



Big D WATER TREATMENT

Big D WATER TREATMENT

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www.bigdco.com

Big D wanted to take a moment and highlight what puts us far above the pack when it comes to water treatment. As I'm sure you're aware, most recycling projects all revolve around similar processes, with each company offering a slightly different chemistry and/or mechanical process.

Our strategy for each water treatment project we take on begins with a well-balanced approach in chemical usage. Over the years, Big D has worked diligently to perfect this process. We start out by carefully selecting and implementing the right concentration and volumes necessary for the water treatment process. We then apply an effective and exclusive mechanical process that sets the stage for results that far exceed expectations.

Process Description:

To give you an idea of what this looks like, we begin by verifying the parameters of your water, which helps us identify the proper oxidant to convert Fe^{2+} to Fe^{3+} . We subsequently apply an anionic or cationic polymer to pull all Fe^{3+} together into a removable state.

Once our mobile units are in place, the water flows through our Big D-owned tanks for residence time and then moves to our unique filtration system. The filters in this system consist of coated carbon steel designed to withstand heavy duty operations. The vessels are horizontal, allowing for 5 times the filtration media surface area, resulting in better filtering and more efficient back flushing. To remove solids, we use an activated glass media that will remove particles above 10 micron. The filters have a Water Quality Management System onboard which allows us to set your desired KPIs for discharge.

As a fail-safe, we've implemented an identification system to locate any water that falls short of KPI standards. Once identified, the unit recirculates the unsatisfactorily processed water, and it cycles through the process until the result is an extremely clean frac-grade water free of solids and bacteria.

These systems can be monitored remotely, and ALL data is compiled into a spreadsheet that is sent to anyone who wants it.



- HIGH VOLUME - SMALL FOOTPRINT - LOW POWER REQUIREMENT - HIGH EFFICIENCY - MINIMAL WASTE - CUSTOMIZABLE -

**HIGH VOLUME
LOW COST
ENVIRONMENTALLY
SAFE WATER TREATMENT**

JUST ONE OF OUR MANY SERVICES
FOR YOUR SITE

Big D

WATER TREATMENT

**THE PERMIAN'S
TRUE TURNKEY
SUPPLIER FOR YOUR
FRAC WATER NEEDS**

- ✓ Design Your Frac Pit Facility
- ✓ Build Your Facility
- ✓ Line Your Pits with Leak Detection
- ✓ Treat Produced Water to Fill Your Pit
- ✓ Transfer Water from Pit to the Frac
- ✓ Chemical Injection With Filtration
- ✓ High Volume and Low Cost
- ✓ Mobile Units Capable of 60,000 BPD
scalable to 90,000+ BPD
- ✓ Customized facilities available

1 DESIGN IT 2 BUILD IT 3 LINE IT 4 FENCE IT 5 FILL IT 6 TREAT IT 7 TRANSFER IT 8 MONITOR IT

432.688.8100
WWW.BIGDCO

Big D WATER TREATMENT

MAKING WATER GREAT AGAIN



INTRODUCTION

Big D Companies has designed a high-volume mobile flow through system for treating produced and flowback water. We can do this efficiently with minimal waste disposal and low cost, and our units can be set-up and start treating water within one week.

FLEXIBILITY

Big D's Mobile System is Flexible

- Can handle various fluctuations of water, ranging in high oil to high H₂S / Sulfur content.
- Can adapt based on the customer's site, and their ability to pull off AST tanks, pipeline, or SWD facility.



HIGH OIL CONTENT RAW WATER

- | | |
|----------------------------|----------------------------|
| • <u>March 20, 2020</u> | • <u>March 25, 2020</u> |
| • TPH- 322ppm | • TPH- 712ppm |
| • H ₂ S- 317ppm | • H ₂ S- 249ppm |
| • Iron- 8.01mg/l | • Iron- 0.74mg/l |
| • ORP- -175mV | • ORP- -312mV |
| • pH- 6.6 | • pH- 6.64 |
| • Turbidity- 1045ntu | • Turbidity- 175ntu |
| • Conductivity- 43.4mS | • Conductivity- 46.7mS |





HIGH OIL CONTENT DISCHARGE WATER

- March 20, 2020

- TPH- 15ppm
- H₂S- 0.0ppm
- Iron- 2.06mg/l
- ORP- 316mV
- pH- 6.5
- Turbidity- 22.2ntu
- Conductivity- 43.4mS

- March 25, 2020

- TPH- 4.07ppm
- H₂S- 0.0ppm
- Iron- 0.53mg/l
- ORP- 296mV
- pH- 6.73
- Turbidity- 14ntu
- Conductivity- 45mS

HIGH H₂S CONTENT



Raw Water

TPH- 683ppm
H₂S- 291ppm
Iron- 3.55mg/l
ORP- -309mV
pH- 6.53
Turbidity- 210ntu
Conductivity- 47mS



Treated Water

TPH- 447ppm
H₂S- 67ppm
Iron- 2.2mg/l
ORP- 356mV
pH- 6.42
Turbidity- 1136ntu
Conductivity- 48mS



Discharge Water

TPH- 0.87ppm
H₂S- 0.0ppm
Iron- 0.37mg/l
ORP- 331mV
pH- 6.89
Turbidity- 3.72ntu
Conductivity- 48mS

REMOVAL OF COLLOIDAL SULFUR

- * When hydrogen sulfide is oxidized into sulfur, the particles remain in a submicron state, making it difficult or impossible to remove them with standard filtration.
- * Big D has created a process to help break those colloids down, which allows us to remove over 70% (Wt% Sulfur 0.4630 to 0.1348) of the sulfur with a 20-micron filter and over 90% of the sulfur with a 10-micron filter (standard filtration).
- * Our flow through system allows 5,000 BPD to 100,000 BPD to be filtered safely, cost effectively, and with a minimal footprint on your site.



IS SULFUR A PROBLEM?

While some believe colloidal sulfur is not a problem down-hole, we speculate that it can and will do damage to the formation. Below are pictures of instrumentation used in this trial BEFORE we removed the sulfur. You tell me if you think sulfur is a problem or not.



MULTIPLE SITES

Small Footprint – High Volume

At this location, we have treated over 13 million barrels and counting. The rate for this set-up ranges from 25,000-90,000 bpd.



And at this location, we have treated over 3 million barrels and counting. The rate for this set-up ranges from 20,000-50,000 bpd, depending how much water the customer can provide us. We always meet and exceed our customers KPI's.



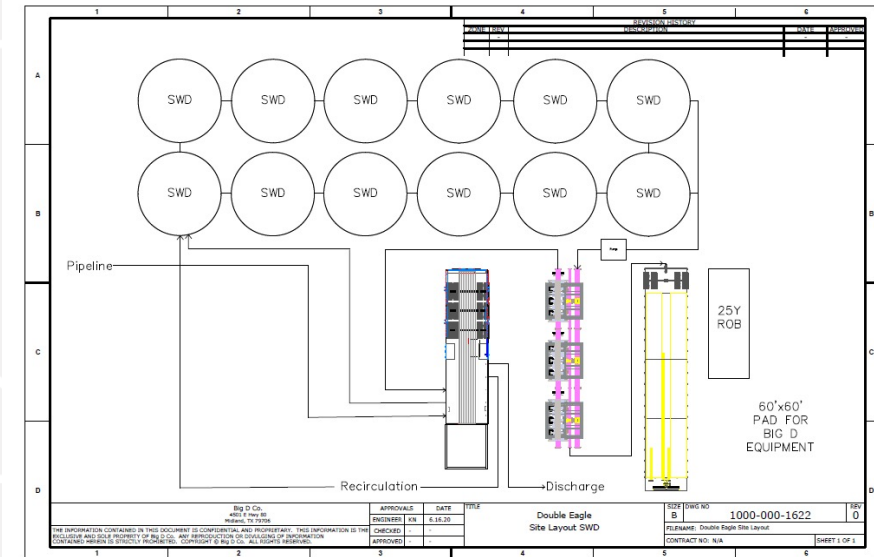
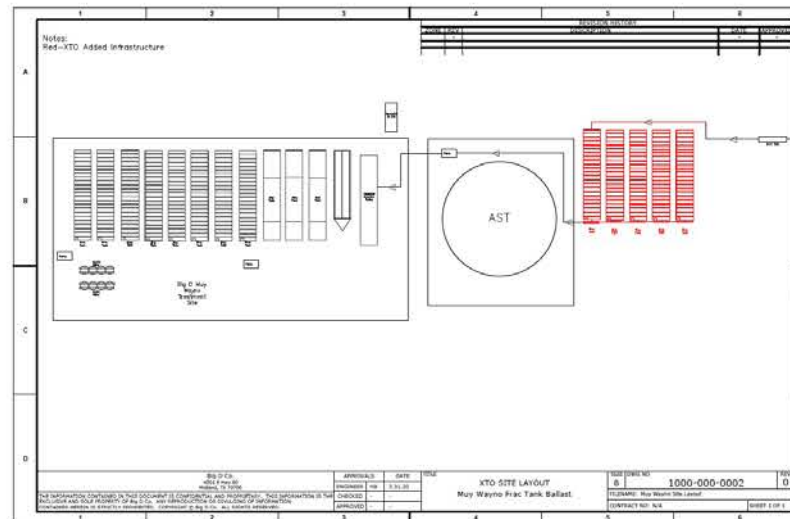
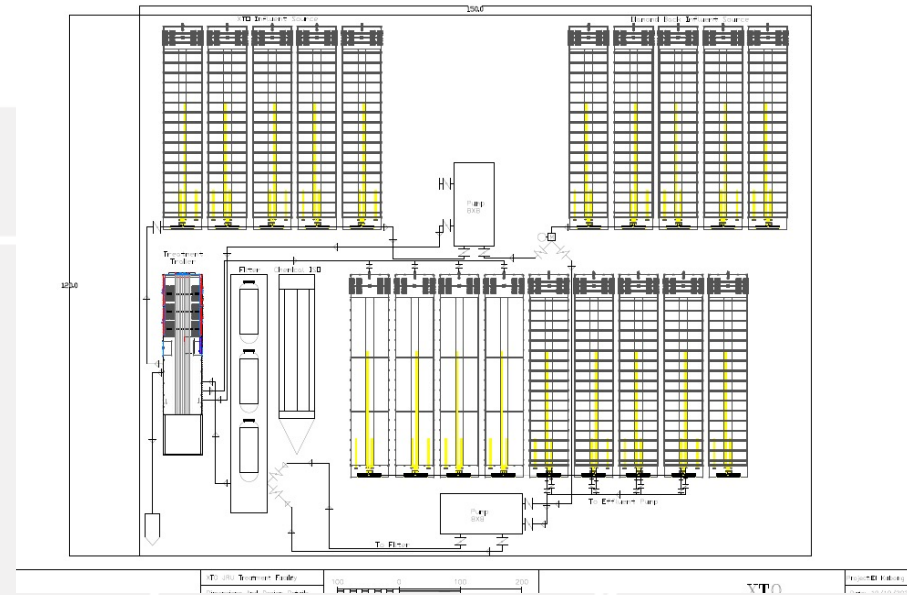


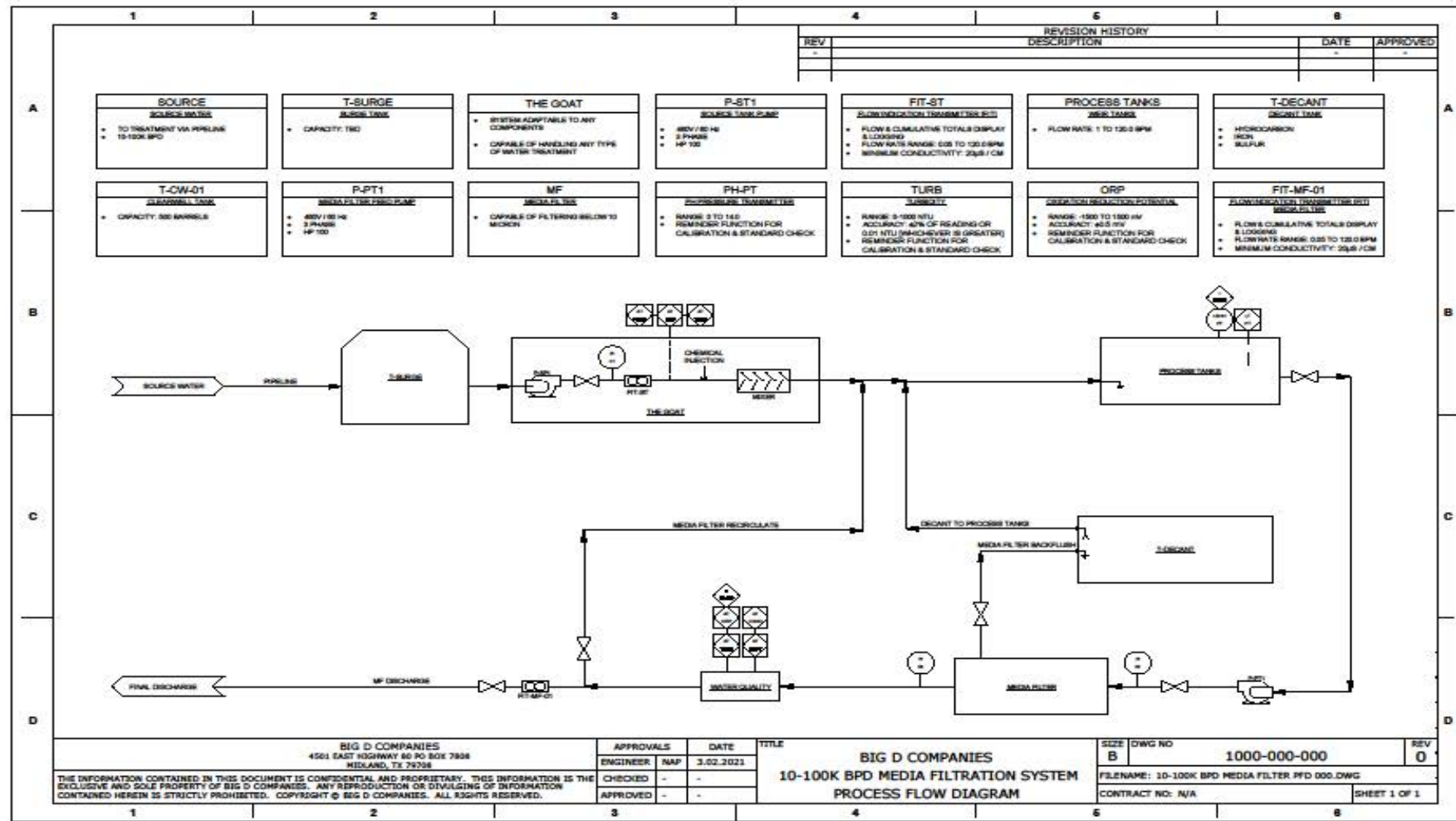
FACILITY SET-UP

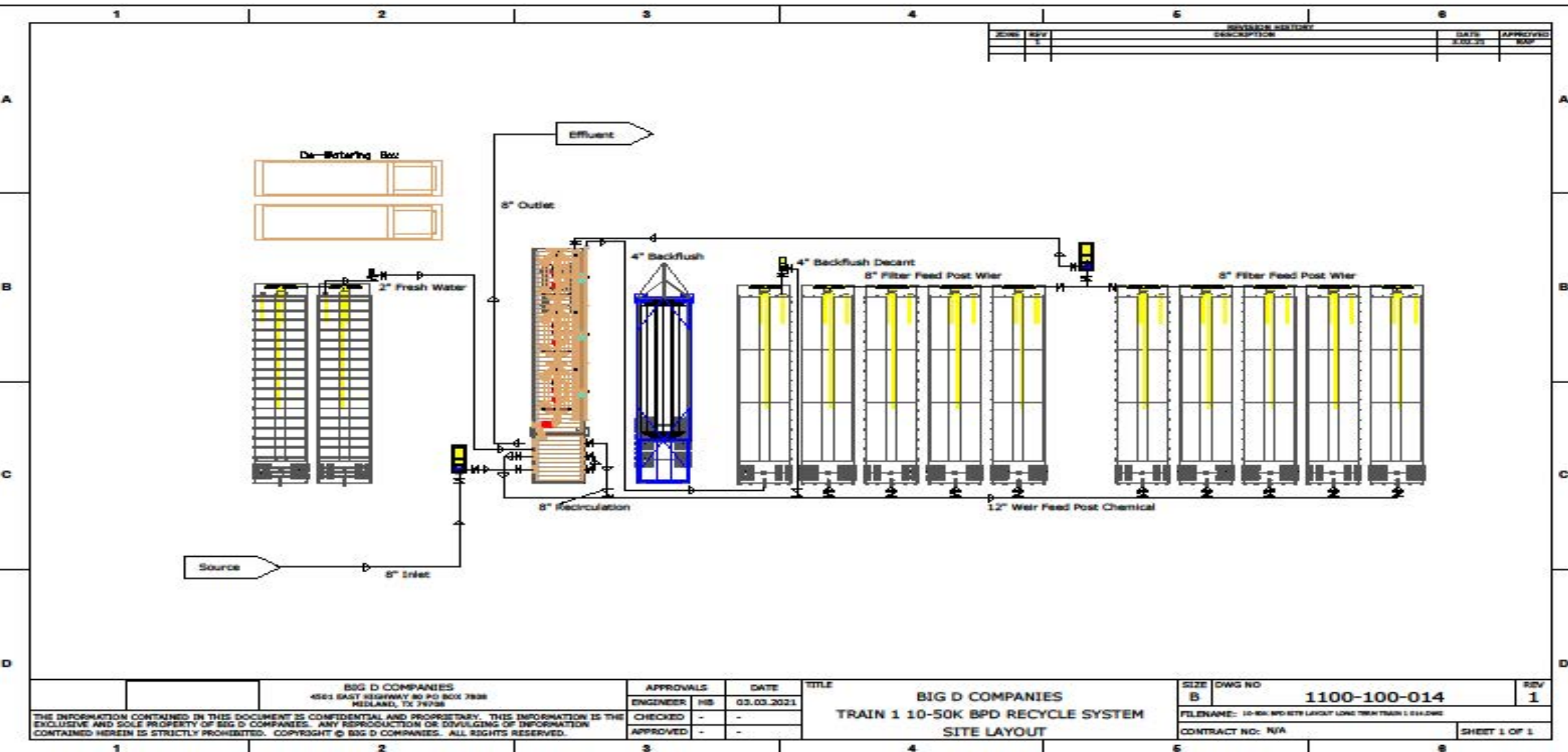
We have done two facility set-ups and have proven to be successful at treating over 2 million barrels flowing through the customers SWD with minimal modifications.

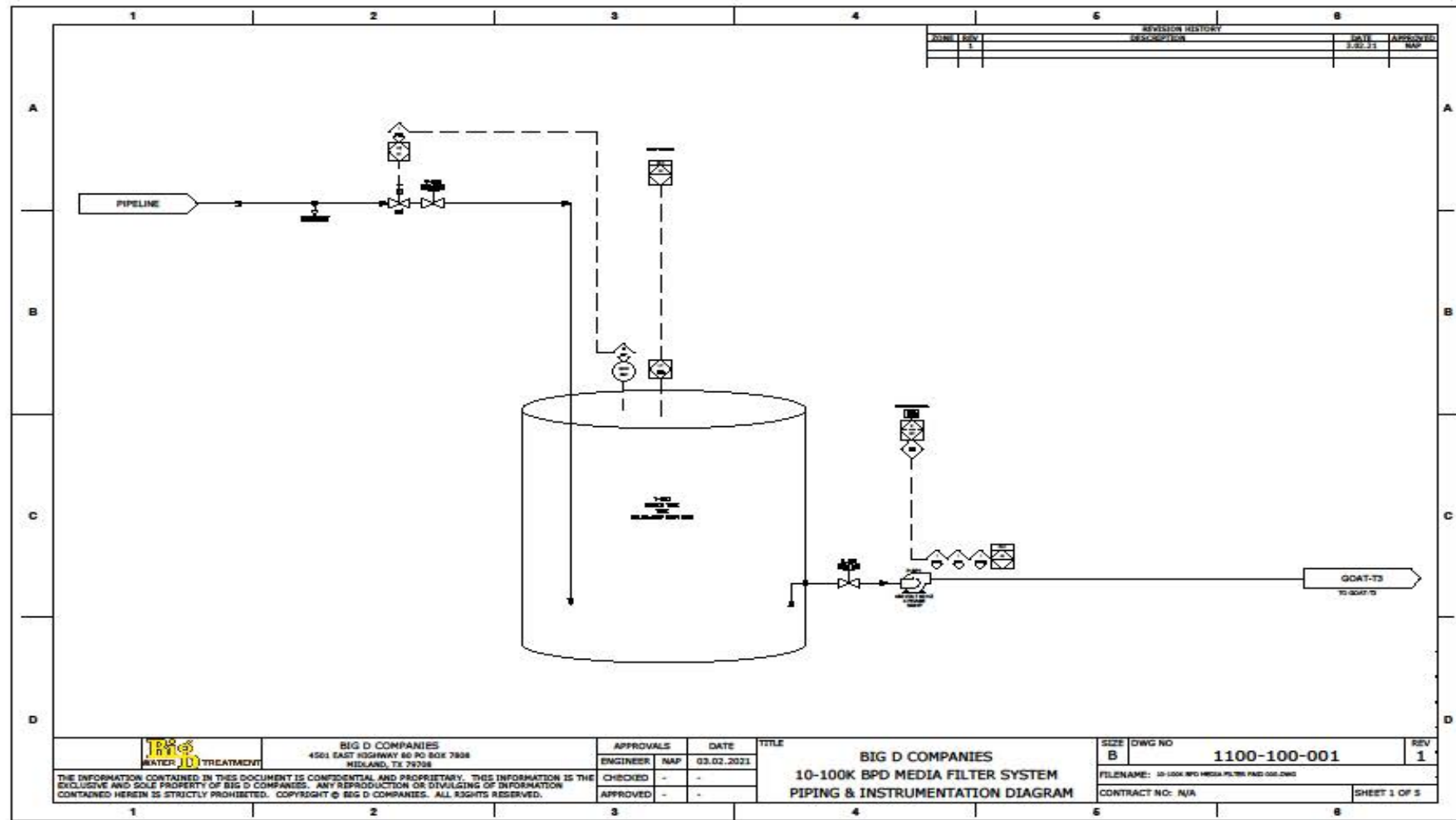
TAILORED SITE LAYOUT

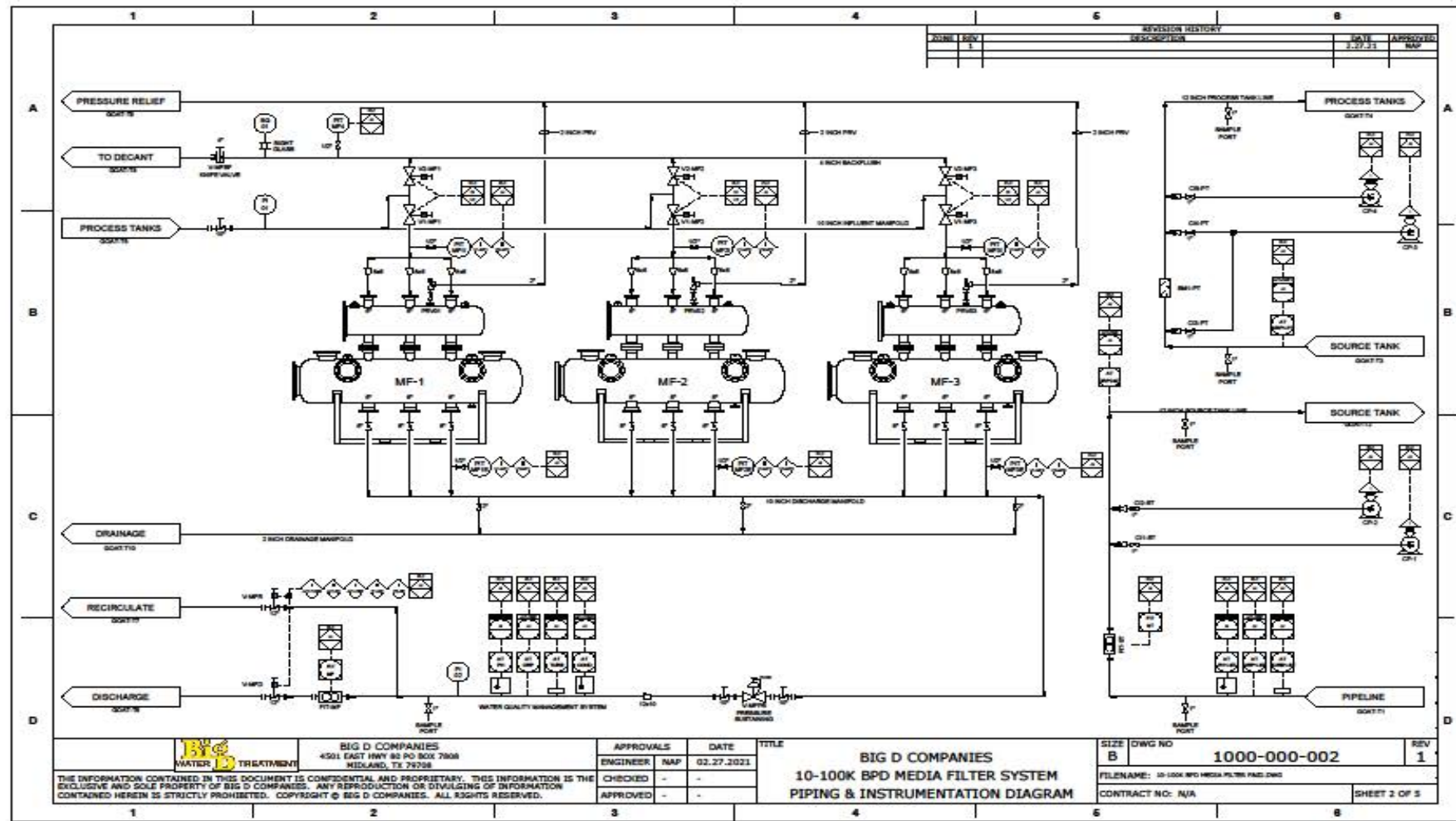
Once we do an initial site visit and take samples, we custom-tailor our site layouts based on the customer's space constraints and flow demands.

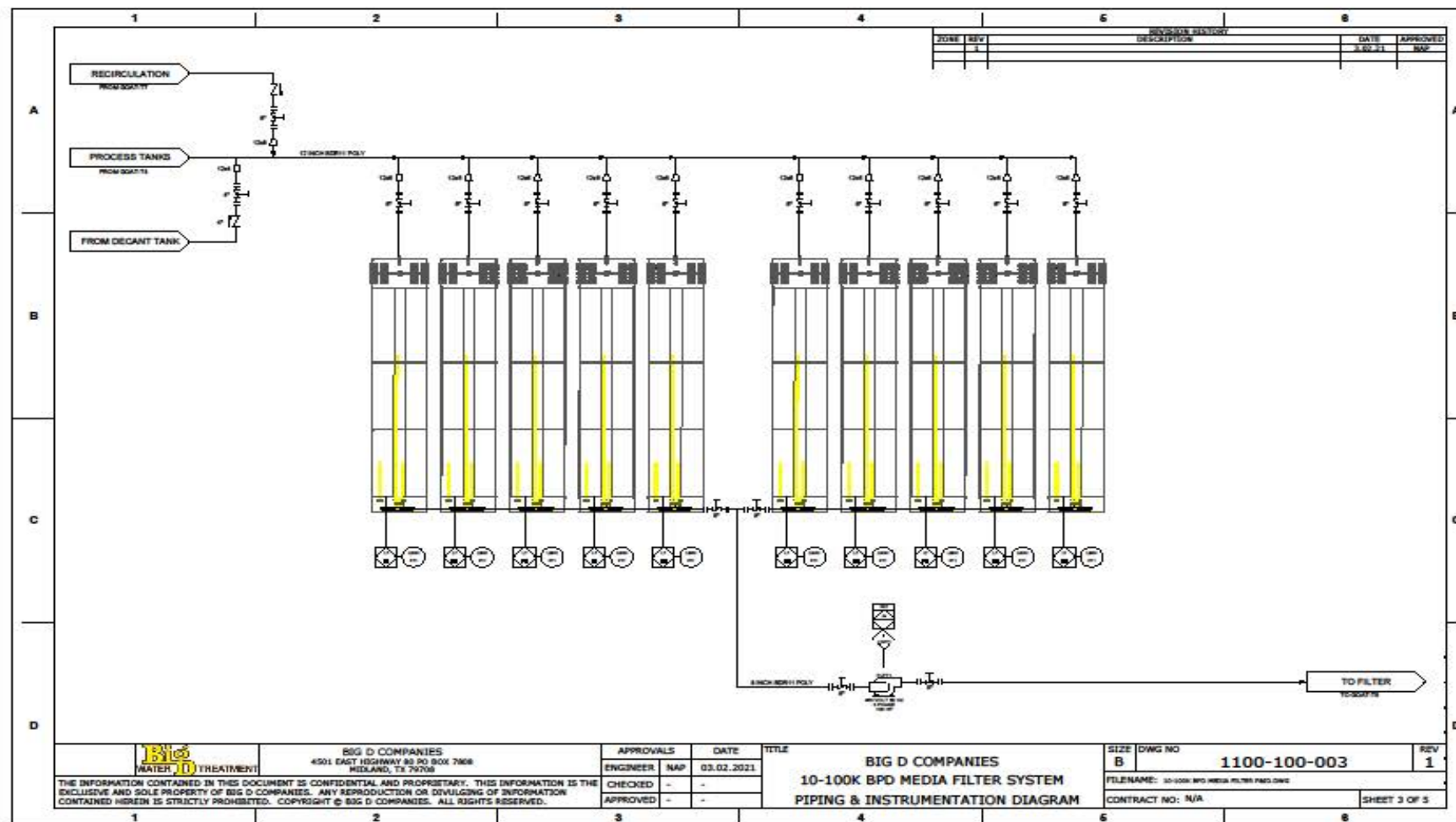












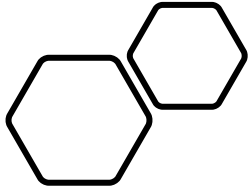


CUSTOM FILTERS



CUSTOM FILTERS

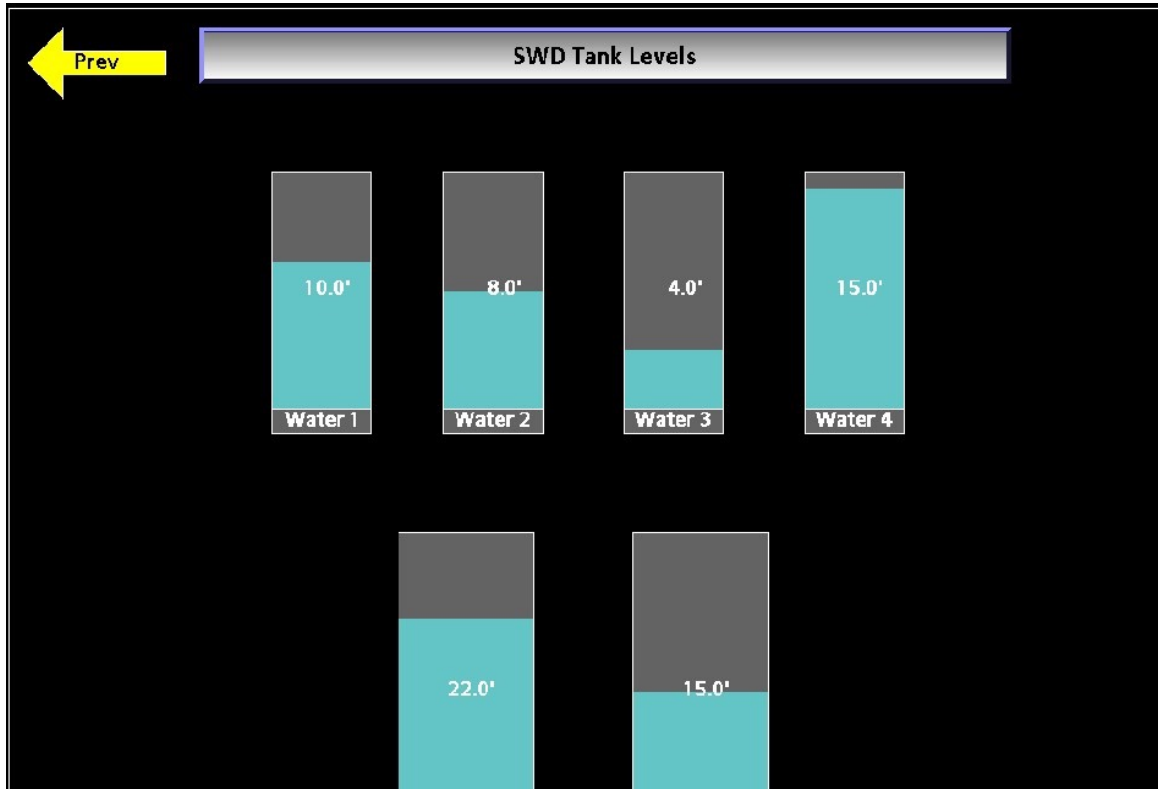
- Patent Pending Design
- Skid-Mounted to Trailers for ease of mobility
- Standard 3-Pod set up can treat 90,000 BPD.
- Highly Efficient and Low Maintenance



CUSTOM FILTERS – Next Generation SMART Filters

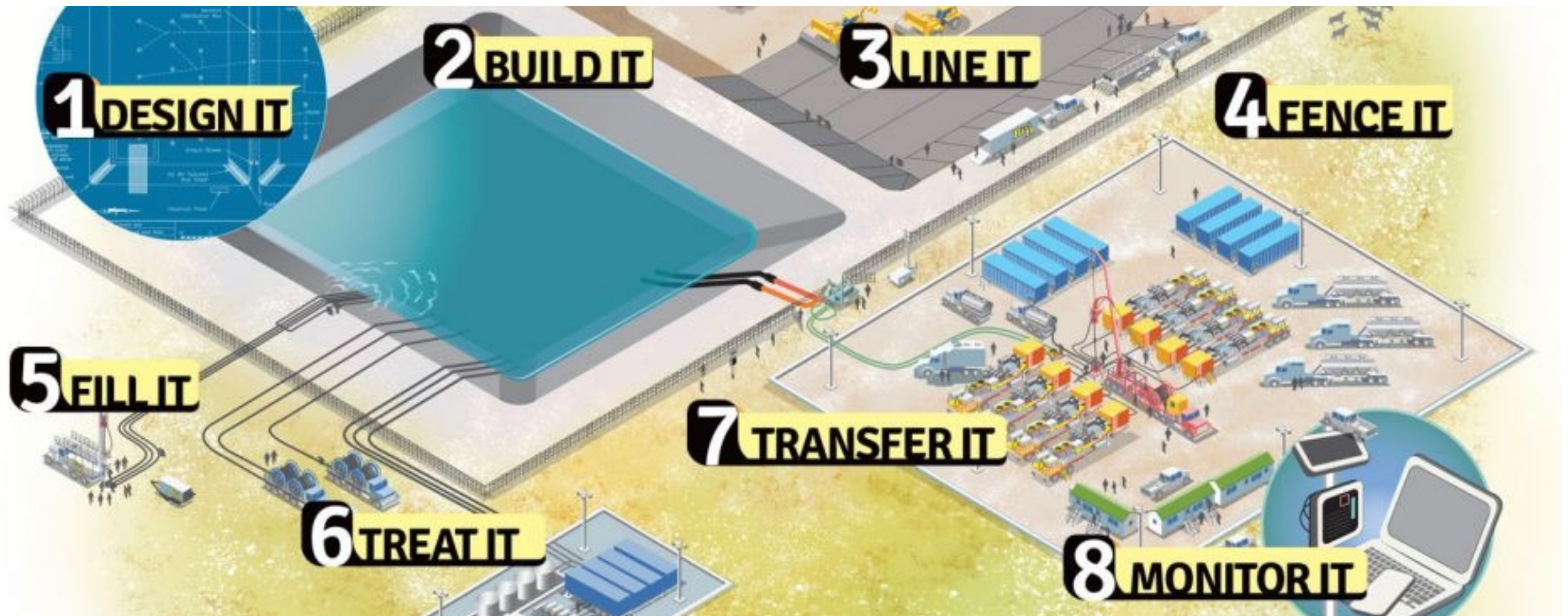
- We incorporate next generation filters into Big D's automation for monitoring influent and effluent water quality. With our controlled algorithm, we can use the on-board water readings to automate the proper dosage for the chemical pumps.
- The system is “all-in-one,” with monitoring and controlling chemical injection and filtration in a single mobile unit.





AUTOMATION & MONITORING

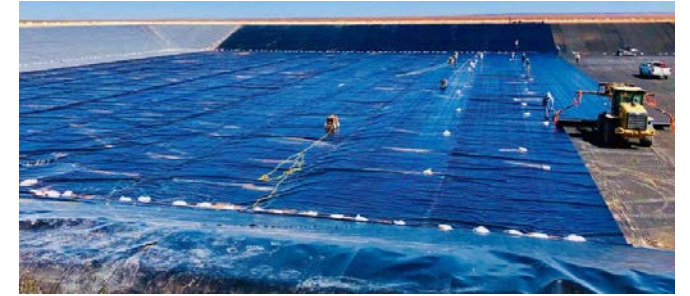
- Big D Automation makes it possible to tie into owned SWD SCADA systems to report and record levels onsite, via modbus. (RS485, TCP/IP)
- The unit is capable of receiving 8 X 4-20mA signals to monitor levels.



ADDITIONAL BIG D SERVICES |

ADDITIONAL BIG D SERVICES

- GENERATOR AND PUMP RENTALS
- PIT LINING – Frac Pits, Reserve Pits, Containment
- CONSTRUCTION – Frac Pits, Drill Site Locations, Facility Pads, Roads, and Remediation
- FENCING – High Game, Chain Link, and Barb-Wire





ADDITIONAL BIG D SERVICES

- WATER TRANSER – Layflat Hose for Frac Water Transfer and Pit to Pit Transfer for Produced and Fresh Water
- WATER WELL – Water Well Pump Installation for Down-Hole and Pit-Pumps
- POLY-PIPE – Rental of 3" and 4" poly-pipe, Sale and Installation of all sizes up to 16"
- AUTOMATION – Full scale automation and monitoring services

5.8'

Effluent Flow Rate: 16 BPM

Effluent Flow Total: 426942 BBLS

PH_5703: 6.73 PH

PH_5703Temp: 84.6 F

ORP_6848: 379.04 mV

ORP_6848Temp: 86.2 F

SOLITAX_Turbidity: 0.24 NTU

SC_0281_temp: 86.2 F

RAC 2

Output: 18.00 HZ

THANK YOU

WWW.BIGDCO.COM

MITCHELL ANALYTICAL LABORATORY

2638 Faudree Road
Odessa, Texas 79765
561-5579

Mr. Hunter Barr
Big D Companies
4501 E. Hwy. 80
Midland, Texas 79706

March 25, 2020

Results: 2 water samples for Iron, H₂S, ATP & Total Petroleum Hydrocarbon content
Dated: 3-24-20,
Lab No. 20-MAR-W91748:

Sample	Iron, Mg/l	H ₂ S, ppm	ATP, RLU	TPH, ppm
Influent	0.74	249.00	8.00	712.96
Effluent	0.53	0.00	0.00	0.07

Analyst
Blake Neatherlin

BIG D COMPANIES

MITCHELL ANALYTICAL LABORATORY

2638 Faudree Road
Odessa, Texas 79765
561-5579

Mr. Hunter Barr
Big D Companies
4501 E. Hwy 80
Midland, TX 79706

March 20, 2020

Results: 2 water samples for Total Petroleum Hydrocarbon & H₂S content,
Dated: 3-19-20,
Lab No. 20-MAR-W91708

Sample:	TPH, ppm	H ₂ S, ppm
Inlet 19 Mar 12:52	322.23	317.00
Outlet 19 Mar 12:52	1.93	0.00

Analyst
George Roberts

BIG D COMPANIES

MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: Sample A Influent
Lease:
Location:
Date Run: 4/1/2020
Lab Ref #: 20-apr-w91768
Wt% Sulfur = 0.1466

Sample Temp: 70
Date Sampled: 3/30/2020
Sampled by: Hunter Barr
Employee #:
Analyzed by: GR

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		225.00	16.00	14.06
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

		Mg/L	Eq. Wt.	MEq/L
Calcium (Ca++)		1,624.08	20.10	80.80
Magnesium (Mg++)		453.84	12.20	37.20
Sodium (Na+)		9,891.89	23.00	430.08
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.01	27.50	.00
Strontium (Sr++)	NOT ANALYZED			

Anions

		Mg/L	Eq. Wt.	MEq/L
Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		1,050.92	61.10	17.20
Sulfate (SO4=)		2,650.00	48.80	54.30
Chloride (Cl-)		16,918.59	35.50	476.58
Total Iron (Fe)		0.01	18.60	.00
Total Dissolved Solids		32,814.35		
Total Hardness as CaCO3		5,920.94		
Conductivity MICROMHOS/CM		47,800		

pH 6.860 Specific Gravity 60/60 F. 1.023

CaSO4 Solubility @ 80 F. 53.06MEq/L, CaSo4 scale is likely

CaCO3 Scale Index

70.0	.325	100.0	.665	130.0	1.265
80.0	.455	110.0	.925	140.0	1.265
90.0	.665	120.0	.925	150.0	1.585

Big D

MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: Sample C Discharge
Lease:
Location:
Date Run: 4/1/2020
Lab Ref #: 20-apr-w91770
Wt% Sulfur = 0.1348

Sample Temp: 70
Date Sampled: 3/30/2020
Sampled by: Hunter Barr
Employee #:
Analyzed by: GR

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		.00	16.00	.00
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

		Mg/L	Eq. Wt.	MEq/L
Calcium (Ca++)		1,624.08	20.10	80.80
Magnesium (Mg++)		458.72	12.20	37.60
Sodium (Na+)		10,113.20	23.00	439.70
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.01	27.50	.00
Strontium (Sr++)	NOT ANALYZED			

Anions

		Mg/L	Eq. Wt.	MEq/L
Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		708.76	61.10	11.60
Sulfate (SO4=)		3,550.00	48.80	72.75
Chloride (Cl-)		16,818.48	35.50	473.76
Total Iron (Fe)		0.02	18.60	.00
Total Dissolved Solids		33,273.27		
Total Hardness as CaCO3		5,940.95		
Conductivity MICROMHOS/CM		48,200		

pH 7.180 Specific Gravity 60/60 F. 1.023

CaSO4 Solubility @ 80 F. 61.23MEq/L, CaSo4 scale is likely

CaCO3 Scale Index

70.0	.474	100.0	.814	130.0	1.414
80.0	.604	110.0	1.074	140.0	1.414
90.0	.814	120.0	1.074	150.0	1.734

Big D

MITCHELL ANALYTICAL LABORATORY

2638 Faudree Road
Odessa, Texas 79765
561-5579

Mr. Kyle Nap
Big D Companies
4501 E. Hwy. 80
Midland, Texas 79706

August 5, 2020

Results: 2 water samples for Total Suspended Solids, Turbidity, ORP, ATP & Total
Petroleum Hydrocarbons,
Dated: 8-3-20,
Lab No. 20-AUG-W92336:

Sample: DE3	ATP, RLU	Turbidity, NTU	TSS, Mg/l	ORP	TPH, ppm
SWD	1.00	251.00	308.00	-35.9	78.93
Pond	0.00	2.33	32.00	327.4	0.21

Analyst
Brittany Neatherlin

BIG D COMPANIES



MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: Raw In Sample Temp: 70
Lease: Double Eagle Date Sampled: 6/10/2020
Location: Sampled by: Kyle Napp
Date Run: 6/10/2020 Employee #:
Lab Ref #: 20-Jun-w92103 Analyzed by: GR
TSS = 172.00 Mg/l - Turbidity = 128.00 NTU

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		.00	16.00	.00
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

Calcium (Ca++)		2,444.16	20.10	121.60
Magnesium (Mg++)		400.16	12.20	32.80
Sodium (Na+)		32,579.80	23.00	1,416.51
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.22	27.50	.01
Strontium (Sr++)	NOT ANALYZED			

Anions

Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		244.40	61.10	4.00
Sulfate (SO4=)		365.00	48.80	7.48
Chloride (Cl-)		55,360.83	35.50	1,559.46
Total Iron (Fe)		14.02	18.60	.02
Total Dissolved Solids		91,394.91		
Total Hardness as CaCO3		7,751.06		
Conductivity MICROMHOS/CM		129,000		

pH 6.720 Specific Gravity 60/60 F. 1.064

CaSO4 Solubility @ 80 F. 55.85MEq/L, CaSO4 scale is unlikely

CaCO3 Scale Index

70.0	-.301	100.0	.019	130.0	.629
80.0	-.181	110.0	.269	140.0	.629
90.0	.019	120.0	.269	150.0	.979

Big D

MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: Discharge Sample Temp: 70
Lease: Double Eagle Date Sampled: 6/10/2020
Location: Sampled by: Hunter Barr
Date Run: 6/10/2020 Employee #:
Lab Ref #: 20-Jun-w92104 Analyzed by: GR
TSS = 15.4 Mg/l - Turbidity = 4.1 NTU

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		.00	16.00	.00
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

Calcium (Ca++)		2,428.08	20.10	120.80
Magnesium (Mg++)		283.04	12.20	23.20
Sodium (Na+)		32,317.97	23.00	1,405.13
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.20	27.50	.01
Strontium (Sr++)	NOT ANALYZED			

Anions

Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		293.28	61.10	4.80
Sulfate (SO4=)		363.00	48.80	7.44
Chloride (Cl-)		54,559.95	35.50	1,536.90
Total Iron (Fe)		0.04	18.60	.00
Total Dissolved Solids		90,245.56		
Total Hardness as CaCO3		7,230.66		
Conductivity MICROMHOS/CM		126,800		

pH 6.960 Specific Gravity 60/60 F. 1.063

CaSO4 Solubility @ 80 F. 56.04MEq/L, CaSO4 scale is unlikely

CaCO3 Scale Index

70.0	.015	100.0	.335	130.0	.945
80.0	.135	110.0	.585	140.0	.945
90.0	.335	120.0	.585	150.0	1.295

Big D

MITCHELL ANALYTICAL LABORATORY

2638 Faudree Road
Odessa, Texas 79765
561-5579

Mr. Kyle Nap
Big D Companies
4501 E. Hwy. 80
Midland, Texas 79706

August 13, 2020

Results: 2 water samples for Total Suspended Solids, Turbidity, ORP, ATP & Total
Petroleum Hydrocarbons,
BN Fasken
Dated: 8-11-20,
Lab No. 20-AUG-W92418:

Sample:	ATP, RLU	Turbidity, NTU	TSS, Mg/l	ORP	TPH, ppm
Influent	92.00	83.40	491.00	-24.5	1,250.00
Effluent	2.00	1.85	25.00	225.6	1.82

Analyst
Brittany Neatherlin

BIG D COMPANIES



MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: 1
Lease: BN Fasken
Location: Influent
Date Run: 8/12/2020
Lab Ref #: 20-aug-w92425

Sample Temp: 70
Date Sampled: 8/11/2020
Sampled by: Hunter Barr
Employee #:
Analyzed by: GR

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		.00	16.00	.00
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

		Mg/L	Eq. Wt.	MEq/L
Calcium (Ca++)		3,449.16	20.10	171.60
Magnesium (Mg++)		429.44	12.20	35.20
Sodium (Na+)		37,435.56	23.00	1,627.63
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.63	27.50	.02
Strontium (Sr++)	NOT ANALYZED			

Anions

		Mg/L	Eq. Wt.	MEq/L
Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		366.60	61.10	6.00
Sulfate (SO4=)		204.00	48.80	4.18
Chloride (Cl-)		64,771.17	35.50	1,824.54
Total Iron (Fe)		4.92	18.60	.26
Total Dissolved Solids		106,661.48		
Total Hardness as CaCO3		10,383.60		
Conductivity MICROMHOS/CM		141,800		

pH 6.640 Specific Gravity 60/60 F. 1.074

CaSO4 Solubility @ 80 F. 50.78MEq/L, CaSO4 scale is unlikely

CaCO3 Scale Index

70.0	.055	100.0	.355	130.0	.945
80.0	.145	110.0	.625	140.0	.945
90.0	.355	120.0	.625	150.0	1.285

Big D

MITCHELL ANALYTICAL LABORATORY

2638 Faudree
Odessa, Texas 79765-8538
561-5579

Company: **Big D**

Well Number: Produced
Lease: BN Fasken
Location: Effluent
Date Run: 8/12/2020
Lab Ref #: 20-aug-w92426

Sample Temp: 70
Date Sampled: 8/11/2020
Sampled by: Hunter Barr
Employee #:
Analyzed by: GR

Dissolved Gases

		Mg/L	Eq. Wt.	MEq/L
Hydrogen Sulfide (H2S)		.00	16.00	.00
Carbon Dioxide (CO2)	NOT ANALYZED			
Dissolved Oxygen (O2)	NOT ANALYZED			

Cations

		Mg/L	Eq. Wt.	MEq/L
Calcium (Ca++)		3,441.12	20.10	171.20
Magnesium (Mg++)		488.00	12.20	40.00
Sodium (Na+)		36,857.26	23.00	1,602.49
Barium (Ba++)	NOT ANALYZED			
Manganese (Mn+)		.58	27.50	.02
Strontium (Sr++)	NOT ANALYZED			

Anions

		Mg/L	Eq. Wt.	MEq/L
Hydroxyl (OH-)		.00	17.00	.00
Carbonate (CO3=)		.00	30.00	.00
BiCarbonate (HCO3-)		244.40	61.10	4.00
Sulfate (SO4=)		240.00	48.80	4.92
Chloride (Cl-)		64,070.40	35.50	1,804.80
Total Iron (Fe)		0.14	18.60	.01
Total Dissolved Solids		105,341.90		
Total Hardness as CaCO3		10,603.60		
Conductivity MICROMHOS/CM		141,600		

pH 6.880 Specific Gravity 60/60 F. 1.073

CaSO4 Solubility @ 80 F. 48.29MEq/L, CaSO4 scale is unlikely

CaCO3 Scale Index

70.0	.058	100.0	.378	130.0	.968
80.0	.168	110.0	.618	140.0	.968
90.0	.378	120.0	.618	150.0	1.308

Big D