENTATION OF SUCH TESTS. ENCO.EMC RECOGNIZES THAT DIFFERENT VALUES MAY BE OBTAINED WITH DIFFERENT EQUIPMENT AND CONDITIONS AND THEREFORE DOES NOT EXPRESS OR IMPLY ANY WARRANTY FOR THE USE OF THE ABOVE OR ANY OTHER DATA PUBLISHED ON ENCO.EMC PRODUCTS.

SYNOPSIS OF PHYSICAL CHARACTERISTICS AND TESTING PROTOCOL.

All downhole assemblies are manufactured using a priority formula comprised of an HP Anhydride Epoxy and a High Silica Filament Glass.

The continuous filament gives the product an extremely high strength / weight ratio, far exceeding any comparable material.

The glass to epoxy ratio is 75% glass to 25% epoxy, resulting in the desired composite material of virtually indestructible glass, sheathed in a closed molecular epoxy.

From the viewpoint of the Environmental Industry, this has become an extremely valuable product, desired both for its chemically inert structure and its low cost.

There are several different types of Fiberglass casing and pipe materials on the market, so it is important to differentiate between ENCO.EMC products and others.

ENCO.EMC produces and markets the ONLY fully tested, inert material available.

This F.R.E. casing and screen stock is manufactured by only one company and is fully protected under U.S. and foreign patent laws.

All other Fiberglass systems are manufactured with a vinyl ester, plastic or untested epoxy resin material.

Most of these materials are capable of high absorbance or leaching of priority pollutants.

ENCO. EMC Products are Intrinsically Incapable of Leaching any Priority Pollutants.

Materials Exceed ASTM - F 480 physical specifications, however, ENCO.EMC does not use the 2 thread/inch configuration.

Crossovers are available for matching other thread designs, including the F-480-90.

PHYSICAL DESCRIPTION

SIZE	FLUSH JOINT INSIDE DIAMETER	INTEGRAL UPSET INSIDE DIAMETER	FLUSH JOINT & CASING OUTSIDE DIAMETER	INTEGRAL UPSET COUPLING DIAMETER	INTERNAL OPERATING PRES.(psi)	EXTERNAL COLLAPSE PRES.(psi)
2" Sch.450	2.0"	2.23"	2.35"	3.12"	450	130
2" Sch.800	2.0"	2.23"	2.39"	3.12"	800	550
3" Sch.450	3.0"	3.35"	3.49"	4.33"	450	60
3" Sch.800	3.0"	3.35"	3.57"	4.49"	800	550
4" Sch.450	4.0"	4.33"	4.49"	5.58"	450	50
4" Sch.800	4.0"	4.33"	4.62"	5.78"	800	250
6" Sch.450	6.1"	6.40"	6.60"	7.75"	300	60
6" Sch.800	6.1"	6.40"	6.65"	7.90"	500	60
8" Sch.450	n/a	8.42"	8.75"	10.0"	500	56
8" Sch.800	n/a	8.42"	8.75"	10.0"	500	56

NOTE

1) Service Temperature 200F
2) Weight Per 100' 2" - 50; 3" - 77; 4" - 100; 6" - 280; 8" - 660:
3) Mill Test Pressure 1.25 X Operating Pressure
4) Higher Test Wall Thicknesses available up to 4000 psi External Collapse and 4000 psi Internal Operating Pressure
5) pH Range 1.5 to 11

TESTING SUMMARY

The following Sorption and Leaching tests have been carried out on production run samples of ENCO.EMC F.R.E. casing materials.

An independent, E.P.A. approved laboratory performed all tests. Detection limits were in accordance with current E.P.A. Priority Pollutant standards or below.

All tests were carried out on either ground up material for maximum sensitivity, fractured casing to simulate slotted sections, or two foot casing samples which included a threaded joint and O-ring seal.

All tests confirmed the theoretical Inert qualities of this casing.

1. 72 hour leach tests using fractured material, in carbon filtered, de-ion ized water carrying 700 ug/l of solvents and Halogenated Organics.

RESULTS:
No extraneous compounds on the GC/MS chromatogram and no increase of the seven solvents occurred.

2. Leach tests on ground F.R.E casing using carbon filtered, de-ionized water, 72 and 504 hours.

RESULTS:
Leachates subjected to full Priority Pollutant analysis showed zero leaching.

3. Leach tests using sample lengths of F.R.E. casing including a joint with an O-ring seal for 504 hours.

RESULTS:
No Priority Pollutants found in the leachate.

4. Absorbance (Sorption) tests using water doped with 700 ug/l of four Halogenated Organics and three solvent organics.

RESULTS:
In 72 hour tests, F.R.E. casing performed better than one hour tests using Teflon laboratory tubing. It has been calculated that F.R.E. casing will reach sorption equilibrium in 15 days compared to 330 days for Teflon and other Thermoplastics. (Analytical Procedures conformed with appropriate E.P.A. methods 608, 610, 612, 622, 624 & 625.)

The objective of the tests was to determine if any Volatile Organics, selected from compounds commonly found in Hazardous Waste sites, would be absorbed by the F.R.E. casing from an aqueous solution, using concentrations of organics comparable with those experienced in pollution plume surveys.

Simulation of monitor well casing conditions was sought by testing fractured pieces, exposing the inner structure of the casing as with machined slots.

The test protocol followed recommendations of the Colorado Department of Health, Region 8 E.P.A., and the City and County of Denver.

All tests were performed by Rocky Mountain Analytical Laboratory, Arvada, Colo.

FIBERGLASS REINFORCED EPOXY CASING

PHYSICAL PROPERTIES AND DESIGNS.

1) Outer surface designed with a high bond surface for positive annular seal.

2) Bacteriostatic inner surface; will not encourage bacteriolologic infestation.

3) Flush joint casing & screens are available In 2", 3", 4" & 6" sizes.

4) Oversized inner diameter, in the integral upset coupled configurations, to allow equipment entry.

5) Integral factory bottom caps installed at no cost with screen purchase.(Larger sizes do necessitate a small charge)

6) Engineered assemblies reduce cost utilizing no expensive pup joints.(Custom Well Assemblies.)

7) All standard lengths, field splice kits, adhesive kits, protective vaults, and surge developers are available.

8) Nominal casing and screen sizes available:

INTEGRAL UPSET	FLUSH JOINT
2". . . . . .2.23"I.D.	2" I.D. . . . . .2.35" O.D.
3". . . . . .3.35"I.D.	3" I.D. . . . . .3.50" O.D.
4". . . . . .4.33"I.D.	4" I.D. . . . . .4.50" O.D.
6". . . . . .6.40"I.D.	6" I.D. . . . . .6.70" O.D.
8". . . . . .8.42"I.D.	

Custom sizes up to 16" are available.

9) Precision factory slotting from .010 to .1 - Minimum engineered flow rates of 1.0 GPM/FT of screen.

10) Rapid installation - integral coupled with O-ring seal no pipe wrenches needed indicator informs operator when seal is complete.

11) Rapid factory response time - over the road transport or next day air transport. (Air under 10' lengths only)

12) Hydrophilic - high strength screens - brittleness not associated with this product.

CASING AND SCREENS

CASING ASSEMBLIES

The entire downhole assembly is comprised of the singular "HP" Epoxy/Fiberglass material.

This product contains no foreign elements which could compromise the groundwater sample.

Each casing assembly is manufactured to the exacting specifications as determined by this document.

ENCO. EMC adheres to a rigid, comprehensive quality control program to ensure the high standard of product produced.

Standard monitor well applications use a 450 PSI screen stock with 800 PSI ends.

Maximum recommended depth of stock material is: **

Schedule 450 (Collapse Pres.)	Schedule 800 (Collapse Pres.)
2" - 210 Feet (130 PSI)	2" - 500 Feet (550 PSI)
3" - 125 Feet (60 PSI)	3" - 500 Feet (550 PSI)
4" - 100 Feet (50 PSI)	4" - 500 Feet (250 PSI)
6" - 100 Feet (60 PSI)	6" - 400 Feet (180 PSI)
8" - 100 Feet (56 PSI)	8" - 350 Feet (150 PSI)

(To top of Screen - Deep set casing is available)

(ENCO.EMC does not warrant materials once placed into the well. Down hole conditions can subject the casing to very high collapse pressures. If conditions are unstable , consult the factory.)

Larger wall thicknesses are available for deeper wells or unstable ground conditions. Call factory for details and pricing.

All well assemblies are available with a factory installed bottom cap, and a small sump for slough material and water sample accumulation.

All threaded ends and fittings are machined to very tight tolerances to ensure quality.

ENCO.EMC uses a non-modified square thread at four (4) threads/inch for strength and manageability. Crossovers to fit other casing manufacturers threads, including F-480-90 are available.

ANALYTICAL METHODOLOGY
E.P.A. PRIORITY POLLUTANT ORGANICS

Volatile Organic Analyses (VOA/VOC) were performed using EPA Method 624. Aliquots of the samples are placed in a sparging device.

Internal standards and deuterinium labeled surrogates are added to verify the analytical results and provide quantitative and qualitative references for each sample.

The samples are then purged with Helium and the VOC's are transferred to the gas stream. The organics are removed from the gas stream with a Tenax / Silica Gel trap. When purging is complete, the trap is rapidly heated and the trapped organics transferred to the analytical chromatograph column of a gas chromatograph / mass spectrometer (GC/MS).

As the individual components elute, complete mass spectra are collected and stored by a computer system . The data are then processed by custom computer programs and also evaluated manually to detect and quantify Priority Pollutants. Identifications are verified by comparison of the sample component mass spectrum and retention time to those of the standard components.

Base / Neutral and Acid (BN/A) compounds were analyzed using EPA method 625.

Aliquots of the samples are extracted first at basic and then at acidic pH's with Methylene Chloride. The extracts are concentrated and analyzed by GC/MS using the same approach as the Volatile Organics.

Pesticides and PCB's were analyzed using EPA method 608.

Aliquots of the sample are extracted with Methylene Chloride at a neutral pH. The extracts are then concentrated and analyzed using an electron capture/gas chromatograph. Identification of components is based on the retention times of the unknown compared to those of the standards. All identifications are confirmed using a second GC column.

Major non-Priority Pollutant chromatograph peaks in the volatiles, base/neutrals and acid fractions are identified. The best computer matches of the unknown mass spectrum to the EPA/NIH/MSDC (commonly known as the NBS library) mass spectra data base of 25,000 compounds are selected and reviewed by an analyst experienced in the interpretation of mass spectra. If no specific identification can be readily made, the chemical type or class is determined and reported. In either case, these identifications are verified by comparison with a standard.

Estimates of the concentrations are made by comparison of the unknown to the response of the nearest internal standard.

Analyses were performed using EPA Method 624 from the Federal Register, Vol. 44, No. 233, Monday, Dec. 3, 1979.

The GC/MS was calibrated to meet EPA specifications for BFB and then calibrated with a standard mix of the components of interest. Concentrations were calculated using the method of internal standards.

No extraneous component peaks were observed and no increase in concentration of the Volatile Organic solvents occurred. It is concluded that exposure to this group of Organic solvents does not result
in the leaching of Priority Pollutant compounds.

Therefore, it is concluded that the use of ENCO.EMC Fiberglass Reinforced Epoxy Casing and Well Screens will not complicate sampling or Its interpretation.

Analyses for the targeted compounds were performed by GC/MS.

The background concentrations for each target component were determined for Table 2 and are shown on the previous page. The measured concentrations are considered the reference points for comparison to the test samples.

The table lists the reference, Set 1 Test and Set 2 Test values measured and the average of Sets 1 and 2.
The absorbance of each component was determined by calculating the weight of the component losses and expressing this as absorbance per unit surface area of sample.

No extraneous component peaks were observed in the Test Samples.

TABLE III

72 HOUR CONTACT

RESULTS OF ABSORBANCE TEST FOR SELECTED VOLATILE ORGANICS (CONCENTRATIONS IN ug/l)

Component	Reference	Set 1 Test	Set 2 Test	Average Sets 1 and 2 Tests
Benzene	116	97.6	98.0	97.8
Toluene	97.6	79.1	82.2	80.7
Methylethyl Ketone	1 04	92.5	91.7	92.1
Dichloromethane	111	99.4	101	100.2
1,1,1,-Trichloroethane	97.4	76.2	82.5	79.4
Trichloroethylene	104	69.1	73.4	71.2
Carbon Tetrachloride	101	77.0	81.4	79.2

Organic Sorbed, Chlorinated Compounds . . . . . .3.07 ug.
Volume to Surface Area Ratio 6.85
Concentrations of Chlorinated Organics in Fluid 2,835 ug/m2
Absorbance of Chlorinated Hydrocarbons 570 ug/m2

Each analysis was monitored for analytical errors by the addition of surrogate spike compounds. Immediately before analysis, each sample was spiked with 100 ug/l of 3 surrogate compounds. Their recoveries indicate that the analyses were consistent throughout the test.

TABLE IV

SURROGATE SPIKE - PERCENT RECOVERY

Component	Reference	Set 1 Test	Set 2 Test
Bromochloropropane	104	107	101
Deuterodichloromethane	118	119	121
Deuterobenzene	117	112	112

THE FOLLOWING PAGES ARE THE LABORATORY ANALYSES OF THE TESTS THAT WERE RUN ON Enco.EMC CASINGS.

ROCKY MOUNTAIN ANALYTICAL LABORATORY

EPA Priority Pollutants Analytical Results

Sample Description LEACHATE FROM CASING TESTS

APPENDIX "C"

Volatile Compounds
µg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
1V. Acrolein (107-02-8)	ND	100	100
2V. Acrylonitrile (107-13-1)	ND	100	100
3V. Benzene (71-43-2)	ND	1	10
4V. Bis (Chloromethyl) Ether (542-88-1)	ND	10	10
5V. Bromoform (75-26-2)	ND	1	10
6V. Carbon Tetrachloride (56-23-5)	ND	1	10
7V. Chlorobenzene (108-90-7)	ND	1	10
8V. Chlorodibromomethane (124-48-1)	ND	1	10
9V. Chloroethane (75-00-3)	ND	10	10
10V. 2-Chloroethylvinyl Ether (110-75-8)	ND	1	10
11V. Chloroform (67-66-3)	ND	1	10
12V. Dichlorobromomethane (75-27-4)	ND	1	10
13V. Dichlorodifluoromethane (75-71-4)	ND	10	10
14V. 1,1-Dichloroethane (75-34-3)	ND	1	10
15V. 1,2-Dichloroethylene (107-06-2)	ND	1	10
16V. 1,1-Dichloroethylene (75-35-4)	ND	1	10
17V. 1,2-Dichloropropane (75-87-5)	ND	1	10
18V. 1,3-Dichloropropylene (542-75-6)	ND	1	10
19V. Ethylbenzene (100-41-4)	ND	1	10
20V. Methyl Bromide (75-83-9)	ND	10	10
21V. Methyl Chloride (74-87-3)	ND	10	10
22V. Methylene Chloride (76-09-2)	ND	1	10
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	ND	1	10
24V. Tetrachloroethylene (127-18-4)	ND	1	10

Volatile Compounds
µg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
25V. Toluene (108-88-3)	ND	1	10
26V. 1,2-Trans-Dichloroethylene (156-60-5)	ND	1	10
27V. 1,1,1-Trichloroethane (71-56-6)	ND	1	10
28V. 1,1,2-Trichloroethane (79-00-5)	ND	1	10
29V. Trichloroethylene (79-01-6)	ND	1	10
30V. Trichlorofluoromethane (75-69-4)	ND	10	10
31V. Vinyl Chloride (75-01-4)	ND	10	10

DIOXIN
µg/l

2,3,7,8 Tetrachlorodibenzo-P Dioxin (1764-01-6)	ND	.50	

ACID COMPOUNDS
µg/l

1A. 2-Chlorophenol (95-57-8)	ND	10	25
2A. 2,4-Dichlorophenol (120-83-2)	ND	10	25
3A. 2,4-Dimethylphenol (105-67-9)	ND	10	25
4A. 4,6-Dinitro-O-Cresol (534-52-1)	ND	25	25
5A. 2,4-Dinitrophenol (51-28-5)	ND	25	250
6A. 2-Nitrophenol (88-75-5)	ND	10	25
7A.4-Nitrophenol (100-02-7)	ND	10	25
8A. P-Chloro-M-Cresol (59-50-7)	ND	10	10
9A. Pentachlorophenol (87-86-5)	ND	10	25
10A. Phenol (108-95-2)	ND	10	25
11A. 2,4,6-Trichlorophenol (88-06-2)	ND	10	25

ROCKY MOUNTAIN ANALYTICAL LABORATORY
EPA Priority Pollutants Analytical Results

Sample Description LEACHATE FROM CASING TESTS

PART A

mg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
a. Biochemical Oxygen Demand *(BOD)*	ND	2	2
b. Chemical Oxygen Demand *(COD)*	ND	5	5
c. Total Organic Carbon *(TOC)*	ND	1	1
d. Total Suspended Solids *(TSS)*	ND	1	1
e. Ammonia *(as N)*	ND	0.1	0.1

PART B

mg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
a. Bromide (24959-67-9)	ND	1	2
b. Chlorine, Total Residual	ND	0.1	0.1
c. Color, units	ND	5	5
d. Fecal Coliform (no./100 ml)	ND	0	1
e. Fluoride (16984-48-8)	ND	0.1	0.1
f. Nitrate - Nitrite *(as N)*	ND	0.1	0.1
g. Nitrogen, Total Organic *(as N)*	ND	0.1	0.1
h. Oil and Grease	ND	1	1
i. Phosphorus *(as P)*, Total (7723-14-0)	ND	0.1	0.1

PART B (continued)

mg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
(1) Alpha, Total pCi/l	ND	0.1	0.1
(2) Beta, Total pCi/l	ND	0.5	0.5
(3) Radium, Total pCi/l	ND	0.1	0.1
(4) Radium 226, Total pCi/l	ND	0.1	0.1
k. Sulfate *(as SO_4)* (14808-79-8)	ND	10	10
l. Sulfide *(as S)*	ND	0.05	.05
m. Sulfite *(as SO_3)* (14265-46-3)	ND	1.0	1.0
n. Surfactants	ND	0.05	.05
o. Aluminum, Total (7429-90-5)	ND	0.20	0.1
p. Barium, Total (7440-39-3)	ND	0.10	0.1
q. Boron, Total (7440-42-8)	ND	0.10	0.1
r. Cobalt, Total (7440-48-4)	ND	0.02	.05
s. Iron, Total (7439-89-6)	ND	0.02	.03
t. Magnesium, Total (7439-95-4)	ND	1.0	.001
u. Molybdenum, Total (7439-98-7)	ND	0.05	0.1
v. Manganese, Total (7439-96-5)	ND	0.01	.01
w. Tin, Total (7440-31-5)	ND	1.0	0.8
x. Titanium, Total (7440-32-6)	ND	0.75	0.4

ROCKY MOUNTAIN ANALYTICAL LABORATORY

EPA Priority Pollutants Analytical Results

Sample Description LEACHATE FROM CASING TESTS

PART C

METALS, CYANIDE AND TOTAL PHENOLS

mg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
1M. Antimony, Total (7440-36-0)	ND	0.001	0.2
2M. Arsenic, Total (7440-38-2)	ND	0.001	.002
3M. Beryllium, Total (7440-41-7)	ND	0.010	.005
4M. Cadmium, Total (7440-43-9)	ND	0.005	.005
5M. Chromium, Total (7440-47-3)	ND	0.035	.05
6M. Copper, Total (7550-50-8)	ND	0.015	.02
7M. Lead, Total (7439-92-1)	ND	0.035	0.1
8M. Mercury, Total (7439-97-6)	ND	0.0002	.0002
9M. Nickel, Total (7440-02-0)	ND	0.020	0.3
10M. Selenium, Total (7782-49-2)	ND	0.001	.002
11M. Silver, Total (7440-22-4)	ND	0.010	.01
12M. Thallium, Total (7440-28-0)	ND	0.002	0.1
13M. Zinc, Total (7440-66-6)	ND	0.010	.005
14M. Cyanide, Total (57-12-5)	ND	0.01	.02
15M. Phenols, Total	ND	0.01	0.01

PESTICIDES

µg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
1P. Aldrin (309-00-2)	ND	.003	10
2P. -BHC (319-84-6)	ND	.001	10
3P. B-BHC (319-85-7)	ND	.004	10
4P. -BHC (58-89-9)	ND	.004	10
5P. ∂-BHC (319-86-8)	ND	.002	10
6P. Chlordane (57-74-9)	ND	.04	
7P. 4,4'-DDT (50-29-3)	ND	.012	10
8P. 4,4'-DDE (72-54-8)	ND	.012	10
9P. 4,4'-DDD (72-54-8)	ND	.016	10
10P. Dieldrin (60-57-1)	ND	.006	10
11P. -Endosulfan (115-29-7)	ND	.005	10
12P. B-Endosulfan (115-29-7)	ND	.01	10
13P. Endosulfan Sulfate (1031-07-8)	ND	.03	10
14P. Endrin (72-20-8)	ND	.049	10
15P. Endrin Aldehyde (7421-93-4)	ND	.02	10
16P. Heptachlor (76-44-8)	ND	.002	10
17P. Heptachlor Epoxide (1025-57-3)	ND	.004	10
18P. PCB-1242 (53469-21-9)	ND	.04	
19P. PCB-1254 (11097-69-1)	ND	.50	
20P. PCB-1221 (11104-28-2)	ND	.04	
21P. PCB-1232 (11141-16-5)	ND	.04	
22P. PCB-1248 (12672-29-6)	ND	.05	
23P. PCB-1260 (11096-82-5)	ND	.50	
24P. PCB-1016 (12674-11-2)	ND	.04	
25P. Toxaphene (8001-35-2)	ND	.40	

ROCKY MOUNTAIN ANALYTICAL LABORATORY
EPA Priority Pollutants Analytical Results

Sample Description LEACHATE FROM CASING TESTS

BASE / NEUTRAL COMPOUNDS

µg/l

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
1B. Acenaphthene (83-32-9)	ND	10	10
2B. Acenaphtylene (208-96-8)	ND	10	10
3B. Anthracene ((120-12-7)	ND	10	10
4B. Benzidine (92-87-5)	ND	10	10
5B. Benzo *(a)* Anthracene (56-55-3)	ND	10	10
6B. Benzo *(a)* Pyrene (50-32-8)	ND	10	10
7B. 3,4-Benzofluoranthene (205-99-2)	ND	10	10
8B. Benzo *(ghi)* Purylene ((191-24-2)	ND	10	25
9B. Benzo *(k)* Fluoranthene (207-08-9)	ND	10	10
10B. Bis *(2-Chloroethoxy)* Methane (111-91-1)	ND	10	10
11B. Bis *(2-Chloroethyl)* Ether (111-44-4)	ND	10	10
12B. Bis *(2-Chloroisopropyl)* Ether (39638-32-9)	ND	10	10
13B. Bis *(2-Ethylhexyl)* Phthalate (117-81-7)	ND	10	10
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	ND	10	10
15B. Octyl Benzyl Phthalate (85-68-7)	ND	10	10
16B. 2-Chloronaphthalene (91-58-7)	ND	10	10
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)	ND	10	10
18B. Chrysene (218-01-9)	ND	10	10
19B. Dibenzo *(a,h)* Anthracene (53-70-3)	ND	10	25
20B. 1,2-Dichlorobenzene (95-50-1)	ND	10	10
21B. 1,3-Dichlorobenzene (541-73-1)	ND	10	10
22B. 1,4-Dichlorobenzene (106-46-7)	ND	10	10
23B. 3,3'-Dichlorobenzidine (91-94-1)	ND	10	10
24B. Diethyl Phthalate (84-66-2)	ND	10	10

	TEST SAMPLE	RMA DETECT. LIMIT	EPA STD.
25B. Dimethyl Phthalate (131-11-3)	ND	10	10
26B. Di-N-Butyl Phthalate (87-74-2)	ND	10	10
27B. 2,4-Dinitrotoluene (121-14-2)	ND	10	10
28B. 2,6-Dinitrotoluene (606-20-2)	ND	10	10
29B. Di-N-Octyl Phthalate (117-84-0)	ND	10	10
30B. 1,2-Diphenylhydrazine *(as Azobenzene)* (122-66-7)	ND	10	10
31B. Fluoranthene (206-44-0)	ND	10	10
32B. Fluorene (86-73-7)	ND	10	10
33B. Hexachlorobenzene (118-71-1)	ND	10	10
34B. Hexachlorobutadene (87-68-3)	ND	10	10
35B. Hexachlorocyclo-pentadene (77-47-4)	ND	10	10
36B. Hexachloroethane (67-72-1)	ND	10	10
37B. Indeno *(1,2,3-cd)* Pyrene (193-39-5)	ND	10	25
38B. Isophorone (78-59-1)	ND	10	10
39B. Naphthalene (91-20-3)	ND	10	10
40B. Nitrobenzene (98-95-3)	ND	10	10
41B. N-Nitrosodimethyl-amine (62-75-9)	ND	ND	ND
42B. N-Nitrosodi-N-Pro-pylamine (621-64-7)	ND	10	10
43B. N-Nitrosodiphenyl-amine (86-30-6)	ND	10	10
44B. Phenanthrene (85-01-8)	ND	10	10
45B. Pyrene (129-00-0)	ND	10	10
46B. 1,2,4-Trichlorobenzene (120-82-1)	ND	10	10

ATTACHMENT #2

ENCO.EMC

CHEMICAL RESISTANCE CHART
for
WELL CASING MATERIALS

COMPLIMENTS OF

ENCO.EMC

MANUFACTURER OF FIBERGLASS REINFORCED EPOXY
WELL CASING, SCREENS AND ACCESSORIES.

11029 SIGNAL HILL DRIVE, AUSTIN, TEXAS 78737
Ph. (512) 288-6090 Fax. (512) 288-6091

Chemical Name	Enco.Emc Epoxy	PVC	SS.304	Teflon
Acetaldehyde	A	D	A	A
Acetamide	A	.	B	.
Acetate Solv.	A	B	B	.
Acetic Acid Glacial	B	C	B	A
Acetic Acid 20‰	B	B	.	A
Acetic Acid 80‰	B	D	.	A
Acetic Acid 100‰	B	D	B	A
Acetic Anhydride	A	D	A	A
Acetone 15‰	A	D	A	A
Acetone 100‰	B	D	A	A
Acetylene	A	B	A	.
Acrylonitrile	A	.	A	.
Alcohols Amyl	A	A	A	A
Benzyl	A	D	A	.
Butyl	A	A	A	.
Diacetone	A	D	A	.
Ethyl	A	A	A	.
Hexyl	A	A	A	.
Isobutyl	A	.	A	.
Isopropyl	A	.	A	.
Methyl	A	B	A	A
Octyl	A	.	A	.
Propyl	A	A	A	A
Aluminum Chloride 25‰	A	A	D	.
Aluminum Chloride 100‰	A	A	D	A
Aluminum Fluoride	A	A	D	A
Aluminum Hydroxide	A	A	A	A
Alum.Potassium Sulfate 10‰	A	A	A	A
Alum.Potassium Sulfate 100‰	A	A	D	A
Aluminum Sulfate	A	A	C	A
Amines	A	C	A	A
Ammonia 10‰	B	A	.	A
Ammonia,Anhydrous	A	A	B	A
Ammonia,Liquids	A	A	A	A
Ammonia,Nitrate	A	B	A	.
Ammonium Bifluoride	A	A	C	A
Ammonium Carbonate	A	A	A	A
Ammonium Caseinite	A	.	.	.
Ammonium Chloride	A	A	C	A
Ammonium Hydroxide	A	A	A	A
Ammonium Nitrate	A	A	A	A
Ammonium Oxalate	A	.	A	.
Ammonium Persulfate	A	A	A	A
Ammonium Phosphate,Di.	A	A	A	A
Ammonium Phosphate,Mono	A	A	A	A
Ammonium Phosphate,Tri	A	A	A	A
Ammonium Sulfate	A	A	B	A
Ammonium Trisulfate	A	.	.	.
Amyl-Acetate	A	D	A	A
Amyl Alcohol	A	A	A	A
Amyl Chloride	A	D	C	A
Aniline	A	D	A	A
Anti-Freeze	A	A	A	A
Antimony Trichloride	A	A	D	A
Aqua Regia	D	D	D	A
Arochlor	A	.	.	.
Aromatic Hydrocarbons	A	D	.	.
Arsenic Acid	A	A	A	A
Asphalt		A	B	A
Barium Carbonate	A	A	A	A

Enco.EMC
Fiberglass Reinforced Epoxy.

TECHNICAL ADVANTAGES

• INERT QUALITIES
- Certified, Tested 100‰ Inert. A.S.T.M STP 963.
- Product will NOT compromise the groundwater Sample.

• LOWEST SORPTION
- Proven the lowest Sorption capacity of any tested product including PTFE.

• FULLY TESTED
- Most stringent Testing Protocol.
- Short and Long-Term Leach tests show no Priority Pollutant Leaching.
- Minimum time to Sorption stabilization.

• CHEMICAL RESISTANT
- Very high resistance to most chemicals common to the Environmental Industry.
- Resistant to most Solvents, Volatile Organics, Hydrocarbons, Organic and Inorganic Chemicals.

• FULL RANGE OF SIZES
- 2", 3", 4" and 6" - Flush Threaded
- 2" through 16" - Bell threaded

• PRECISION SLOTTING
- Factory slotting from 0.01' - 0.3'
- Regular and High Flow
- Custom configurations.

• SUPERIOR QUALITY
- High Quality Control
- Meets or exceeds all applicable standards.
- All components precision machined.

Fiberglass Pipe , Tubing and Casings have been used extensively in Industrial, Mining and Oil production applications for over 35 years, primarily in Hostile Environments, due to their ability to withstand attacks by Caustics, Acids and other Corrosive materials.

In 1981, a group of consultants began to trace the appearance of "Shadow contaminants" to the use of PVC and other plastic Casing materials.
As part of the research into Inert Casing materials, it was discovered that a Proprietary Epoxy resin used in the Oil Industry had displayed inert characteristics in preliminary testing.

Subsequent short and long term testing under the direction of Region 8 E.P.A. and State agencies proved the qualities and since have been duplicated and published in A.S.T.M. STP 963.

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Barium Chloride	A	A	A	A
Barium Cyanide	A	-	-	-
Barium Hydroxide	A	A	-	A
Barium Nitrate	B	B	A	-
Barium Sulfate	B	A	A	A
Barium Sulfide	A	A	A	A
Beer	A	A	A	A
Beet Sugar Liquids	A	A	A	-
Benzyldehyde	A	D	A	A
Benzene	A	D	A	A
Benzoic Acid	A	A	A	A
Benzol	A	D	A	A
Borax(Sidium Borate)		A	A	A
Boric Acid	A	A	A	A
Brewery Slop	A	-	-	-
Bromine	B	B	D	A
Butadiene	A	A	A	A
Butane	A	A	A	-
Butanol (Butyl Alcohol)	-	-	A	A
Butter	A	-	B	-
Buttermilk	A	A	A	-
Butylene	A	B	A	-
Butyl Acetate	A	D	C	A
Butyric Acid	A	B	B	A
Calcium Bisulfate	A	A	D	A
Calcium Bisulfide	A	A	D	A
Calcium Bisulfite	-	A	D	A
Calcium Carbonate	A	A	A	A
Calcium Chlorate	A	A	C	A
Calcium Chloride	A	A	A	A
Calcium Hydroxide	A	A	A	A
Calcium Hypochlorite	A	D	C	A
Calcium Sulfate	A	A	A	A
Calgon	A	-	A	-
Cane Juice	A	A	A	-
Carbolic Acid (Phenol)	B	A	A	A
Carbon Bisulfide	A	D	A	-
Carbon Dioxide	A	A	A	-
Carbon Dioxide (Dry)	-	D	A	A
Carbon Dioxide (Wet)	-	-	A	A
Carbon Disulfide	A	D	B	A
Carbon Monoxide	A	A	A	-
Carbon Tetrachloride	B	C	C	A
Carbonated Water	A	A	A	-
Carbonic Acid	A	A	B	A
Catsup	A	-	A	-
Chloracetic Acid	B	A	D	A
Chloric Acid	D	D	D	A
Chlorinated Glue	A	-	A	-
Chlorine (Anhydrous Liquid)	B	D	D	A
Chlorine (Dry)	D	D	A	-
Chlorine Water		A	D	A
Chlorobenzene (Mono)	A	D	A	A
Chloroform	A	D	A	A
Chlorosulfonic Acid	C	C	D	A
Chlorox (Bleach)	A	A	A	-
Chocolate Syrup	A	A	A	-
Chromic Acid (5%)	B	A	A	-
Chromic Acid (10%)	C	A	B	A

PRODUCT OUTLINE

FIBERGLASS EPOXY PRODUCTS

ENVIRONMENTAL

Flush threaded F.R.E. Well Casing and Screens.

Double Screens with enclosed Sand Pack for unstable ground and horizontal applications.

Horizontal Casing Systems for Liquid and Vapor Recovery.

Pump Shrouds

Fittings, Adaptors, Crossovers and Repair Kits.

PIPING SYSTEMS

UL Listed piping systems for distribution of Petroleum products. (Gasoline, Alcohol and Alcohol blends.)

UL Listed Double Containment Piping Systems featuring Centron "Key-Lok" system.

CALL Enco.EMC FOR A FULL BROCHURE OR A DISTRIBUTOR NEAR YOU.

Telephone (512) 288-6090

Facsimile (512) 288-6091

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Chromic Acid (30%)	C	A	B	A
Chromic Acid (50%)	C	B	B	A
Cider	A	A	A	-
Citric Acid	A	A	A	A
Citric Oils	A	-	A	-
Coffee	A	-	A	-
Copper Chloride	A	A	D	A
Copper Cyanide		A	A	A
Copper Nitrate	A	A	A	A
Copper Sulfate (5% Solution)	A	A	A	A
Copper Sulfate	A	A	B	A
Cream	A	-	A	A
Cresols	A	D	A	-
Cresylic Acid	A	B	A	A
Cyclohexane	A	-	-	A
Cyanic Acid	A	-	-	-
Detergents	A	A	A	-
Dichloroethane	A	D	A	A
Diesel Fuel	A	-	A	-
Diethylamine	A	D	-	A
Diethylene Glycol	A	-	-	-
Diphenyl Oxide	A	-	-	-
Dyes	A	-	A	-
Epsom Salts (Mg. Sulfate)	A	A	A	-
Ethane	A	-	-	-
Ethanolamine	A	-	A	-
Ether	A	D	A	-
Ethyl Acetate	A	D	A	A
Ethyl Chloride	A	D	A	A
Ethyl Sulfate	A	-	D	-
Ethylene Chloride	A	D	A	A
Ethylene Dichloride	A	D	A	A
Ethylene Glycol	A	A	A	A
Ethylene Oxide	A	D	A	A
Fatty Acids	A	A	A	A
Ferric Chloride	A	A	D	A
Ferric Nitrate	A	A	A	A
Ferric Sulfate	A	A	C	A
Ferrous Chloride	A	A	D	A
Ferrous Sulfate	A	A	C	A
Fluboric Acid	A	A	D	A
Fluorine	D	C	D	C
Flousilicic Acid	C	A	B	A
Formaldehyde (40%)	A	B	A	-
Formaldehyde	A	B	A	A
Formic Acid	B	D	A	A
Freon 11	A	B	-	A
Freon 12 (Wet)	A	B	D	A
Freon 22	A	D	-	A
Freon 113	A	C	-	-
Freon T.F.	A	B	-	-
Fruit Juice	A	A	A	A
Fuel Oils	A	A	A	A
Furan Resin	A	-	-	-
Furfural	A	D	A	A
Gallic Acid	-	A	A	A
Gasoline	A	C	A	A
Gelatin	A	A	A	-

PRODUCT SUITABILITY

SENSITIVE P.P.B MONITOR WELLS

Enco.EMC Monitor Well Casing and Screens are 100% INERT.

They will not Leach any Priority Pollutants into the Groundwater. This has been proven in a multitude of tests.

All tests were designed by Region 8 E.P.A staff in conjunction with the Colorado Department of Health and the City and County of Denver Environmental Department.

Testing has subsequently been duplicated and published in A.S.T.M. STP 963.

Our entire line of Well Casings and Screens are designed to be chemically Inert as well as Cost-Effective in both material and installation cost.

UNDERGROUND STORAGE FACILITIES LEAK DETECTION SYSTEMS.

Enco.EMC Well Casing and Screens are impervious to all components of Gasoline, Hydrocarbon products and most associated solvents.

This material will remove all suspect materials from the construction of your monitor wells at considerably less cost than either Stainless Steel or P.T.F.E.

Shallow wells around Storage Tanks can be supplied in one piece with any slot configuration at any desired interval.

Drive points are available that can be pushed or vibrated into unconsolidated or backfill areas.

Enco.EMC offers consulting services for Well design, including Well materials, components and installation. We can also assist your Engineers in submittals to Regulatory Agencies. Call Today!.

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Glucose	A	A	-	-
Glue P.V.A.	A	-	B	-
Glycerine	A	A	A	A
Glycolic Acid	A	A	-	-
Gold Monocyanide	A	-	-	-
Grape Juice	A	A	A	A
Grease	A	-	A	-
Heptane	A	A	A	A
Hexane	A	C	A	A
Honey	A	-	A	-
Hydraulic Oils (Petroleum)	A	-	A	-
Hydraulic Oils (Synthetic)	A	-	A	-
Hydrazine	A	-	A	-
Hydrobromic Acid (20%)	B	A	D	A
Hydrobromic Acid (100%)	A	A	D	A
Hydrochloric Acid (Dry Gas)	A	A	C	A
Hydrochloric Acid (20%)	A	A	D	A
Hydrochloric Acid (37%)	A	A	D	A
Hydrochloric Acid (100%)	A	A	D	A
Hydrocyanic Acid	A	A	A	A
Hydrocyanic Acid (Gas 10%)	A	A	D	A
Hydrofluoric Acid (20%)	B	D	D	A
Hydrofluoric Acid (50%)	C	C	D	A
Hydrofluoric Acid (75%)	C	D	D	A
Hydrofluoric Acid (100%)	A	C	D	A
Hydrofluosilicic Acid (20%)	C	D	D	A
Hydrofluosilicic Acid (100%)	-	-	D	A
Hydrogen Gas	A	A	-	A
Hydrogen Peroxide (10%)	A	A	C	A
Hydrogen Peroxide (30%)	A	A	C	A
Hydrogen Peroxide (50%)	A	B	B	A
Hydrogen Peroxide	A	A	A	A
Hydrogen Sulfide (Aqueous)	A	A	A	A
Hydrogen Sulfide (Dry)	A	A	C	A
Hydroxyacetic Acid	A	-	-	-
Ink	A	-	A	-
Iodine	A	D	D	A
Iodine in Alcohol	-	D	-	A
Iodoform	-	-	A	A
Isotane	A	-	-	-
Isopropyl Acetate	A	-	-	-
Isopropyl Ether	-	-	-	-
Jet Fuel (JP3,JP4,JP5)	A	A	-	-
Kerosene	A	A	A	A
Ketones	A	D	A	A
Laquers	A	-	A	-
Laquer Thinners	-	C	-	A
Lactic Acid	A	A	A	A
Lard	A	A	A	-
Latex	A	-	A	-
Lead Acetate	A	A	A	A
Lead Sulfamate	A	-	-	-
Ligroin	A	-	-	-
Lime	A	A	A	-
Lubricants	A	A	A	A
Magnesium Carbonate	A	A	A	-
Magnesium Chloride	A	A	B	A
Magnesium Hydroxide	A	A	A	A
Magnesium Nitrate	A	A	A	A
Magnesium Oxide	A	-	A	A

DUAL SCREEN - PRE-SAND PACKED DOUBLE WELL SCREENS

These double wall Well Screens combine an inner Well Screen, graded Silica sand-pack and an outer Well Screen in one integral unit.

Threaded and complete, these dual units enable the installer to accurately place the Well Screen and Sand-Pack in the target zone with no error or bridging, thus saving considerable time and expense in Screen placement and Well completion.

All outer diameters are flush to allow passage through Hollow-Stem Augers and otther down-hole systems.

AVAILABLE SIZES:

2" X 3"	3" X 4"
2" X 4"	3" X 6"
2" X 6"	4" X 6"

LENGTHS:

2.5' 5' 10'

CUSTOM LENGTHS ARE AVAILABLE, HOWEVER, THERE ARE WEIGHT LIMITATIONS ON THE LARGER SIZES.

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Sodium Borate	-	C	A	A
Sodium Carbonate	A	A	A	A
Sodium Chlorate	A	A	A	A
Sodium Chloride	A	A	A	A
Sodium Chromate	C	-	-	-
Sodium Cyanide	A	A	A	A
Sodium Fluoride	A	D	C	A
Sodium Hydrosulfite	-	C	-	A
Sodium Hydroxide (20%)	A	A	A	A
Sodium Hydroxide (50%)	A	A	A	A
Sodium Hydroxide (80%)	A	A	A	A
Sodium Hypochlorite (>20%)	B	A	C	A
Sodium Hypochromate	A	A	A	A
Sodium Hyposulfate	C	-	A	A
Sodium Metaphosphate	A	-	-	-
Sodium Metasilicate	A	-	-	-
Sodium Nitrate	A	A	A	A
Sodium Perborate	A	-	C	A
Sodium Peroxide	A	A	A	A
Sodium Polyphosphate	A	-	A	A
Sodium Silicate	A	A	A	A
Sodium Sulfate	A	A	A	A
Sodium Sulfide	A	A	A	A
Sodium Sulfite	A	A	C	A
Sodium Tetraborate	A	A	-	-
Sodium Thiosulfate	A	A	A	-
Sorghum	A	-	A	-
Soy Sauce	A	-	A	-
Stannic Chloride	A	A	D	A
Stannic Fluoborate	A	-	-	-
Stannous Chloride	A	A	D	A
Starch	A	A	A	-
Stearic Acid	A	A	A	A
Stoddard Solvent	A	D	A	A
Styrene	A	-	A	-
Sugar (Liquids)	A	-	A	-
Sulfate Liquors	A	-	C	-
Sulfur Chloride	C	A	D	A
Sulfur Dioxide	A	D	A	A
Sulfur Dioxide (Dry)	D	D	A	A
Sulfur Trioxide (Dry)	A	A	C	A
Sulfuric Acid (up to 10%)	A	A	D	A
Sulfuric Acid (10%-75%)	B	A	D	A
Sulfuric Acid (75%-100%)	D	B	D	A
Sulfuric Acid (Hot Conc.)	C	C	D	A
Sulfuric Acid (Cold Conc.)	C	C	A	A
Sulfurous Acid	A	A	C	A
Sulfuryl Chloride	A	A	-	A
Tallow	A	-	A	-
Tannic Acid	A	A	A	A
Tanning Liquors	A	A	A	A
Tartaric Acid	A	A	A	A
Tetrachloroethane	A	D	-	A
Tetrahydrofuran	A	D	-	-
Toluene, Toluol	A	D	A	A
Tomato Juice	A	-	A	-
Trichloroethane	A	-	C	A
Trichloroethylene	A	D	A	A
Trichloropropane	A	-	-	-
Tricresylphosphate	A	D	-	A

TESTING SUMMARY

The following Sorption and Leach tests have been carried out on production run samples of Enco.EMC casing materials.

An independent E.P.A. approved laboratory performed all tests. Detection limits were in accordance with current E.P.A. Priority Pollutant standards or below.

<u>All tests confirmed the theoretical Inert qualities of this Casing.</u>

1: 72 hour Leach test using fractured material in carbon filtered, de-ionized water carrying 700 ug/l of solvents and Halogenated Organics.

<u>RESULTS:</u>
No extraneous compounds on the GC/MS Chromatogram and no increase of the seven solvents occurred.

2: Leach tests on ground F.R.E. casing using (60 mesh) using carbon filtered, de-ionized water for 72 and 504 hours.

<u>RESULTS:</u>
Leachates subjected to full Priority Pollutant analysis showed zero leaching.

3: Leach tests using sample lengths of F.R.E. Casing including a threaded joint and an "O"-Ring seal for 504 hours.

<u>RESULTS:</u>
No Priority Pollutants found in the Leachate.

4: Absorption (sorption) tests using water doped with 700 ug/l of four Halogenated Organics and three Solvent Organics.

<u>RESULTS:</u>
In 72 hour tests, F.R.E. performed better than one hour tests using Teflon Laboratory tubing. (Analytical procedures conformed with appropriate EPA methods 608, 610, 612, 622, 624 and 625)

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Triethylamine	A	A	-	-
Turpentine	A	A	A	A
Urine	A	A	A	-
Vegetable Juice	A	-	A	-
Vinegar	A	A	A	A
Varnish	A	-	A	-
Water, Acid, Mine	A	A	A	-
Water, Distilled Lab grade 7	A	A	A	A
Water, Fresh	A	A	A	A
Water, Salt	A	A	A	A
Weed Killers	A	-	A	-
Whey	A	-	A	-
Whiskey & Wines	A	A	A	-
White Liquor (Pulp mill)	A	A	A	A
White Water (Paper Mill)	A	A	A	-
Xylene	A	D	A	A
Zinc Chloride	A	D	A	A
Zinc Hydrosulfite	A	-	-	-
Zinc Sulfate	A	C	A	A

Enco.EMC will supply a copy of our full Technical Brochure upon request which details all the Physical and Chemical testing that has been performed on the Well Casing materials.

Please call:
(512) 288-6090

or Fax us at:
(512) 288-6091

NOTES:

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Magnesium Sulfate	A	A	B	A
Maleic Acid	A	A	A	A
Maleic Anhydride	A	-	-	-
Malic Acid	-	A	A	A
Mash	A	-	A	-
Mayonaise	A	-	A	-
Melamine	A	-	D	-
Mercuric Chloride (Dilute)	A	A	D	A
Mercuric Cyanide	A	A	A	-
Mercury	A	A	A	A
Methanol	A	B	A	A
Methyl Acetate	-	-	-	-
Methyl Acrylate	A	-	-	-
Methyl Acetone	B	-	-	-
Methyl alcohol (10%)	A	A	-	-
Methyl Bromide	B	-	-	-
Methyl Butyl Ketone	B	-	-	-
Methyl Cellusolve	C	-	-	-
Methyl Chloride	A	D	C	A
Methyl Dichloride	A	-	-	-
Methyl Ethyl Ketone	B	D	A	A
Methyl Isobutyl Ketone	B	D	-	A
Methyl Isopropyl Ketone	B	D	-	A
Methyl Methacrylate	A	-	-	-
Methylalanine	A	-	-	-
Methylene Chloride	A	D	A	A
Milk	A	A	A	A
Molasses	A	A	A	A
Mustard	A	-	A	-
Naptha	A	A	A	A
Napthalene	A	D	A	A
Nickel Chloride	A	A	A	A
Nickel Sulfate	A	A	A	A
Nitrating Acid (<15%)	-	-	C	A
Nitrating Acid (>15%)	D	-	C	A
Nitrating Acid (<1% Acid)	-	-	C	A
Nitrating Acid (<15% HNo3)	-	-	C	A
Nitric Acid (5-10%)	A	A	A	A
Nitric Acid (20%)	B	A	A	A
Nitric Acid (50%)	D	A	A	A
Nitric Acid (Conc.)	D	D	D	A
Nitrous Acid	-	-	A	-
Nitrobenzene	B	D	A	A
Oils Anilene	A	D	A	A
Anise	A	-	A	-
Bay	A	-	A	-
Bone	A	-	A	-
Castor	A	A	A	-
Cinnamon	A	-	A	-
Citric	A	-	A	-
Clove	A	-	A	-
Coconut	A	-	A	-
Cod Liver	A	-	A	-
Corn	A	-	A	-
Cotton Seed	A	A	A	A
Cresote	A	D	A	A
Diesel Fuel (2D,3D,4D,5D)	A	-	A	-
Fuel (1,2,3,5A,5B,6)	A	A	A	A
Ginger	A	-	A	-

HORIZONTAL WELLS

This leading edge Technology enables the Drilling contractor to place a single Horizontal Product recovery Well into the contaminated zone in a very narrow vertical plane.

This technology has been used extensively in the Oil Industry and has now crossed over into the Environmental Industry with overwhelming success.

Enco.EMC has participated with Sandia National Laboratories of Albuquerque, N.M., in the installation of pilot Research and Development wells that have been placed in High-Security government facilities.

These installations used Enco.EMC High-strength F.R.E. Well Casing and Screens exclusively, resulting in recovery systems that successfully met the operating criteria where other materials failed.

Enco.EMC has a full range of 2" through 8" materials that can withstand the rigors of this type of installation with acceptable bend radii, high range of collapse pressures and axial and tensile strengths.

(All specifications to A.S.T.M. standards).

Chemical Name	Enco.EMC Epoxy	PVC	S.S.304	Teflon
Oleum	A	D	-	-
Oxalic Acid (Cold)	A	A	A	A
Paraffin	A	A	A	-
Pentane	A	-	A	-
Perchlorethylene	A	-	-	A
Petrolatum	A	-	-	-
Phenol (10%)	B	A	A	A
Phenol (Carbolic Acid)	B	A	A	A
Phosphoric Acid (<40%)	A	A	B	A
Phosphoric Acid (100%)	C	A	C	A
Phosphoric Acid (Crude)	A	-	D	-
Phosphoric Anhydride	-	D	A	A
Phosphoric Acid (Molten)	A	D	A	A
Photographic (Developer)	A	A	C	A
Phthalic Anhydride	-	-	A	-
Picric Acid	A	A	A	A
Potash	A	A	A	-
Potassium Bicarbonate	A	A	A	A
Potassium Bromide	A	A	B	A
Potassium Carbonate	A	A	A	A
Potassium Chlorate	A	A	A	A
Potassium Chloride	A	A	C	A
Potassium Chromate	C	A	B	-
Potassium Cyanide Sol'n	A	A	A	A
Potassium Dichromate	A	A	A	A
Potassium Ferrocyanide	A	A	A	A
Potassium Hydroxide	A	A	B	A
Potassium Nitrate	A	A	A	A
Potassium Permanganate	A	A	A	A
Potassium Sulfate	A	A	A	A
Potassium Sulfide	-	A	A	A
Propane	A	D	A	-
Propylene Glycol	A	-	B	-
Pyradine	A	-	C	-
Pyrogallic Acid	A	A	A	A
Rosins	A	-	A	-
Rum	A	-	A	-
Rust Inhibitors	A	-	A	-
Salad Dressing	A	-	A	-
Sea Water	A	A	A	-
Shellac (Bleached)	A	-	A	-
Shellac (Orange)	A	-	A	-
Silicone	A	-	B	-
Silver Bromide	A	-	C	-
Silver Nitrate	A	A	A	A
Soap Solutions	A	D	A	A
Soda Ash	A	A	A	A
Sodium Acetate	A	A	A	A
Sodium Aluminate	A	-	-	A
Sodium Bicarbonate	A	A	A	A
Sodium Bisulfate	A	A	A	A
Sodium Bisulfite	A	A	A	A

SYNOPSIS OF PHYSICAL CHARACTERISTICS AND TESTING PROTOCOL

All downhole assemblies are manufactured using a Priority formula comprised of an HP Anhydride Epoxy and a high Silica Filament Glass.

The continuous filament gives the product an extremely high strength/weight ratio, far exceeding any comparable material. The glass to epoxy ratio is 75% glass to 25% epoxy, resulting in the desired composite material of virtually indestructable glass, sheathed in a closed molecular epoxy.

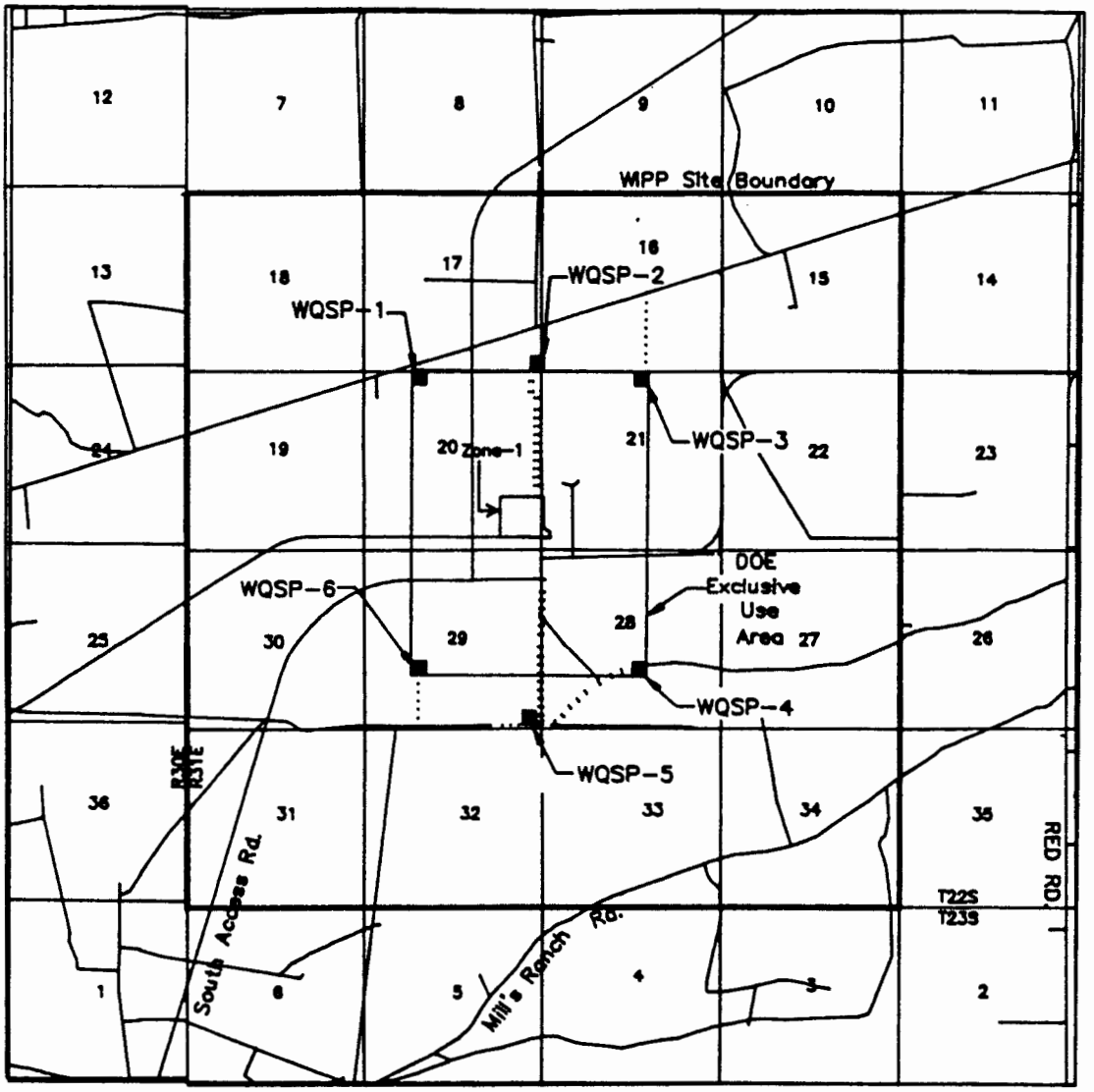
This F.R.E material is manufactured by Enco.EMC under extremely strict quality controls and manufacturing tolerances to ensure full field compatability and ease of assembly.

All materials are threaded by lathes rather than automatic threaders to ensure thread tolerances remain within specifications that do not exceed plus or minus .002".

Enco.EMC Fiberglass Reinforced Epoxy materials exceed all physical specifications as outlined in ASTM F480-88 and 90.

Enco.EMC offers crossovers to meet with all other thread designs including 2 TPI and 4 TPI. Stock material is threaded using a 4 TPI configuration.

2 TPI configurations can be custom ordered for any material except the 2" where crossovers are used.



PROPOSED NEW MONITORING WELL LOCATIONS

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□ PROPOSED NEW WELL LOCATIONS

EXISTING ACCESS ROADS

PROPOSED NEW ACCESS ROADS

WQSP-1	WQSP-2	WQSP-3
50 FNL 1464 FWL	148 FSL 84 FEL	50 FNL 2213 FEL
WQSP-4	**WQSP-5**	**WQSP-6**
1612 FSL 2275 FEL	300 FSL 350 FEL	1667 FSL 1329 FWL