

February 17, 2011 Examiner Hearing in Case 14601



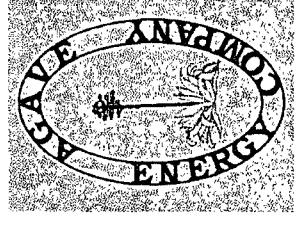
OCD Case No. 14601
AGAVE ENERGY
Exhibit # 1

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Agave's Witnesses at Today's Hearing

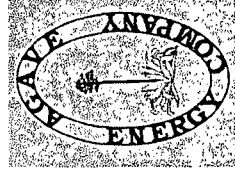
- ▶ Jennifer Knowlton, PE - Environmental Manager
- ▶ Ivan Villa - Engineering Supervisor
- ▶ Alberto A. Gutiérrez, RG - Geolex, Inc.

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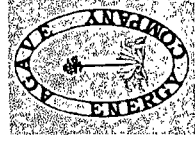
Presentation Goals

- ▶ Describe overall history and environmental benefits of Agave's AGI project; describe H₂S Contingency Plan - **Jennifer Knowlton, PE**
- ▶ Describe gas plant operations and pipeline design, construction and monitoring – **Ivan Villa**
- ▶ Describe relevant site geology and hydrogeology, system design, operation, analyses of anticipated effect on injection zone and summarize all components C-108 application – **Alberto A. Gutiérrez, RG**



Executive Summary

- ▶ Agave is requesting authority to inject acid gas:
 - Into the Devonian, Fusselman and Montoya Formations at a depth of approximately 9330 feet – 10500 feet
 - At a maximum rate of 205 bbl/day and maximum operating pressure of 3280 psig
- ▶ No wells penetrate the injection zone or cap rock within the one-mile radius area of review
- ▶ The entire area of the reservoir expected to be affected over 30 years of injection is less than 15 acres and a radius of approximately 400 feet from the well



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Injection Fluid Volume, Composition and Pressure Considerations

- ▶ Initial design for 205bbl/d acid gas to be injected as maximum rate
- ▶ Injected fluid composition is 61% H₂S, 38% CO₂, <1% Trace hydrocarbons (C1-C8)
- ▶ Injected fluid compatibility determined through previous injection experience and formation fluid analysis
- ▶ Maximum allowable operating pressure per NMOCD calculation guideline is 3280 psi surface

Location of Agave's Metropolis Disposal #1

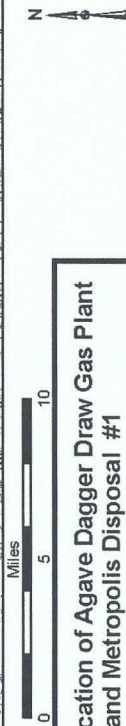
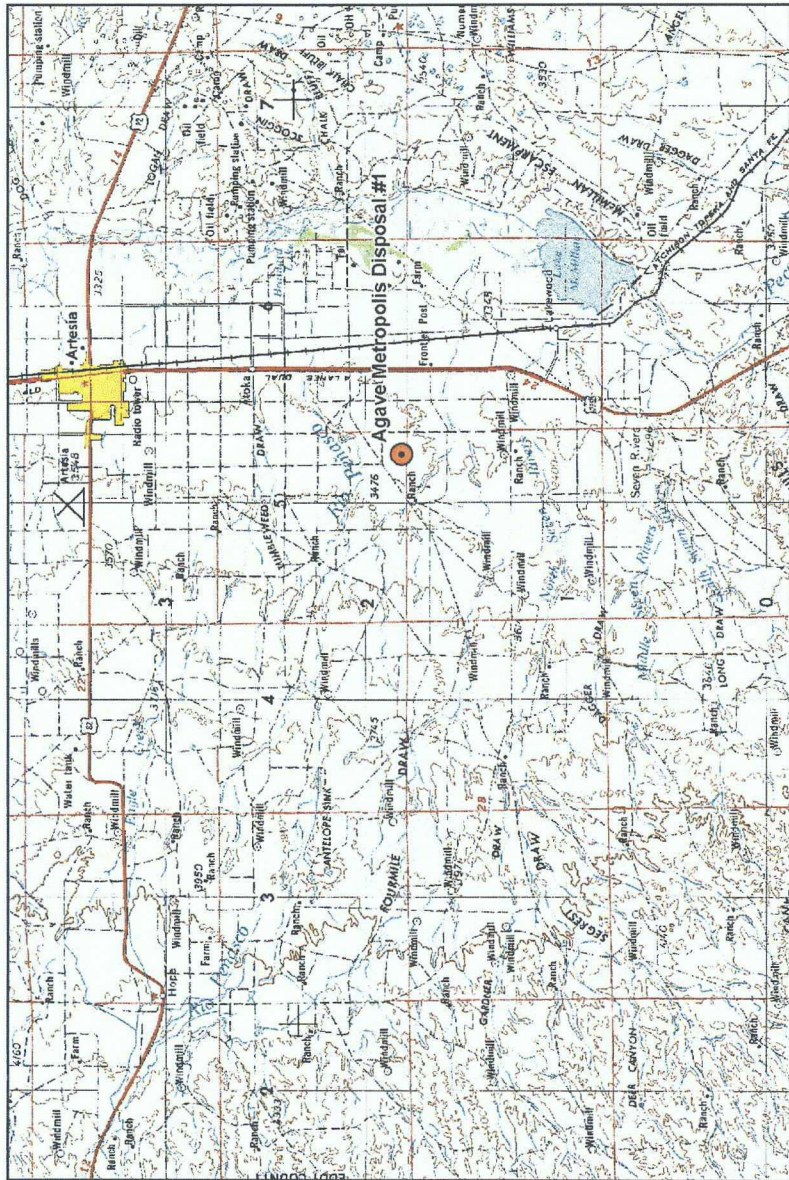


Figure 1: Location of Agave Dagger Draw Gas Plant and Metropolis Disposal #1

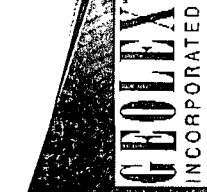
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Summary of History of Metropolis Disposal #1 Well

- ▶ Originally drilled in 2001 as exploratory well to 9360' and abandoned as a dry hole
- ▶ Agave applied for and obtained approval to use as acid gas/wastewater disposal well in August 2004 (SWD-936)
- ▶ Recompleted well in 2004-2006 for AGI/wastewater injection
- ▶ Began injection of acid gas only on April 14, 2006; no wastewater ever injected
- ▶ Tubing leak detected in August 2006, injection stopped and tubing leak repaired in November 2006
- ▶ Injection recommenced on December 19, 2006 and continued until July 5, 2007
- ▶ Plant begins to receive only sweet gas so disposal well usage was discontinued after July 2007
- ▶ Concurrent with Agave's need to reactivate well in 2010, NMOCD sends letter on March 25, 2010 stating that a new application would be required to receive permission for reactivating well
- ▶ Geolex retained in September 2010 to evaluate well and prepare application for injection resulting in application submitted on December 20, 2010
- ▶ NMOCD sets application for hearing on February 17, 2011



Schematic of Proposed AGI System

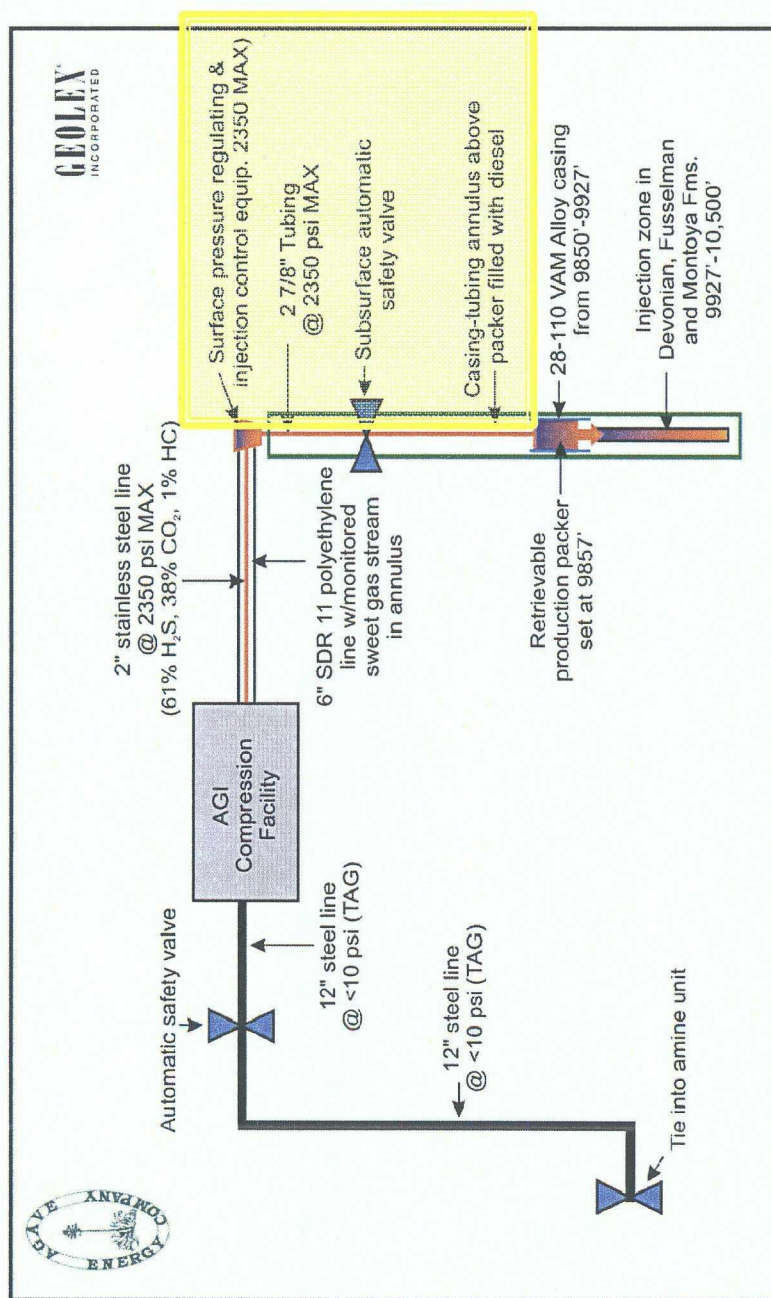
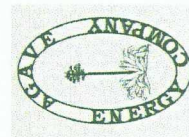


Figure 4: Schematic of Agave Energy Dagger Draw Gas Plant and Metropolis Disposal #1 Acid Gas Injection (AGI) System Components



Photographs of Existing Pipeline

A. Pipeline at Dagger Draw Plant



B. Buried Pipeline Markers on ROW



C. Pipeline Exit at Wellhead



Adjacent Operators and Surface Owner Notification and Notice

- ▶ Agave's C-108 application details the full information needed to approve the recompletion of the Metropolis well as an AGI well and was sent to adjacent operators and surface owners within 1 mile radius of proposed well via Certified Mail, Return Receipt Requested
- ▶ Notice of the application and the Examiner hearing was published in the *Carlsbad Current Argus*
- ▶ No objections to Agave's application have been submitted
- ▶ Adjacent operators and the BLM support the AGI project which will allow increased throughput and increase royalties to State of New Mexico
- ▶ NMOCD Environmental Bureau was provided H₂S Contingency Plan for proposed AGI operation in April, 2010 and copy was attached to C-108 as Appendix E on December 20, 2010

What Are We Looking For in a Reservoir For CO₂ and Acid Gas Sequestration?

- ▶ Geologic seal to permanently contain gas
- ▶ Isolated from any fresh groundwater
- ▶ No effect on existing or potential production
- ▶ Laterally extensive, permeable, good porosity
- ▶ Compatible fluid chemistry

✓ Agave's Metropolis Disposal #1 Meets all of these Criteria

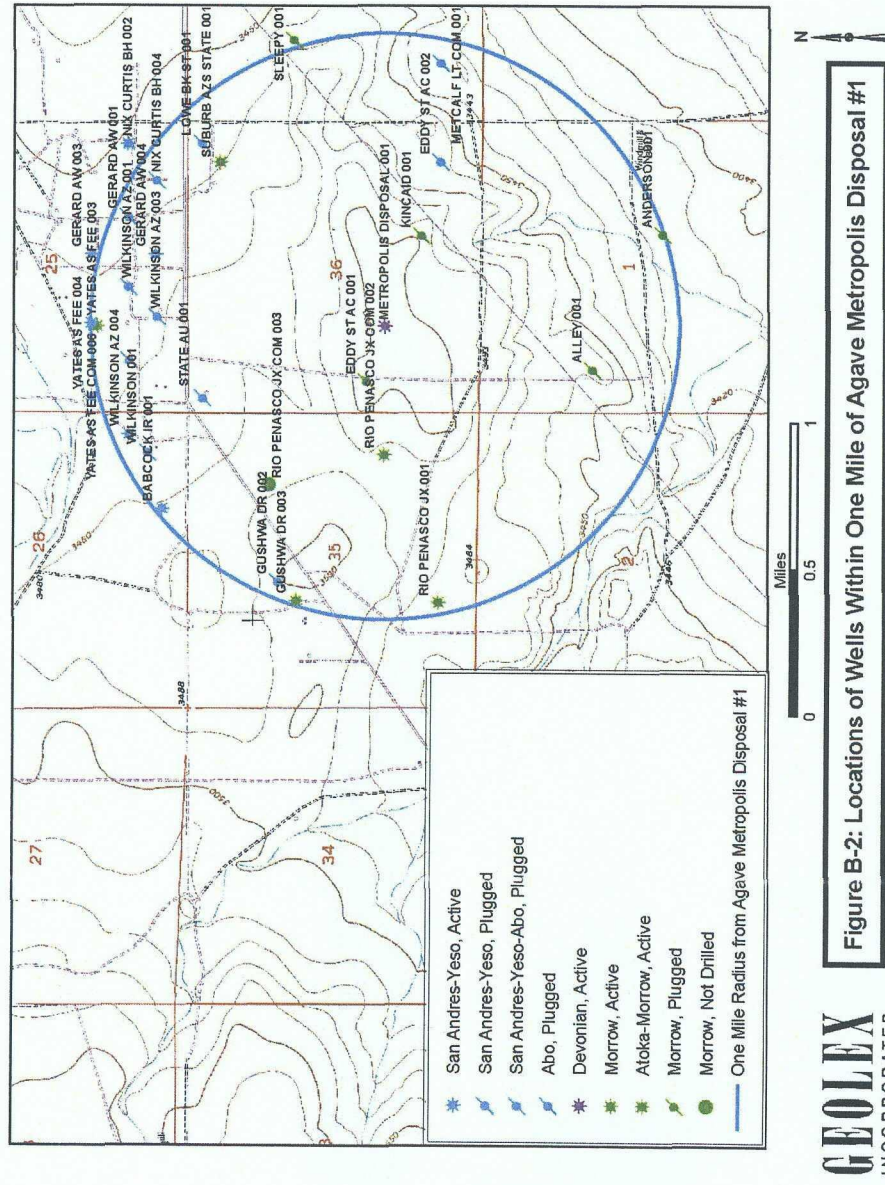
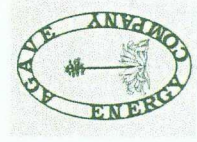


Identification & Characterization of Wells, Stratigraphy & Geologic Structure in the Project Area

- ▶ All producing wells and plugged wells within one-mile area of review are in shallower units and no wells penetrate cap rock or injection zone
- ▶ Based on stratigraphic analysis and evaluation of previous AGI experience, the injection zone is excellent acid gas reservoir
- ▶ Data from existing Metropolis Disposal #1 demonstrates ability to take fluid well under calculated maximum permitted pressure using NMOCD guidelines for calculation (3280 psi)

All Wells Within Area of Review

**No wells
penetrate
injection
zone**



Schematic Regional Cross Section (West-East)

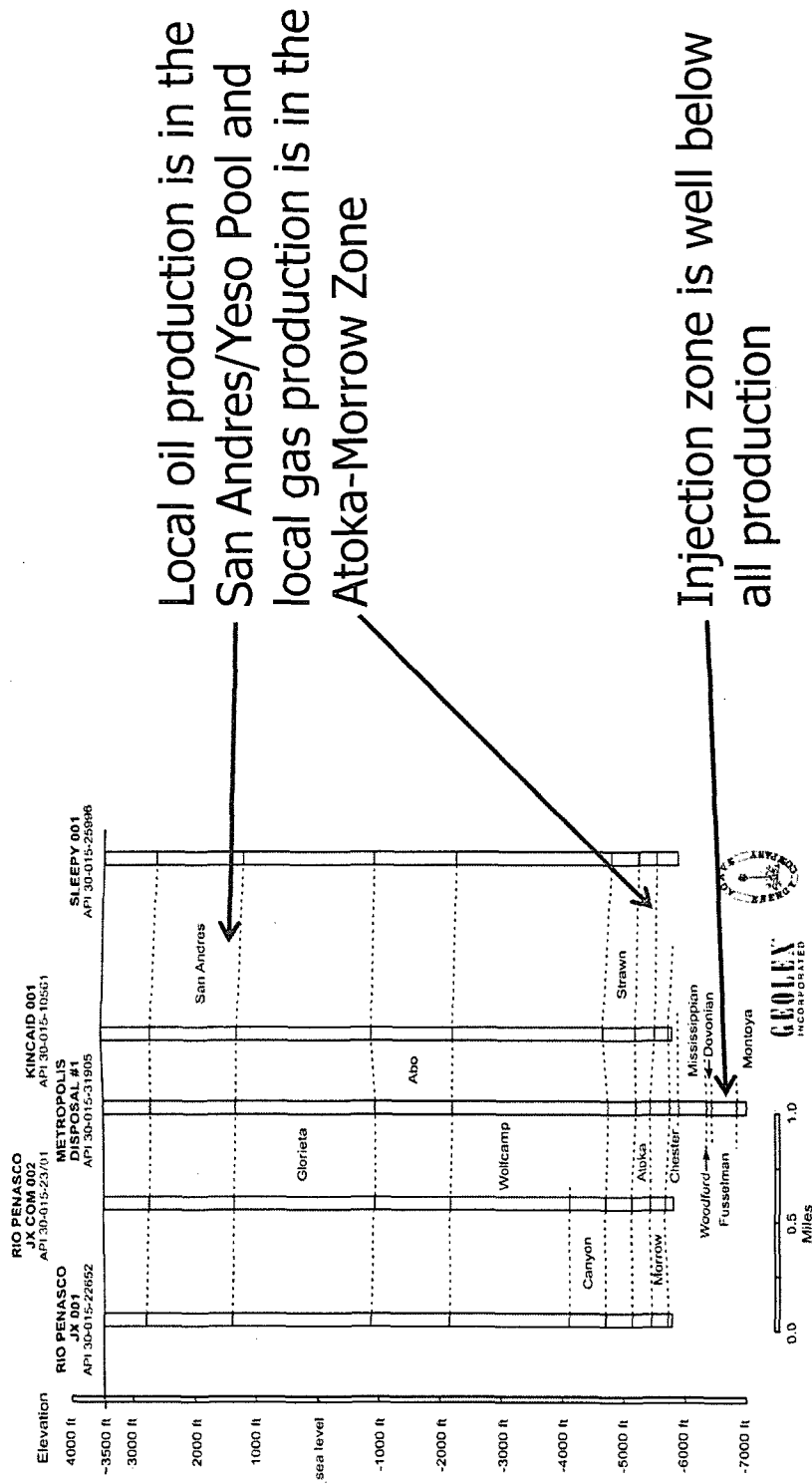
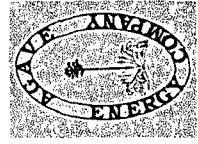


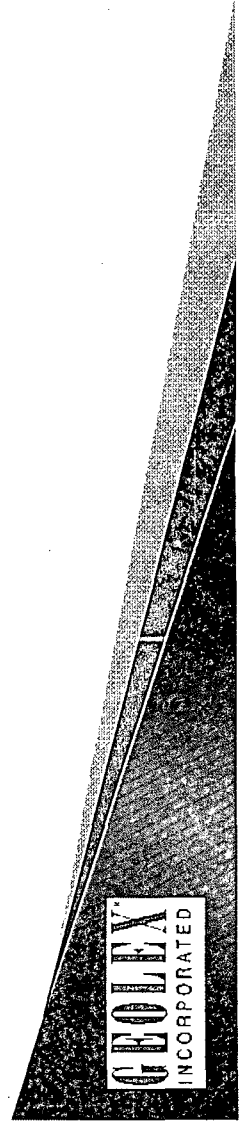
Figure 11: Stratigraphic Cross-section Through the Metropolis Disposal #1. Locations of Wells Shown in Figure 10



Water Wells in Area of Review

Table 3. Water Wells Within One Mile of Metropolis Disposal #1

POD Num	Owner	Distance (miles)	Rng	Tsh	Sec	Diversion (acre ft./yr)	Use	Well Depth (ft)	Water Depth (ft)	Source
RA 03975	Gulf Oil Corp	0.24	25E	18S	36	0	DOM	430	270	Artesian
RA 07639	Nearburg Producing Co	0.72	25E	19S	1	0	PRO	260	172	Shallow
RA 04128	E. T. Howell	0.80	25E	19S	2	3	STK	211	100	Shallow
RA 05344	Yates Petroleum Corp	0.91	25E	18S	26	0	PRO	455	200	Shallow
RA 05233	Yates Petroleum Corp	0.91	25E	18S	26	0	PRO	N/A	N/A	Shallow



Maximum Depth of Fresh Water in Area of Review

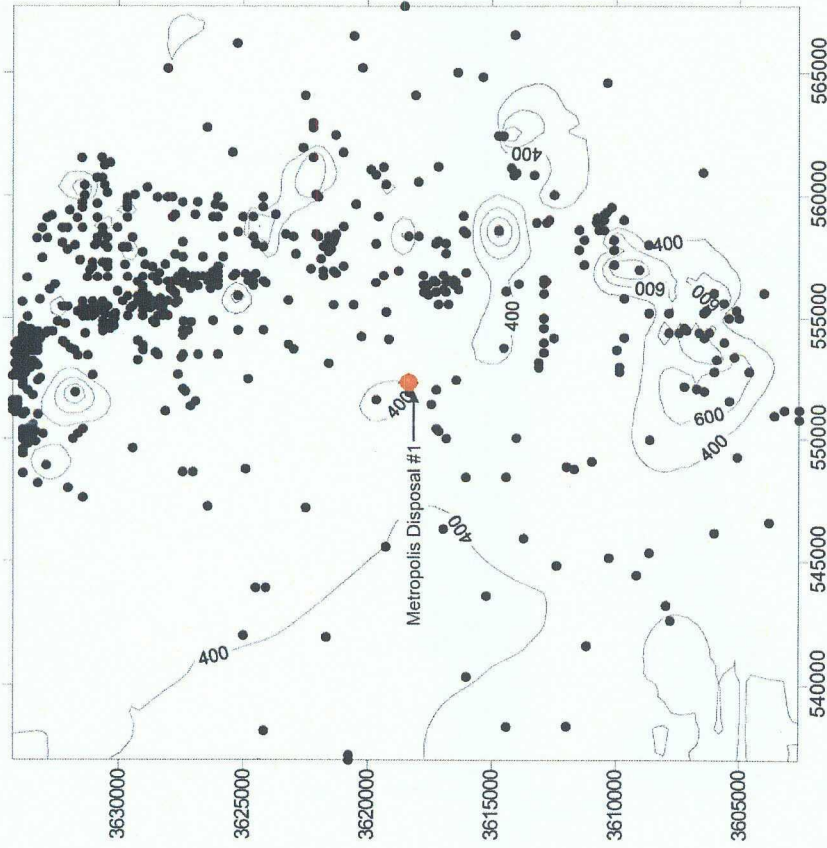


Figure 16: Depth of Water Wells in the Roswell Basin

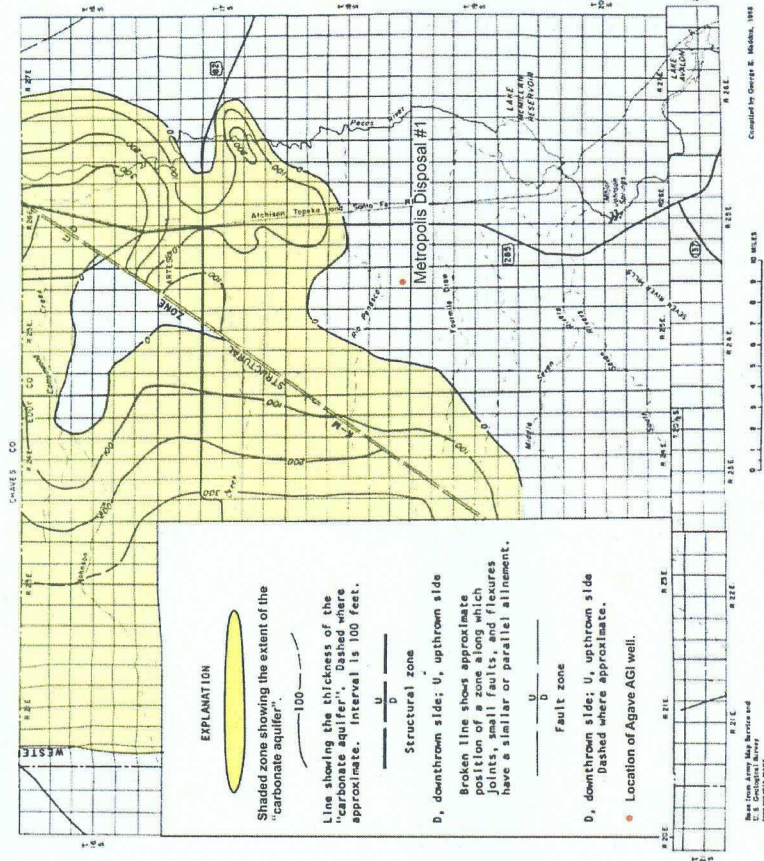
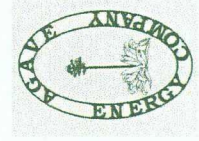


Figure 17: Thickness of the Freshwater Aquifer Hosted in Carbonate Rocks in the Roswell Basin (Modified from Maddox, 1969)



Average Porosity of Injection Zone is 4.2%

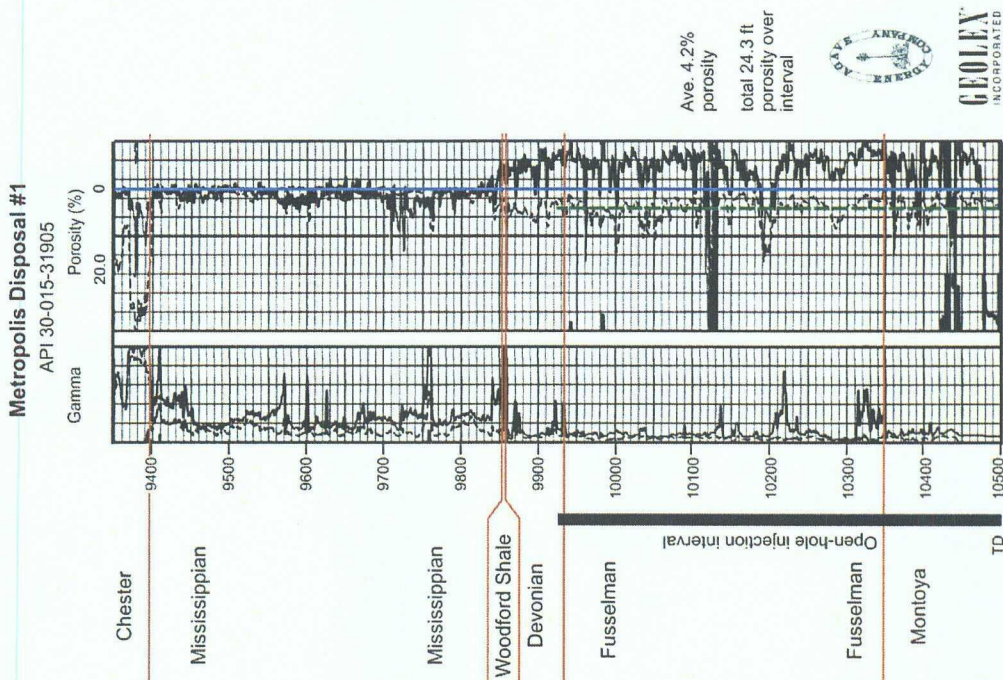


Figure 12: Porosity and Gamma Log for Metropolis Disposal #1 Well

Generalized Design of AGI System

- ▶ Conceptual design shown on Figures 4 and 6 of Agave's C-108 application. The following safety features are included:
 - Corrosive resistant L-80 FJ FX threaded tubing
 - Automated subsurface safety valve
 - Choke and regulating pressure valves
 - Annulus between casing and tubing loaded with inert fluid (diesel) and pressure monitored
 - Corrosion resistant packer
- ▶ Meters are included to record volumes of acid gas injected
- ▶ Pipeline is double-walled with leak detection at plant and buried 6' deep
- ▶ Layout of plant including H₂S monitors shown in H₂S Contingency Plan

Existing and Recompleted Well Configurations

WELL NAME: METROPOLIS DISPOSAL 001 API 30-015-31950 FIELD: Devonian
 LOCATION: Unit K, Sec. 36-T18S-R25E, 1650 S/1650 W COUNTY: Eddy
 GL: 3498 ft. SPUD DATE: 8/31/01 COMPLETION DATE: 9/2/01
 COMMENTS: PA 9/23/01, RE 10/17/04 RE-COMPLETION 1/30/06, MIT (OK), NEW

CASING PROGRAM

20" NA	40 R
13 3/8" 48# H-40	400 R
8 5/8" 24# J-55	1200 R
5 1/2" 17 & 15.5# J-55 ST&C	9850 R
5 1/2" VAM Alloy Casing top	9850 R
2 7/8" 6.5# L-80 ULTRA FX tubing	9927 R
2 7/8" 6.5# L-80 ULTRA FX tubing	250 R
SSSV lb	SSSV lb
	9853 R

RECOMMENDED 10/2010

20" NA	40 R
13 3/8" 48# H-40	400 R
8 5/8" 24# J-55	1200 R
5 1/2" 17 & 15.5# J-55 ST&C	9850 R
5 1/2" VAM Alloy Casing top	9850 R
2 7/8" 6.5# L-80 8rd tubing	9927 R
	bottom
	9853 R

CURRENT 10/2010

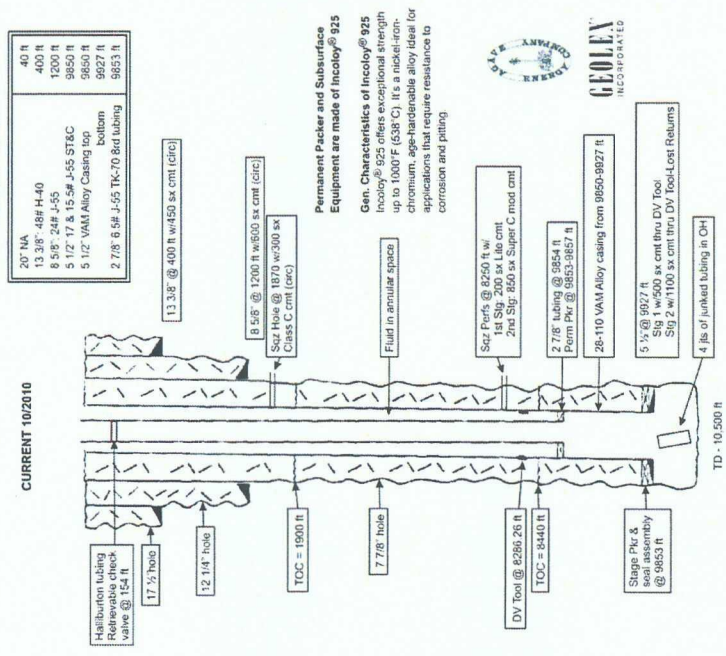
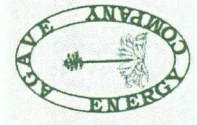


Figure 5: Existing Design and Well Components for Metropolis Disposal #1

MIT will be performed prior to commencing injection and at least once every 5 years

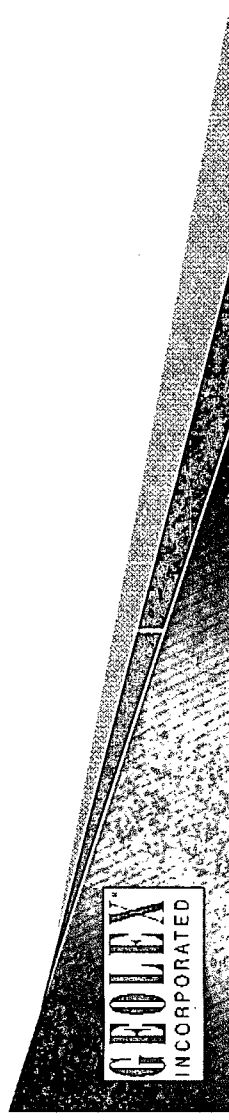
Figure 6: Design and well components for Metropolis Disposal #1 following recommended service and modifications. Recommended modifications are highlighted.



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Summary of Well Design Factors Assuring Integrity and Safety of Proposed AGI

- Surface casing set over 700' below deepest fresh water, cemented to surface
- New tubing and subsurface safety valve will assure the integrity of the well with annular space filled with inert fluid (diesel) and monitored for pressure to indicate potential tubing leak before it can affect production casing
- Similar designs have been implemented successfully for many years without any leakage problems at similar zones in NM, Texas and Alberta, Canada, including 6 such installations designed, permitted and completed by Geolex



Summary of Geologic Factors Assuring Integrity and Safety of Proposed AGI

- No faults or structural pathways identified in the area of review
- Caprock (Mississippian) is low porosity shale and recrystallized limestone which is effective barrier above injection zone
- Injection zone is significantly deeper than production zones
- All fresh water zones isolated by surface casing
- Proposed injection pressure is well below fracture pressure of reservoir and caprock
- Injection history of Metropolis Disposal #1 demonstrates closed system
- No wellbores have penetrated injection zone within the entire area of review

Calculations of Reservoir Area Affected after 30-Years

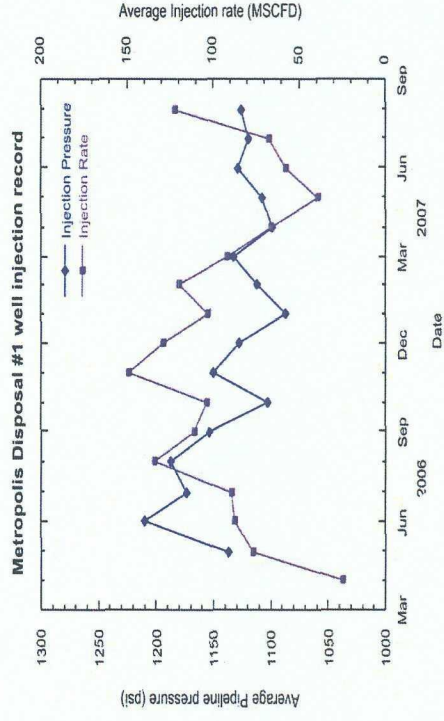
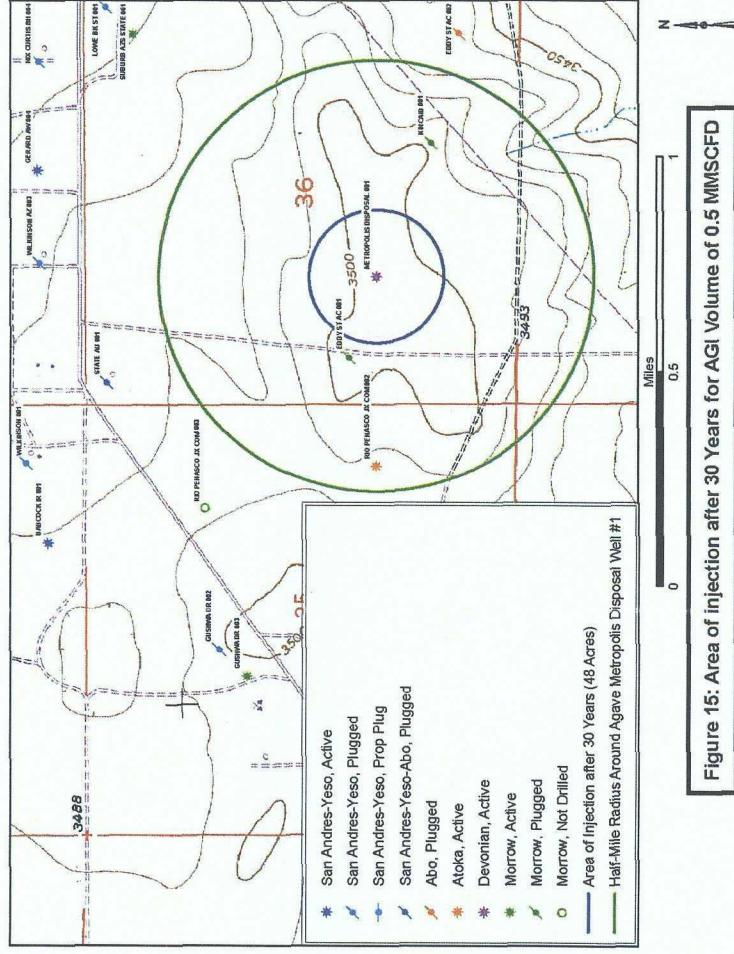
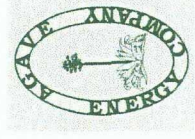


Figure 13: Monthly Average Injection Rates and Pipeline Pressures for Days of Injection at the Metropolis Disposal #1 Well, March 2006-July 2007

While the simple plug model is an idealized approximation of area affected, the requested rate of 205 bbl/day for 30-years will extend less than 500 feet from well and include an area of less than 15 acres



Geologic Evaluation Summary

- ▶ Identified background regional geologic data (C-108, Section 4)
- ▶ Identified, located and evaluated all wells in local area (C-108, Section 5 and Appendices B & C)
- ▶ Evaluated stratigraphic information to confirm that reservoir meets basic geologic criteria (C-108, Section 4 and Figures 7-12)
- ▶ Constructed cross-sections with available logs (C-108, Figures 11 and 12)
- ▶ Reviewed previous disposal well data (C-108, Section 4, Appendix A)
- ▶ Prepared C-108 and submitted to NMOCD for approval
- ▶ NMOCD previously approved this project for mixed acid gas and wastewater injection under SWD-936

Key Elements of Agave's C-108

- ▶ AGI project has substantial environmental benefits of greenhouse gas reduction due to sequestration of CO₂ which otherwise would be released to atmosphere
- ▶ AGI project reduces waste and potential air emission upsets by eliminating upstream treating of sour gas as control to eliminate H₂S at wellhead
- ▶ Existing Metropolis Disposal #1 will be recompleted and upgraded for dry AGI use
- ▶ Nearby oil and gas wells, nearby water wells and surface water are protected by well design and geologic factors
- ▶ No wells, active or plugged, penetrate the injection zone or the overlying cap rock within one mile of Agave's Metropolis Disposal #1



Key Elements of Agave's C-108 (cont.)

- ▶ Adequacy of injection reservoir has been demonstrated by previous successful injection of acid gas into the Metropolis Disposal #1
- ▶ Agave's C-108 application details the full information needed to approve the installation of AGI well
- ▶ H₂S Contingency Plan for proposed AGI was submitted to NMOCD for approval in April 2010, and an updated plan was included as an appendix to the C-108 submitted on December 10, 2010
- ▶ Adjacent operators and the BLM support the project
- ▶ Operators and surface owners have received proper notice and there are no objections to the AGI project



Agave's Request for NMOCD Order

- ▶ Test and recomplete well as specified in Agave's C-108 application
- ▶ Agave requests permission to inject acid gas at a maximum rate of 205 bbl/day and maximum operating pressure of 3280 psig
- ▶ Agave would like to begin the well recompletion as soon as possible

