

U.S. Patent No. 8,505,332
Claims 1-4, 6-7
Goldsmith Processing Plant
(Ector County, Texas)

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
Claim 1 [1.P] A method comprising: [1.1] receiving a hydrocarbon feed stream, wherein the hydrocarbon feed stream comprises carbon dioxide, natural gas liquid (NGL), heavy hydrocarbons, and acid gas, wherein the NGL comprises C₃-C₈ hydrocarbons, and wherein the heavy hydrocarbons comprise C₉+ hydrocarbons;	As do most all Enhanced Oil Recovery (“EOR”) processes, the Goldsmith EOR hydrocarbon feed stream includes carbon dioxide, natural gas liquid (NGL), heavy hydrocarbons, and acid gas. (Ex. 2060, C6+ Gas/Vapor Fractional Analysis (showing Inlet gas having Carbon Dioxide, C3-C8 hydrocarbons, and Hydrogen Sulfide acid gas).) The NGL includes C3-C8 hydrocarbons (Ex. 2060, C6+ Gas/Vapor Fractional Analysis (showing Inlet gas having C3-C8 hydrocarbons); and The heavy hydrocarbons include C9+ hydrocarbons. (Ex. 2059, Page 1, Gas Extended Analysis (showing Inlet Gas having C9 (C9 Naphthenes and Paraffins, and n-Nonane) and C10 hydrocarbons (n-Decane and Undecane Plus))

[1.2] separating the hydrocarbon feed stream into a heavy hydrocarbon rich stream and a carbon dioxide recycle stream, wherein the heavy hydrocarbon rich stream comprises the C₉₊ hydrocarbons, and wherein the carbon dioxide recycle stream comprises the carbon dioxide, the C₃-C₈ hydrocarbons, and the acid gas;	The Goldsmith EOR separates the “Hydrocarbon Feed Stream” into a “Heavy Hydrocarbon Rich Stream” and a “Carbon Dioxide Recycle Stream.” This initial separation step is performed prior to the Stream No. 1 “Carbon Dioxide Recycle Stream” entering the NGL recovery gas processing plant, so is not shown on the Process Flow Diagrams (“PFDs”) exhibit used for the following steps in the process. The Goldsmith EOR performs this initial separation step using a Three-Phase Separator that separates the “Hydrocarbon Feed Stream” into water, oil, and gaseous components. Water exits the bottom of the Three-Phase Separator, Oil (“Heavy Hydrocarbon Rich Stream” C₉₊ hydrocarbons) out the middle, and gas (“Carbon Dioxide Recycle Stream”) out the top. The “Heavy Hydrocarbon Rich Stream” includes C₉₊ hydrocarbons The “Carbon Dioxide Recycle Stream” includes Carbon Dioxide, C₃-C₈ hydrocarbons, and acid gas Carbon Dioxide Recycle Stream = Stream No. 1, “Feed from Compressor Stage” (Ex. 2058, Page 1). Stream No. 1 “Carbon Dioxide Recycle Stream” composition (Ex. 2058, Page 2) includes:
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	carbon dioxide Carbon Dioxide (Mole Fraction) 84.937% C3-C8 hydrocarbons: C3 Propane (Mole Fraction) 1.474% C4 iC4 (Mole Fraction) 0.289% n-Butane (Mole Fraction) 0.837% C5 iC5 (Mole Fraction) 0.369% nC5 (Mole Fraction) 0.309% C6 nC6 (Mole Fraction) 0.996% C7+ nC7 (Mole Fraction) 0.070% C8 (included in C7+ above) acid gas (H₂S/CO₂) Hydrogen Sulfide (Mole Fraction) 1.175% other components are: N₂ (2.072%), Methane (5.458%), Ethane (1.624%), and Water (0.392%), which accounts for 100% While the stream compositions in the PFDs do not separately specify the C8 component, the Gas Extended Analysis (Ex. 2059, Page 1) shows the presence of C8 (N-OCTANE) in the Inlet Gas, confirming that the stream compositions in the PFDs include C8 in the C7 data, meaning that the C7 data in the PFDs is C7+.
[1.3] separating the carbon dioxide recycle stream into a sour NGL rich	The Stream No. 1 “Carbon Dioxide Recycle Stream” flows through the E-200 Inlet [heat] Exchanger, exiting as the cooled “Carbon Dioxide Recycle Stream” (Stream No. 21), then flows through the V-201 NGL 3-Phase Separator, exiting as Stream No. 3, which flows to the V-601 TEG

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
stream and a purified carbon dioxide recycle stream,	Contactors for dehydration, then returns as the dehydrated “Carbon Dioxide Recycle Stream” (Stream 70), which then enters the V-203 NGL Fractionator (as Stream No. 20 after passing through a valve), where this [1.3] separating step is performed. (Ex. 2058, Page 1.) The V-203 NGL Fractionator separates the Stream No. 1 (21, 3, 70, 20) “Carbon Dioxide Recycle Stream” into a bottoms “Sour NGL Rich Stream” (Stream No. 12) and an overhead “Purified Carbon Dioxide Recycle Stream” (Stream No. 22). (Ex. 2058, Page 1.)
wherein the sour NGL rich stream comprises the C ₃ -C ₈ hydrocarbons and the acid gas, and	Stream No. 9 exits the bottom of the V-203 NGL Fractionator and flows to the H-207 NGL Reboiler, exiting the bottom as Stream No. 11, which then enters the V-209 NGL Surge Tank, exiting as the “Sour NGL Rich Stream” (Stream No. 12). (Ex. 2058, Page 1.) Stream No. 12 “Sour NGL Rich Stream” composition (Ex. 2058, Page 2) includes C₃-C₈ hydrocarbons and acid gas:

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)		
wherein the purified carbon dioxide recycle stream comprises the carbon dioxide; and	C3-C8 hydrocarbons:		
	C3	Propane (Mole Fraction)	14.5%
	C4	iC4 (Mole Fraction)	7.0%
		n-Butane (Mole Fraction)	22.6%
	C5	iC5 (Mole Fraction)	10.4%
		nC5 (Mole Fraction)	8.69%
	C6	nC6 (Mole Fraction)	28.0%
	C7+	nC7 (Mole Fraction)	1.96%
	C8	(included in C7+ above)	
	acid gas (H2S/CO2):		
	H2S	Hydrogen Sulfide (Mole Fraction)	1.70%
	CO2	Carbon Dioxide (Mole Fraction)	4.79%
	other components are: Ethane (0.227%) and Water (0.12%), which accounts for 99.987%, and miniscule amounts of methane and N2 to account for 100%		
	Stream No. 4 exits the top of the V-203 NGL Fractionator as the overhead stream and flows through the E-204 Overhead Condenser, exiting as Stream No. 5, which then enters the V-205 NGL Reflux Accumulator, exiting as the Stream No. 8 cooled “Purified Carbon Dioxide Recycle Stream,” which flows through the E-200 Inlet [heat] Exchanger, exiting as		

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)			
	the “Purified Carbon Dioxide Recycle Stream” (Stream No. 22). (Ex. 2058, Page 1.) Stream No. 22 “Purified Carbon Dioxide Recycle Stream” composition (Ex. 2058, Page 2) includes carbon dioxide: <table><tr><td>CO2</td><td>Carbon Dioxide (Mole Fraction)</td><td>88.2%</td></tr></table> other components are: Methane (5.69%), Ethane (1.68%), Propane (0.998%), C4 (0.0419% & 0.0367%), N2(2.16%), and H2S (1.15%), which accounts for 99.9566%, and miniscule amounts of C5-C7+ and water, to account for 100%	CO2	Carbon Dioxide (Mole Fraction)	88.2%
CO2	Carbon Dioxide (Mole Fraction)	88.2%		

[1.4] separating the sour NGL rich stream into a sweet NGL rich stream and an acid gas stream,

wherein the sweet NGL rich stream comprises the C₃-C₈ hydrocarbons, and

The Stream No. 13 cooled “Sour NGL Rich Stream” flows to the V-501 Amine Contactor, exiting the AC-208 Sour NGL Cooler at Ex.2058 flow diagram Page 1, and entering Page 3 at the “from AC-208 Sour NGL Cooler,” continuing as the Stream No. 23 “Sour NGL Rich Stream.” (Ex. 2058, Page 3.)

The Stream No. 23 “Sour NGL Rich Stream” is separated into a “Sweet NGL Rich Stream” (Stream No. 25) and an “Acid Gas Stream” (Stream No. 36) by the V-501 DEA Contactor. (Ex. 2058, Page 3.)

Stream No. 24 exits the top of the V-501 DEA Contactor and enters the F-500 DEA Coalescer, exiting as Stream No. 25, which is the “Sweet NGL Rich Stream” that flows to the NGL Stabilizer Skid. (Ex. 2058, Page 3.)

Stream No. 25 “Sweet NGL Rich Stream” composition (Ex. 2058, Page 4) includes C₃-C₈ hydrocarbons:

C₃-C₈ hydrocarbons:

C3	Propane (Mole Fraction)	16.0%
C4	iC4 (Mole Fraction)	7.5%
	n-Butane (Mole Fraction)	24.0%
C5	iC5 (Mole Fraction)	11.0%
	nC5 (Mole Fraction)	9.3%
C6	nC6 (Mole Fraction)	30.0%
C7+	nC7 (Mole Fraction)	2.1%
C8	(included in C7+ above)	

which accounts for 99.9%

other components are: Methane (0.00025%), Ethane (0.24%), Water

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)						
wherein the acid gas stream comprises the acid gas,	(0.11%), H2S (0.00015%), and DEA (0.0016%), and miniscule amounts of methane, N2, CO2, and TEG to account for 100%. Stream No. 27 exits the bottom of the V-501 DEA Contactor and flows through V-502, F-504, F-503, E-505, V-507, AC-509, and V-508, exiting as the “Acid Gas Stream” (Stream No. 36) to Acid Gas Compressor Stream No. 36 “Acid Gas Stream” composition (Ex. 2058, Page 4) includes the acid gas CO2 and H2S: <table><tr><td>CO2</td><td>Carbon Dioxide (Mole Fraction)</td><td>69.0%</td></tr><tr><td>H2S</td><td>Hydrogen Sulfide (Mole Fraction)</td><td>24.0%</td></tr></table> other components are: water (6.4%,), which accounts for 99.4%, and miniscule amounts of Methane, Ethane (0.0099%), Propane (0.19%), C4 (0.025% & 0.099%), and C5+, to account for 100%	CO2	Carbon Dioxide (Mole Fraction)	69.0%	H2S	Hydrogen Sulfide (Mole Fraction)	24.0%
CO2	Carbon Dioxide (Mole Fraction)	69.0%					
H2S	Hydrogen Sulfide (Mole Fraction)	24.0%					

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
[1.5] wherein the carbon dioxide is not removed from the hydrocarbon feed stream and is not removed from the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and	(CO₂ is not removed from the hydrocarbon feed stream and CO₂ is not removed from the carbon dioxide recycle stream) prior to separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream The only CO₂ removal steps are the [1.3] separation of the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream, and <u>after</u> that step [1.3] separation, removal of the CO₂/H₂S acid gas from the sour NGL rich stream.
[1.6] wherein the hydrocarbon feed stream, the carbon dioxide recycle stream, and the sour NGL rich stream are not subjected to cryogenic conditions, membranes, and carbon dioxide recovery solvents between being received and being separated into the heavy hydrocarbon rich stream, the purified carbon dioxide recycle stream, the sweet NGL rich stream, and the acid gas stream.	There are no cryogenic conditions in this process. The coldest temperatures in the process are Stream Nos. 18 (19°F) and 19 (18.9°F), which are the refrigerant streams entering and exiting the E-204 Overhead Condenser for the overhead Stream No. 4 from the V-203 NGL Fractionator. (Ex. 2058, Pages 1-2.) There are no membranes in this process. There are no “carbon dioxide recovery solvents” in this process. The only solvents in the process are the dehydration solvents (TEG) in the dehydration step, and the amine solvents (DEA) in the sweetening step, neither of which is a solvent used for recovery of carbon dioxide.

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	The dehydration solvents are used to remove water from the carbon dioxide recycle stream, not to recover carbon dioxide. The amine solvents are used in the sweetening step to remove acid gas (CO ₂ /H ₂ S) from the “Sour NGL Rich Stream,” not to recover carbon dioxide.

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
Claim 2 [2.1] The method of claim 1, further comprising: compressing the carbon dioxide recycle stream prior to separating the carbon dioxide recycle stream;	The Stream No. 1 “Carbon Dioxide Recycle Stream” is compressed prior to entering the gas processing plant. The process flow diagram shows this “prior compression” step by designating the inlet feed Stream No. 1 as “Feed from Compressor Stage.” (Ex. 2058, Page 1.)

[2.2] dehydrating at least part of the carbon dioxide recycle stream using a dehydration solvent prior to separating the carbon dioxide recycle stream;	The Stream No. 1 “Carbon Dioxide Recycle Stream” is dehydrated using a dehydration solvent prior to separating the “Carbon Dioxide Recycle Stream.” The Stream No. 1 “Carbon Dioxide Recycle Stream” is dehydrated using the V-601 TEG Contactor. (Ex. 2058, Page 5.) TEG is Triethylene glycol, which is a dehydration solvent. After Stream No. 1 “Carbon Dioxide Recycle Stream” is cooled by the E-200 Inlet [heat] exchanger, exiting as the Stream No. 21 cooled “Carbon Dioxide Recycle Stream,” it flows into the V-201 NGL 3-Phase Separator, exiting as Stream No. 3 (Ex. 2058, Page 1), then flows into the V-601 TEG Contactor, exiting as Stream No. 50 (Ex. 2058, Page 3). Stream No. 50 then flows through the E-602 Gas-TEG Exchanger, exiting as Stream No. 51, then flows through the F-600 TEG Coalescer, exiting as the dehydrated “Carbon Dioxide Recycle Stream” (Stream No. 70). (Ex. 2058, Page 3.) Comparison of the stream composition for the Stream No. 3 that enters the V-601 TEG Contactor (0.0945% water) (Ex. 2058, Page 2), with the Stream 50 that exits the V-601 TEG Contactor (0.0027% water) (Ex. 2058, Page 4), confirms that the V-601 TEG Contactor dehydrates the Stream No. 1 “Carbon Dioxide Recycle Stream.” The Stream No. 70 dehydrated “Carbon Dioxide Recycle Stream” flows from the F-600 TEG Coalescer to the V-203 NGL Fractionator (Ex. 2058, Page 3), for separating the “Carbon Dioxide Recycle Stream,” entering the V-203 NGL Fractionator (as Stream No. 20 after passing through a valve). (Ex. 2058, Page 1)
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Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
[2.3] combining a carbon dioxide makeup stream external to the method with the purified carbon dioxide recycle stream; and	As do most all Enhanced Oil Recovery (“EOR”) processes, the Goldsmith EOR uses a “Carbon Dioxide Makeup Stream” external to the NGL recovery process, and combines that makeup stream with the Stream No. 22 “Purified Carbon Dioxide Recycle Stream.”
[2.4] injecting the combined carbon dioxide makeup stream and the purified carbon dioxide recycle stream into a subterranean formation.	The Goldsmith EOR injects the combined “Carbon Dioxide Makeup Stream” and the “Purified Carbon Dioxide Recycle Stream” into the subterranean formation.

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Claim 3 [3] The method of claim 1, further comprising cooling the carbon dioxide recycle stream with the purified carbon dioxide recycle stream.	The Stream No. 1 “Carbon Dioxide Recycle Stream” is cooled with the Stream No. 8 cooled “Purified Carbon Dioxide Recycle Stream” by the E-200 Inlet [heat] Exchanger. (Ex. 2058, Page 1.) The Stream No. 1 “Carbon Dioxide Recycle Stream” enters the E-200 Inlet [heat] Exchanger at 120 °F, and exits the E-200 Inlet [heat] Exchanger at 70 °F as the Stream No. 21 cooled “Carbon Dioxide Recycle Stream.” (Ex. 2058, Page 2 (showing Stream No. 1 as 120 °F, and Stream No. 21 as 70 °F).) The Stream No. 8 cooled “Purified Carbon Dioxide Recycle Stream” enters the E-200 Inlet [heat] Exchanger at 33.1 °F, cools the Stream No. 1 “Carbon Dioxide Recycle Stream,” exiting as the Stream No. 22 “Purified Carbon Dioxide Recycle Stream” at 98 °F, then flowing to the Compressor Stage for compression and re-injection into the subterranean formation. (Ex. 2058, Page 2 (showing Stream No. 8 as 33.1 °F, and Stream No. 22 as 98 °F).)

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)												
Claim 4 [4] The method of claim 3, wherein the sweet NGL rich stream comprises no more than 1 molar percent methane, no more than 1 molar percent ethane, and no more than 1 molar percent acid gases.	The Stream No. 25 “Sweet NGL Rich Stream” composition for Methane, Ethane, and Acid Gases (H2S/CO2) is (Ex. 2058, Page 4): The Stream No. 25 “Sweet NGL Rich Stream” has much less than 1 molar percent Methane, Ethane, and Acid Gases. <table><tr><td>C1</td><td>Methane (Mole Fraction)</td><td>0.00025%</td></tr><tr><td>C2</td><td>Ethane (Mole Fraction)</td><td>0.24%</td></tr></table> Acid gases: <table><tr><td>H2S</td><td>Hydrogen Sulfide (Mole Fraction)</td><td>0.00015%</td></tr><tr><td>CO2</td><td>Carbon Dioxide (Mole Fraction)</td><td>4.4e-5 (0.000044)%</td></tr></table>	C1	Methane (Mole Fraction)	0.00025%	C2	Ethane (Mole Fraction)	0.24%	H2S	Hydrogen Sulfide (Mole Fraction)	0.00015%	CO2	Carbon Dioxide (Mole Fraction)	4.4e-5 (0.000044)%
C1	Methane (Mole Fraction)	0.00025%											
C2	Ethane (Mole Fraction)	0.24%											
H2S	Hydrogen Sulfide (Mole Fraction)	0.00015%											
CO2	Carbon Dioxide (Mole Fraction)	4.4e-5 (0.000044)%											
Claim 6 [6.1] The method of claim 1, wherein separating the carbon dioxide recycle stream into the sour NGL rich stream and the purified carbon dioxide recycle stream comprises: refluxing part of the purified carbon dioxide recycle stream;	The V-203 NGL Fractionator that separates the Stream No. 1 “Carbon Dioxide Recycle Stream” into the Stream No. 12 “Sour NGL Rich Stream” and the Stream No. 22 “Purified Carbon Dioxide Recycle Stream” uses the E-204 Overhead Condenser and the V-205 NGL Reflux Accumulator to reflux part of the overhead Stream No. 4, and uses the H-207 NGL Reboiler to reboil part of the Stream No. 12 “Sour NGL Rich Stream.” (Ex. 2058, Page 1.) The V-203 NGL Fractionator overhead Stream No. 4 enters the E-204 Overhead Condenser and exits as the partially condensed Stream No. 5, which enters the V-205 NGL Reflux Accumulator. Reflux Stream No. 6												

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)
	exits the bottom of V-205 Reflux Accumulator and is pressured up by P-206 NGL Reflux Pump and returned to the top of the V-203 NGL Fractionator as reflux Stream No. 7. The Stream No. 8 cooled “Purified Carbon Dioxide Recycle Stream” exits the top of the V-205 NGL Reflux Accumulator and flows to the E-200 Inlet [heat] Exchanger. (Ex. 2058, Page 1.)
[6.2] reboiling part of the sour NGL rich stream; and	The V-203 NGL Fractionator bottoms Stream No. 9 enters the H-207 NGL Reboiler. Boil-up Stream No. 10 exits the top of the H-207 NGL Reboiler and is returned to the bottom of the V-203 NGL Fractionator. Stream No. 11 exits the bottom of the H-207 NGL Reboiler and flows to the V-209 NGL Surge Tank. The Stream No. 12 “Sour NGL Rich Stream” exits the V-209 NGL Surge Tank and flows to the AC-208 Sour NGL Cooler for cooling. (Ex. 2058, Page 1.)
[6.3] cooling and throttling the sour NGL rich stream.	The Stream No. 12 “Sour NGL Rich Stream” is cooled by the AC-208 Sour NGL Cooler and exits as Stream No. 13 cooled “Sour NGL Rich Stream.” (Ex. 2058, Page 2 (showing Stream No. 12 as 328 °F, and Stream No. 13 as 120 °F).) The Stream No. 13 cooled “Sour NGL Rich Stream” is throttled by the “Throttling Valve” downstream of the AC-208 Sour NGL Cooler (Ex. 2058, Page 1), which reduces the pressure of the stream so it can enter the

Claims 1-4, 6-7	Goldsmith Processing Plant (Ector County, Texas) Ex. 2058, Goldsmith Processing Plant, Process Flow Diagram, Project No. 5100928 (March 13, 2012 – Final Design)												
	V-501 DEA Contactor at the operating pressure of the DEA Contactor as low pressure “Sour NGL Rich Stream” (Stream No. 23) (Ex. 2058, Page 3).												
Claim 7 [7] The method of claim 6, wherein the sour NGL rich stream comprises no more than 5 molar percent carbon dioxide, no more than 1 molar percent methane, and no more than 5 molar percent ethane, and wherein the sweet NGL rich stream is substantially free of carbon dioxide.	The Stream No. 12 “Sour NGL Rich Stream” composition for Carbon Dioxide, Methane, and Ethane is (Ex. 2058, Page 2): The Stream No. 12 “Sour NGL Rich Stream” has less than 5 molar percent Carbon Dioxide, much less than 1 molar percent Methane, and much less than 5 molar percent Ethane. <table><tr><td>CO2</td><td>Carbon Dioxide (Mole Fraction)</td><td>4.79%</td></tr><tr><td>C1</td><td>Methane (Mole Fraction)</td><td>0.000239%</td></tr><tr><td>C2</td><td>Ethane (Mole Fraction)</td><td>0.227%</td></tr></table> The Stream No. 25 “Sweet NGL Rich Stream” composition for Carbon Dioxide is (Ex. 2058, Page 4): The Stream No. 25 “Sweet NGL Rich Stream” is substantially free of Carbon Dioxide. <table><tr><td>CO2</td><td>Carbon Dioxide (Mole Fraction)</td><td>4.4e-5 (0.000044)%</td></tr></table>	CO2	Carbon Dioxide (Mole Fraction)	4.79%	C1	Methane (Mole Fraction)	0.000239%	C2	Ethane (Mole Fraction)	0.227%	CO2	Carbon Dioxide (Mole Fraction)	4.4e-5 (0.000044)%
CO2	Carbon Dioxide (Mole Fraction)	4.79%											
C1	Methane (Mole Fraction)	0.000239%											
C2	Ethane (Mole Fraction)	0.227%											
CO2	Carbon Dioxide (Mole Fraction)	4.4e-5 (0.000044)%											

Streams:

Stream No. 1 (21, 3, 70, 20) “Carbon Dioxide Recycle Stream”
(aka “Feed from Compressor Stage”)

Stream No. 21 cooled “Carbon Dioxide Recycle Stream” flows into the V-201 NGL 3-Phase Separator
Stream No. 3 exits the V-201 NGL 3-Phase Separator, then flows into the V-601 TEG Contactor (see below) for dehydration, then returns as the dehydrated “Carbon Dioxide Recycle Stream” (Stream No. 70)
Stream No. 20 (Stream No. 70 dehydrated “Carbon Dioxide Recycle Stream” after passing through a valve) enters the V-203 NGL Fractionator for separating the “Carbon Dioxide Recycle Stream”

Stream No. 4 The V-203 NGL Fractionator overhead enters the E-204 Overhead Condenser

Stream No. 5 exits the E-204 Overhead Condenser as a partially condensed (not fully condensed since it separates into a liquid stream 6 and a vapor stream 8) Stream No. 5, which enters the V-205 NGL Reflux Accumulator.

Stream No. 6 exits the bottom of V-205 Reflux Accumulator as the Reflux Stream No. 6, and is pressured up by P-206 NGL Reflux Pump

Stream No. 7 exits the P-206 NGL Reflux Pump and is returned to the top of the V-203 NGL Fractionator

Stream No. 8 (see below)

Stream No. 9 exits the bottom of the V-203 NGL Fractionator and flows to the H-207 NGL Reboiler

Stream No. 10 exits the top of the H-207 NGL Reboiler as Boil-up Stream No. 10 and is returned to the bottom of the V-203 NGL Fractionator

Stream No. 11 exits the bottom of the H-207 NGL Reboiler, then enters the V-209 NGL Surge Tank

Stream No. 12 “Sour NGL Rich Stream” exits the V-209 NGL Surge Tank

Stream No. 13 cooled “Sour NGL Rich Stream” exits the AC-208 Sour NGL Cooler, and flows to the “Throttling Valve”

Stream No. 23 low pressure “Sour NGL Rich Stream” exits the “Throttling Valve,” then flows to the V-501 DEA Contactor (on DEA System PFD)

Stream No. 20 (Stream No. 70 dehydrated “Carbon Dioxide Recycle Stream” after passing through a valve) enters the V-203 NGL Fractionator for separating the “Carbon Dioxide Recycle Stream”

Stream No. 21 cooled “Carbon Dioxide Recycle Stream” flows into the V-201 NGL 3-Phase Separator

Stream No. 22 “Purified Carbon Dioxide Recycle Stream”

Stream No. 8 cooled “Purified Carbon Dioxide Recycle Stream”

Stream No. 24 exits the top of the V-501 DEA Contactor and enters the F-500 DEA Coalescer,

Stream No. 25 “Sweet NGL Rich Stream” exits the F-500 DEA Coalescer and flows to the NGL Stabilizer Skid

Stream No. 27 exits the bottom of the V-501 DEA Contactor and flows through V-502, F-504, F-503, E-505, V-507, AC-509, and V-508, exiting as the “Acid Gas Stream” (Stream No. 36) to Acid Gas Compressor

Stream No. 36 “Acid Gas Stream”

Stream No. 50 exits the V-601 TEG Contactor, then flows through the E-602 Gas-TEG Exchanger

Stream No. 51 exits the E-602 Gas-TEG Exchanger, then flows through the F-600 TEG Coalescer, exiting as the dehydrated “Carbon Dioxide Recycle Stream” (Stream No. 70).

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Stream No. 70 dehydrated “Carbon Dioxide Recycle Stream” exits the F-600 TEG Coalescer, then flows into the V-203 NGL Fractionator (as Stream No. 20 after passing through a valve).	