June2020

Volume 1
C-147 Registration Package for Telluride Air Gap Above-Ground Storage Tank
Section 3, T25S, R34E, Lea County

Prepared pad for the Telluride Air Gap Above-Ground Storage Tank. View is NE.

Prepared for:
Solaris Midstream LLC
9811 Katy Freeway Suite 900
Houston, TX 77024

Prepared by:
R.T. Hicks Consultants, Ltd. 901
Rio Grande NW F-142
Albuquerque, New Mexico

R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Since 1996
Durango, Co ▲ Carlsbad, NM ▲ Hobbs, NM

June 3, 2020

Ms. Susan Lucas Kamat
NMOCD
1220 S. St. Francis Blvd
Santa Fe, NM
Via Email Susan.LucasKamat@state.nm.us

RE: Solaris Water Midstream – Telluride Air Gap Above-Ground Storage Tank at Unit Letter P, Section 3, T25S, R34E, Lea County

Dear Ms. Lucas Kamat:

On behalf of Solaris Water Midstream, LLC, Hicks Consultants submits the attached permit application for one above-ground storage tank. The package follows the order of Form C-147 to allow for an easier review. Construction will begin upon OCD approval of this application.

The following elements of the submission are germane to your review.

Volume 1 contains

a) The C-147 form
b) Engineering drawings of the AST Containment
c) Design, operational and closure plans for the AST Containment
d) Site specific information that demonstrates compliance with siting criteria for the location.

Volume 2 contains

a) Variances applicable to the Telluride Air Gap AST Containment
b) Stamped letters from Ron Frobel PE discussing the applicability of engineering variances to a wide variety of site conditions for in-ground containments; CV included.

I have personally evaluated the applicability of all non-engineering variances to the text of Rule 34 listed below. In my opinion, these variances, all of which have been previously approved by OCD, are applicable to the location of the Telluride AST facility and all containments in the Permian Basin of New Mexico:

- Alternative chloride testing method

We urge OCD to carefully evaluate the freeboard variance arguments in the discussion by Mr. Frobel. The denial of this variance request for the Quail Ranch Air Gap AST was surprising to us and if this variance is also denied, we would appreciate an explanation of OCD logic. A hearing on this matter per the Rule benefits nobody.

In compliance with 19.15.34.10 of the Rule, this submission Solaris will transmit a copy of this application to the BLM who is the owner of the surface upon which the containments will be constructed.

The closure cost estimate is attached. Upon OCD approval of this estimate, Solaris will secure the bond and forward same to OCD.

If you have any questions or concerns regarding this registration or the attached C-147, please contact me. As always, we appreciate your work ethic and attention to detail.

Sincerely,
R.T. Hicks Consultants

Randall T. Hicks PG
Principal

Copy: Solaris Water Midstream
Bureau of Land Management, Carlsbad

Closure Cost Estimate and Financial Assurance
Telluride Air Gap AST

Solaris will install the AST CONTAINMENT on an existing production pad that is associated with the air gap for the Solaris pipeline. Thus, there is no "reclamation" associated with the disassembly and removal of the AST CONTAINMENT as the pad will remain in accordance to the agreement between Solaris and the landowner.

Sampling beneath the containment in accordance with Subsection C of 19.15.34.14 of Rule 34 is required. The sampling program would include an EM survey at a cost about $1500. The EM survey would identify any high salinity soil beneath the AST footprint and the pad. EM evaluation of the nearby pasture would provide a baseline to compare findings. Sampling beneath the AST footprint would occur as well as any areas where the EM survey suggests high salinity. Sampling beneath the AST footprint would be a 5-point composite sample in conformance with the Rule. The sampling program with laboratory analysis would cost less than $5,000. Thus, the total cost of closure sampling is about $6,500

The Rule suggests that after the containment is closed reclamation begins. Thus, the "closure cost" does not include reclamation and revegetation to the condition that existed prior to construction – because, as stated above, construction of the AST is on an existing pad.

"Closure cost" could include the cost of disassembly and removal. Attached to this submission is a quotation from New Wave that outlines the cost for removal of an AST in southern Lea County that is near a paved road. With a set up and rig down cost of $21,000, the cost of removal is $10,500 or half the total cost on the bid sheet. The cost of a used 22,000 bbl AST CONTAINMENT ranges from $75,000 to $125,000[1]. Based upon the attached rig down and removal cost from New Wave, the value of an abandoned AST CONTAINMENT is four times the cost of removal. These costs suggest that a company would pay the surface owner to allow them to remove the abandoned AST Containment, resulting in a negative cost of removal.

We understand that the concern of OCD is that long-term downturn of the oil and gas industry could cause the State of NM to be responsible for an abandoned AST Containment that can only be salvaged for scrap. The current value of the AST Containment as scrap is about $2600.00

Thus, the total closure cost to close the Telluride Air Gap AST CONTAINMENT is $6,500 + 15,000 – 2600 = $18,900.

[1] Personal communication with Randal Strickland, VP of Sales, New Wave Energy Services, 4/28/20

C-147

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-147
Revised April 3, 2017

Recycling Facility and/or Recycling Containment

Type of Facility: ☐ Recycling Facility ☒ Recycling Containment*

Type of action: ☒ Permit ☐ Registration
☐ Modification ☐ Extension
☐ Closure ☐ Other (explain) _____

*** At the time C-147 is submitted to the division for a Recycling Containment, a copy shall be provided to the surface owner.**

Be advised that approval of this request does not relieve the operator of liability should operations result in pollution of surface water, ground water or the environment. Nor does approval relieve the operator of its responsibility to comply with any other applicable governmental authority's rules, regulations or ordinances.

1.

Operator: Solaris Midstream LLC OGRID #: 371643

Address: 9811 Katy Freeway, Suite 900, Houston, TX, 77024

Facility or well name (include API# if associated with a well): Telluride Air Gap Above-Ground Storage Tank

OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)

U/L or Qtr/Qtr: P Section: 3 Township: 25S Range: 34E County: Lea

Surface Owner: ☒ Federal ☐ State ☐ Private ☐ Tribal Trust or Indian Allotment

2.

☒ **Recycling Facility:**

Location of (if applicable): Latitude: 32.1553749°N Longitude: 103.4526942°W approximately (NAD83)

Proposed Use: ☒ Drilling* ☒ Completion* ☒ Production* ☒ Plugging *

****The re-use of produced water may NOT be used until fresh water zones are cased and cemented***

☐ Other, ***requires permit for other uses. Describe use, process, testing, volume of produced water and ensure there will be no adverse impact on groundwater or surface water.***

☒ Fluid Storage

☐ Above ground tanks ☒ Recycling containment ☐ Activity permitted under 19.15.17 NMAC explain type_____

☐ Activity permitted under 19.15.36 NMAC explain type:_____ ☐ Other explain _____

☐ For multiple or additional recycling containments, attach design and location information of each containment

☐ **Closure Report (required within 60 days of closure completion):** ☐ Recycling Facility Closure Completion Date:_____

3.

☒ **Recycling Containment:**

☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)

Center of Recycling Containment (if applicable) Lat 32.1553702°N Long 103.4527172°W approx. (NAD83)

☐ For multiple or additional recycling containments, attach design and location information of each containment

☒ Lined ☒ Liner type: Thickness 40 mil Primary, 30 mil Secondary ☒ LLDPE ☐ HDPE ☐ PVC ☐ Other _____

☐ String-Reinforced

Liner Seams: ☒ Welded ☐ Factory ☐ Other Volume: 22,000 BBL Dimensions 138 ft diameter x 8 ft tall.

☐ Recycling Containment Closure Completion Date:_____

4.

Bonding:

☐ Covered under bonding pursuant to 19.15.8 NMAC per 19.15.34.15(A)(2) NMAC **(These containments are limited to only the wells owned or operated by the owners of the containment.)**

☒ Bonding in accordance with 19.15.34.15(A)(1). Amount of bond $_____ **(work on these facilities cannot commence until bonding amounts are approved)**

☒ Attach closure cost estimate and documentation on how the closure cost was calculated. (See Transmittal Letter)

5.

Fencing:

☒ Four-foot height, four strands of barbed wire evenly spaced between one and four feet

☐ Alternate. Please specify:_____.

6.

Signs:

☒ 12"x 24", 2" lettering, providing Operator's name, site location, and emergency telephone numbers

☐ Signed in compliance with 19.15.16.8 NMAC

7.

Variances:

Justifications and/or demonstrations that the proposed variance will afford reasonable protection against contamination of fresh water, human health, and the environment.

Check the below box only if a variance is requested:

☒ *Variance(s): Requests must be submitted to the appropriate division district for consideration of approval. If a Variance is requested, include the variance information on a separate page and attach it to the C-147 as part of the application.*

If a Variance is requested, it must be approved prior to implementation. See Volume 2 for Variances

8.

Siting Criteria for Recycling Containment

Instructions: The applicant must provide attachments that demonstrate compliance for each siting criteria below as part of the application. Potential examples of the siting attachment source material are provided below under each criteria.

General siting

Ground water is less than 50 feet below the bottom of the Recycling Containment. NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells FIGURES 1-2	☐ Yes ☒ No ☐ NA
Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended. - Written confirmation or verification from the municipality; written approval obtained from the municipality FIGURE 3	☐ Yes ☒ No ☐ NA
Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division FIGURE 4	☐ Yes ☒ No
Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map FIGURE 5	☐ Yes ☒ No
Within a 100-year floodplain. FEMA map FIGURE 6	☐ Yes ☒ No
Within 300 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, or lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). - Topographic map; visual inspection (certification) of the proposed site FIGURE 7	☐ Yes ☒ No
Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image FIGURE 8	☐ Yes ☒ No
Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application. FIGURES 1 and 7 - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within 500 feet of a wetland. FIGURE 9 - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site	☐ Yes ☒ No

9.

Recycling Facility and/or Containment Checklist:

Instructions: Each of the following items must be attached to the application. Indicate, by a check mark in the box, that the documents are attached.

- ☒ Design Plan - based upon the appropriate requirements.
- ☒ Operating and Maintenance Plan - based upon the appropriate requirements.
- ☒ Closure Plan - based upon the appropriate requirements.
- ☒ Site Specific Groundwater Data -
- ☒ Siting Criteria Compliance Demonstrations –
- ☒ **Certify that notice of the C-147 (only) has been sent to the surface owner(s)**

10.

Operator Application Certification:

I hereby certify that the information and attachments submitted with this application are true, accurate and complete to the best of my knowledge and belief.

Name (Print): Bradley Todd Carpenter Title: Operations Manager

Signature: Bradley Todd Carpenter Date: June 2 2020

e-mail address Todd Carpenter <todd.carpenter@solarismidstream.com> Telephone: 432 203 9020

11.

OCD Representative Signature: _____ **Approval Date:** _____

Title: _____ **OCD Permit Number:** _____

☐ OCD Conditions _____

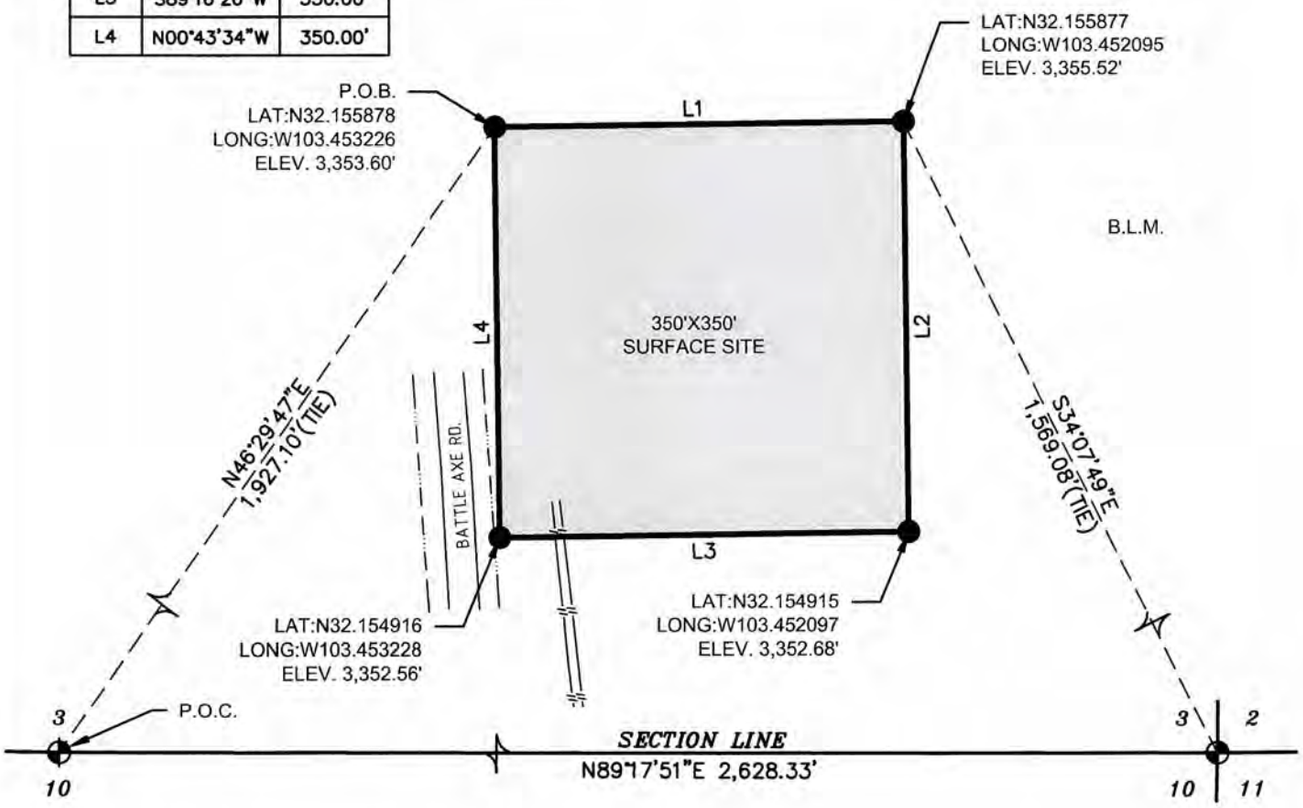
☐ Additional OCD Conditions on Attachment

SURVEY FOR CONTAINMENT

EXHIBIT A

SECTION 3, TOWNSHIP 25 SOUTH, RANGE 34 EAST, N.M.P.M.
LEA COUNTY, NEW MEXICO
BUREAU OF LAND MANAGEMENT (B.L.M.)

LINE TABLE		
LINE#	BEARING	DISTANCE
L1	N89°16'26"E	350.00'
L2	S00°43'34"E	350.00'
L3	S89°16'26"W	350.00'
L4	N00°43'34"W	350.00'



A METES AND BOUNDS DESCRIPTION OF A PROPOSED 350' X 350' SURFACE SITE

BEING A 2.81 ACRE TRACT OF LAND SITUATED IN THE S/2 OF SECTION 3, TOWNSHIP 25 SOUTH, RANGE 34 EAST, N.M.P.M., IN LEA COUNTY, NEW MEXICO, SAID SURFACE SITE BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTH QUARTER CORNER OF SAID SECTION 3 BEING A FOUND BRASS CAP MONUMENT STAMPED "U.S. GENERAL LAND OFFICE SURVEY", THENCE NORTH 46°29'47" EAST, 1,927.10 FEET TO THE POINT OF BEGINNING BEING A SET 1/2" IRON ROD WITH A YELLOW CAP MARKED "NM PS 24876"; THENCE NORTH 89°16'26" EAST, 350.00 FEET TO A SET 1/2" IRON ROD WITH A YELLOW CAP MARKED "NM PS 24876" FROM WHICH THE SOUTHEAST CORNER OF SAID SECTION 3, BEING FOUND BRASS CAP MONUMENT STAMPED "U.S. GENERAL LAND OFFICE SURVEY", BEARS SOUTH 34°07'49" EAST, 1,569.08 FEET; THENCE SOUTH 00°43'34" EAST, 350.00 FEET TO A SET 1/2" IRON ROD WITH A YELLOW CAP MARKED "NM PS 24876"; THENCE SOUTH 89°16'26" WEST, 350.00 FEET TO A SET 1/2" IRON ROD WITH A YELLOW CAP MARKED "NM PS 24876"; THENCE NORTH 00°43'34" WEST, 350.00 FEET TO THE POINT OF BEGINNING, AND CONTAINING 2.81 ACRES (122,500 SQUARE FEET) OF LAND.

BASIS OF BEARING: BEARINGS SHOWN HEREON ARE BASED UPON UNIVERSAL TRANSVERSE MERCATOR ZONE 13 NORTH, US SURVEY FEET, NORTH AMERICAN DATUM OF 1983. ALL DISTANCES ARE GRID. COORDINATES AND ELEVATIONS SHOWN WERE DERIVED FROM G.P.S. OBSERVATIONS ON 4/13/2020. VERTICAL DATUM IS N.A.V.D. 1988, GEOID 12A (CONUS).

LEGEND:
- = APPROXIMATE 60' STATUTORY ROAD RIGHT OF WAY
- = DENOTES CENTERLINE (C/L) OF EASEMENT
- = DENOTES PIPELINE
- = DENOTES SET 1/2" IRON ROD WITH YELLOW CAP MARKED "NM PS 24876"
- = DENOTES FOUND BRASS CAP MONUMENT STAMPED "U.S. GENERAL LAND OFFICE SURVEY"

NOTES:
1. RESEARCH HAS BEEN PROVIDED BY OTHERS.
2. THIS PLAT IS FOR EASEMENT PURPOSES ONLY.
3. EASEMENTS, SETBACKS, AND OTHER ENCUMBRANCES ARE NOT SHOWN BY AGREEMENT WITH CLIENT.
4. P.O.C. = POINT OF COMMENCEMENT
5. P.O.B. = POINT OF BEGINNING
6. P.O.T. = POINT OF TERMINATION
7. MODIFICATION IN ANY WAY OF THE FOREGOING DESCRIPTION TERMINATES LIABILITY OF SURVEYOR.

EASEMENT TABLE		
SURFACE SITE	122,500 S.F.	2.81 AC.

SURVEYOR'S CERTIFICATE

I, CHRIS E. CARLSON, NEW MEXICO PROFESSIONAL SURVEYOR NO. 24876, DO HEREBY CERTIFY THAT THIS EASEMENT SURVEY PLAT AND THE ACTUAL SURVEY ON THE GROUND UPON WHICH IT IS BASED WERE PERFORMED BY ME OR UNDER MY DIRECT SUPERVISION; THAT I AM RESPONSIBLE FOR THIS SURVEY; THAT THIS SURVEY MEETS THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO; AND THAT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I FURTHER CERTIFY THAT THIS SURVEY IS NOT A LAND DIVISION OR SUBDIVISION IN THE NEW MEXICO SUBDIVISION ACT AND THAT THIS INSTRUMENT IS A EASEMENT SURVEY PLAT OF A EXISTING TRACT OR TRACTS.

4/15/2020

DATE OF SIGNATURE: 04/15/2020
CHRIS E. CARLSON N.M.P.S. NO. 24876

CHRIS E. CARLSON
NEW MEXICO
24876
PROFESSIONAL SURVEYOR

0 75' 150'
SCALE 1"= 150'

DOWNTOWN DESIGN SERVICES, INC.
16 E. 16TH ST. SUITE 400
TULSA, OK 74119
Tel: 918-592-3374 Fax: 918-221-3940
www.ddsiglobal.com

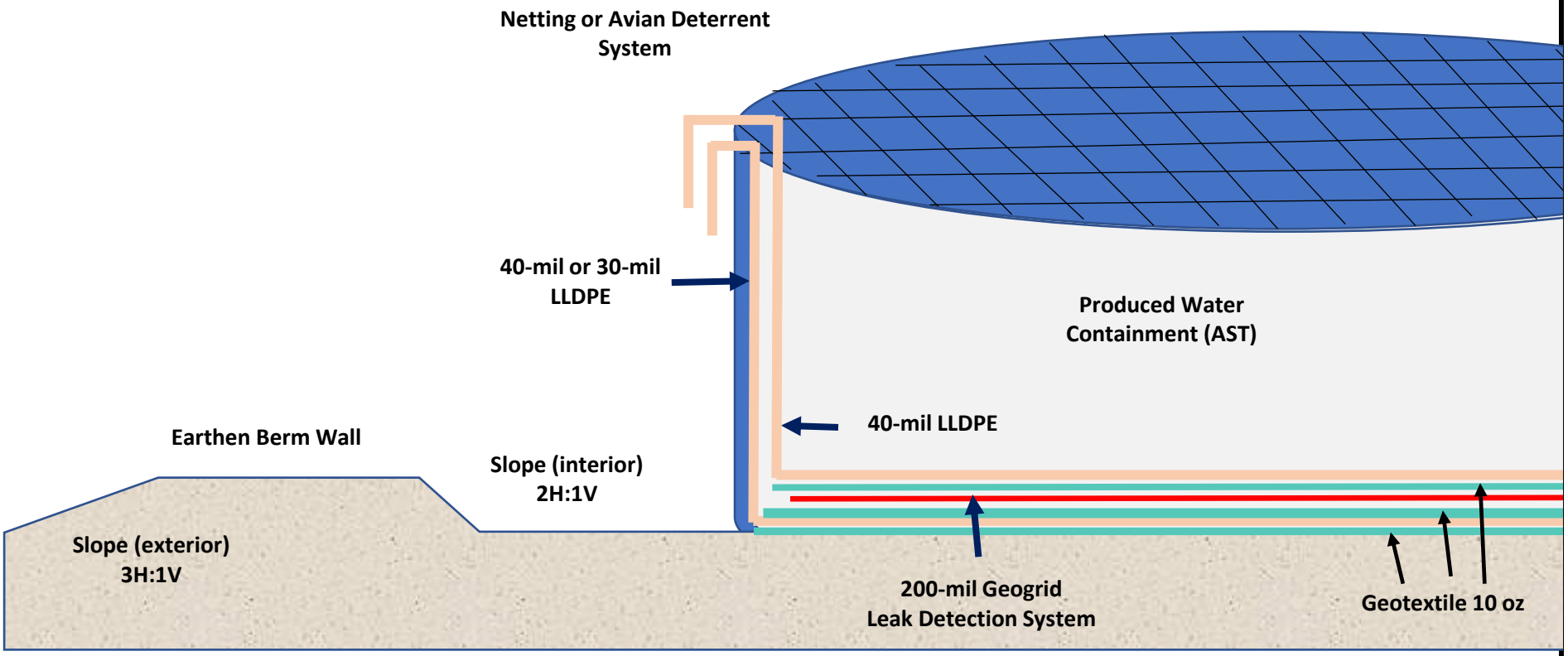
NO.	REVISION DESCRIPTION	DATE	BY
1	NEW PAD SIZE	3/4/20	DMB
2	ADD LAT/LONG & ELEV.	4/15/20	DMB

SOLARIS WATER MIDSTREAM, LLC.

TELLURIDE AIR GAP SWD
LOCATION OF A PROPOSED SURFACE SITE IN
SECTION 3, TOWNSHIP 25 SOUTH, RANGE 34 EAST, N.M.P.M.,
LEA COUNTY, NEW MEXICO

FIELD DATE: 04/13/2020		SURFACE SITE
DRAFTING DATE: 04/15/2020		PAGE 1 OF 1
JOB No. 2019-103	APPROVED BY: CEC / DRAWN BY: DMB	TRACT: LTC-4

RECYCLING CONTAINMENT DESIGN DRAWINGS



Description of Leak Detection System

- 200-mil geogrid drainage layer lies between the primary and secondary liner
- Geotextile between the geogrid and the liners
- 2- to 3-inch deep sump excavated within the compacted caliche pad as a collection point for any seepage
- A ¾-inch aqua braid line runs from the collection sump between the liners and beneath the geogrid drainage system to the outside of the AST
- The leak detection pipe is fastened to the exterior of the AST and terminates at ground level.
- Every week, a portable self-priming peristaltic pump connects to the leak detection system.
- The self-priming pump discharges into a ¾" aqua braid line, through a turbine meter, and back into the AST, on top of the primary liner
- If fluid is detected, it is tested for conductance to determine the origin of the water (e.e. produced water or condensation)

R.T. Hicks Consultants Albuquerque, NM	**Design Sketch**	**Plate 1**
	Solaris Water Midstream - Telluride Air Gap AST	**May-20**

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1. REPORT SCOPE

The 18 panels of 8ft x24ft (600095) are bolted together to form a water ring to contain water (Fig. 1 shows a typical build). FEA analysis is used to confirm that the bolted connection and panel are suitable for the application. Solidworks 2012 Simulation is used for FEA analysis, and manual calculation is used for bolt connection checking. The object of the analysis is to confirm the design is suitable for the application with SF of 2.5 against the minimum yield strength.

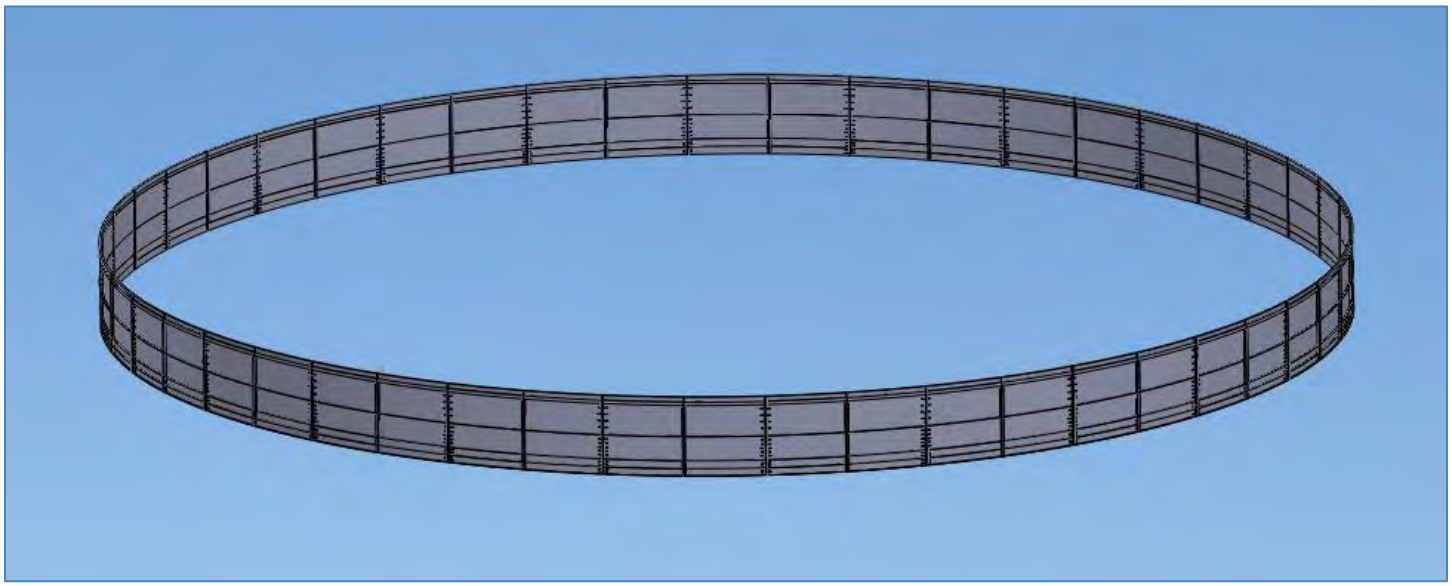

Figure 1

2. ANALYSIS

2.1 Panel

A section of the whole assembly is used for analysis (Fig. 2). One typical bolted connection is included in the analysis model.

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Material properties are defined as carbon steel with E = 30 × 10^6 psi and Poison's ratio = 0.28. The minimum yield strength of the steel panel is 44ksi.

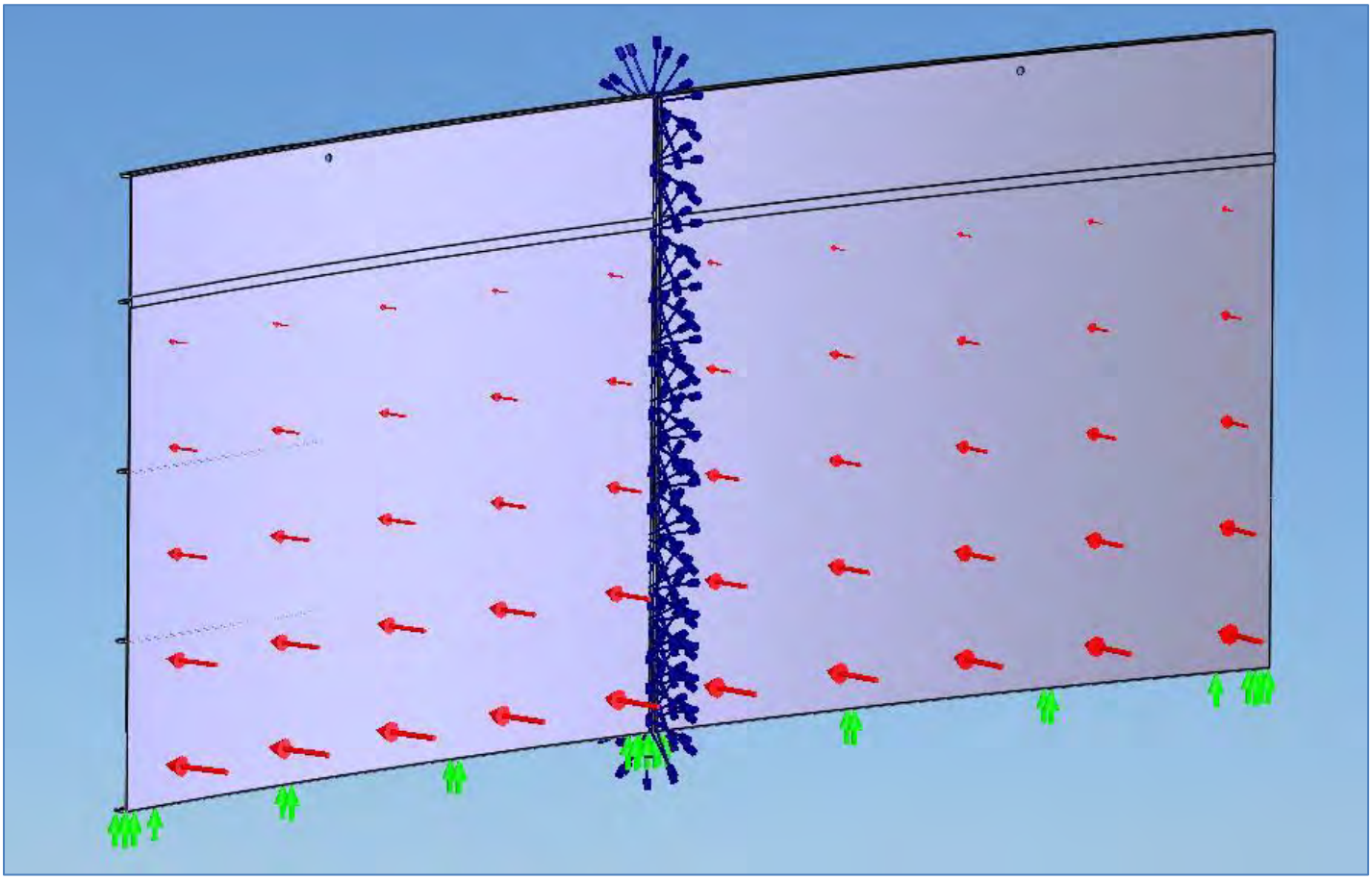

Figure 2

The following boundary conditions are applied to the calculation model:

1. Cyclic Symmetry is applied to two end surfaces.
2. Bolted connection is simulated. Applied clamping force on each bolt is 24,000lbs based on the specified tightening torque of 400ft-lbs which is close to the half of the available clamping force of 1" Gr. 8 bolt. In the field connection, it is more realistic to have reduced clamping force due to the difficulty of applying high tightening torque.
3. Bolted surface is defined as non-penetration contact
4. Maximum pressure applied is 4.2psi at the bottom and gradually reduced to 0psi at the top. The pressure is calculated by using specific density of 1,200 kg/m^3.

In the FEA analysis model and boundary conditions, there is no credit applied from ground indentation which may be helpful in certain situations. But the ground indentation effect may not exist in all situations. Therefore, it has been omitted in the analysis which is more conservative approach.

2.2 Bolt

For the first group of bolts with c-c distance of 6":

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The maximum hydro static pressure at the bottom,

P = ρ g h = 1,200 x 9.81 x 8 x 0.3048 =28,705 Pa = 4.2 psi

The maximum hoop stress at the bottom of the ring,

$\sigma_h = \frac{PD}{2t}$

P = 4.2 psi;

D= 1662 inch;

T = 0.25 inch

$\sigma_h = \frac{4.2 \times 1662}{2 \times 0.25}$ = 13,958 psi

The separation force at the flange connection at the bottom of first bolt c-c distance of 6 inch will be,

$F = \sigma_h$ x 6x 0.25 = 20,937lb

The specified tightening torque is T = 400 ft-lb = 4,800 in-lb,

So the preload for 1”-8 UNC Gr. 8 bolt is,

$F_i = \frac{T}{0.2\ d} = \frac{4800}{0.2 \times 1}$ = 24,000 lb

Total load on the bottom bolt (resultant load) is,

$F_b = P_b + F_i$

P_b is portion of external load taken by the bolt. It can be calculated as below:

$P_b = F \cdot K_b / (K_b + K_m) = C \cdot F$

$P_m = F \cdot K_m / (K_b + K_m) = (1-C) \cdot F$

P_m: portion of external load taken by members.

K_b : spring constant of bolt

K_m : spring constant of members

$K_b = K_T \cdot K_d / (K_T \cdot + K_d) = A_d \cdot A_T \cdot E / (A_d \cdot l_T + A_T \cdot l_d) = \pi \times 0.5^2 \times 0.606 \times E / (\pi \times 0.5^2 \times 0 + 0.606 \times 2) = 0.3927\ E$

$K_m = 0.577\ \pi E d / 2 \cdot l_n \cdot (5x(0.577 \times l + 0.5xd) / (0.577 \times l + 2.5xd))$

d=1”, l=2” , tensile area of 1”-8 UNC bolt, A_T = 0.606 sq.inch

So,

$K_m = 1.1096\ E$

$C = K_b / (K_b + K_m) = 0.2614$

$P_b = 0.2614\ F = 0.2614 \times 20{,}937 = 5{,}473$ lb

$P_m = 0.7386\ F = 0.7386 \times 20{,}937 = 15{,}464$ lb< F_i, so, no separation on connection.

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$F_b = P_b + F_i = 5{,}473 + 24{,}000 = 29{,}473$ lbs

The ultimate force of the bolt is,

$F_u = 0.606 \times 150{,}000 = 90{,}900$ lb

The yield force of the bolt is,

$F_y = 0.606 \times 130{,}000 = 78{,}780$ lb

So, the safety factors are,

$(SF)_u = 90{,}900 / 29{,}473 = 3.08$

$(SF)_y = 78{,}780 / 29{,}473 = 2.67$

Calculate all the rest groups of bolts by the same procedure. They all meet the requirement of application, and the safety factors are all above 2.5.

3. ANALYSIS RESULTS AND DISCUSSION

The design safety factor of 2.5 is used. Therefore, the allowable stress is 17,600psi. Figure 3 has shown the plot that stresses are over 17,600 psi. It can be seen that the panel meets the required safety factor of 2.5 against the yield strength (Fig. 3).

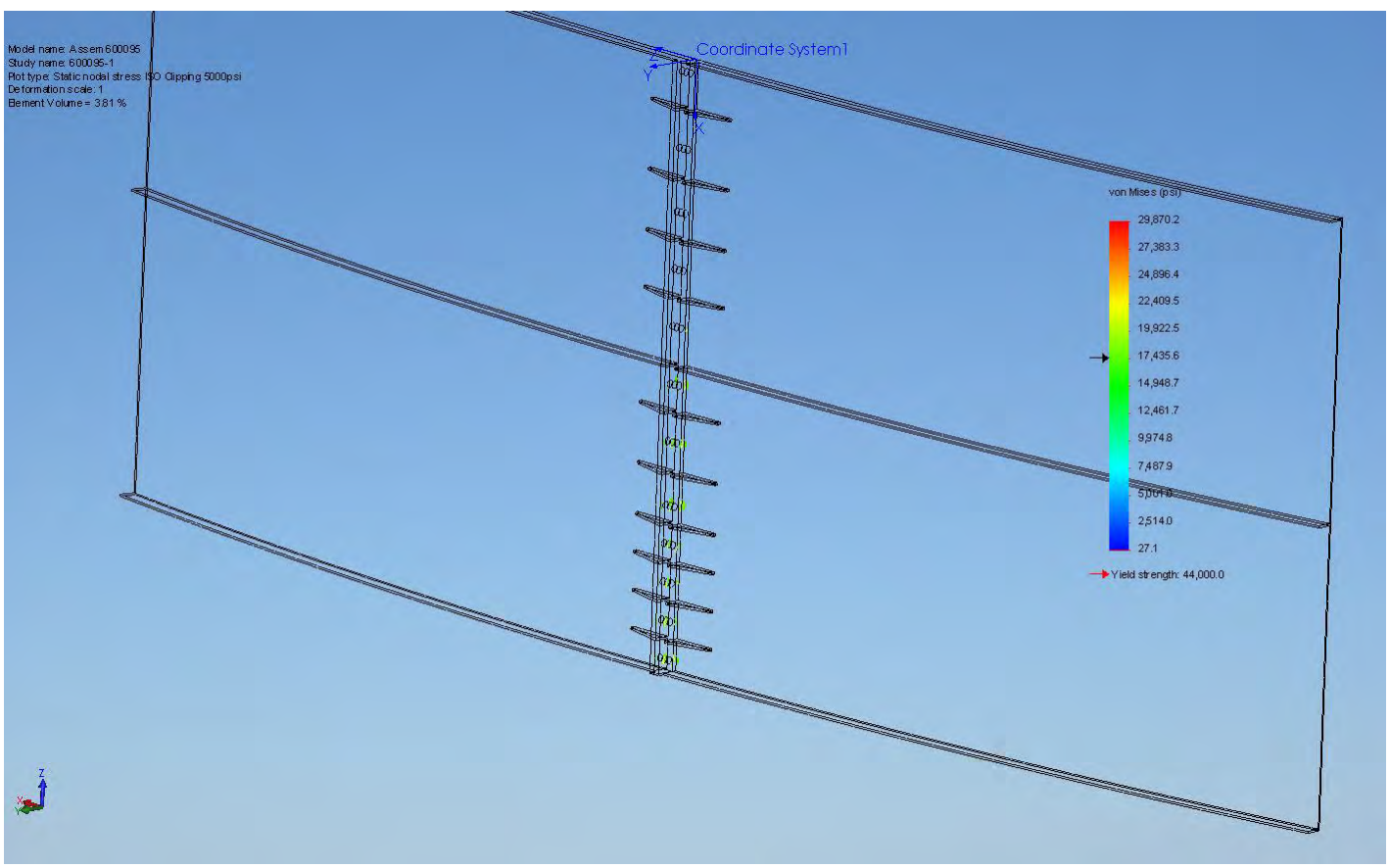

Figure 3

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Figures 4 and 5 have shown the very localized stress concentration distribution at the flange connection. There is no tensile yield occurred. There is no stress over 36,000 psi.

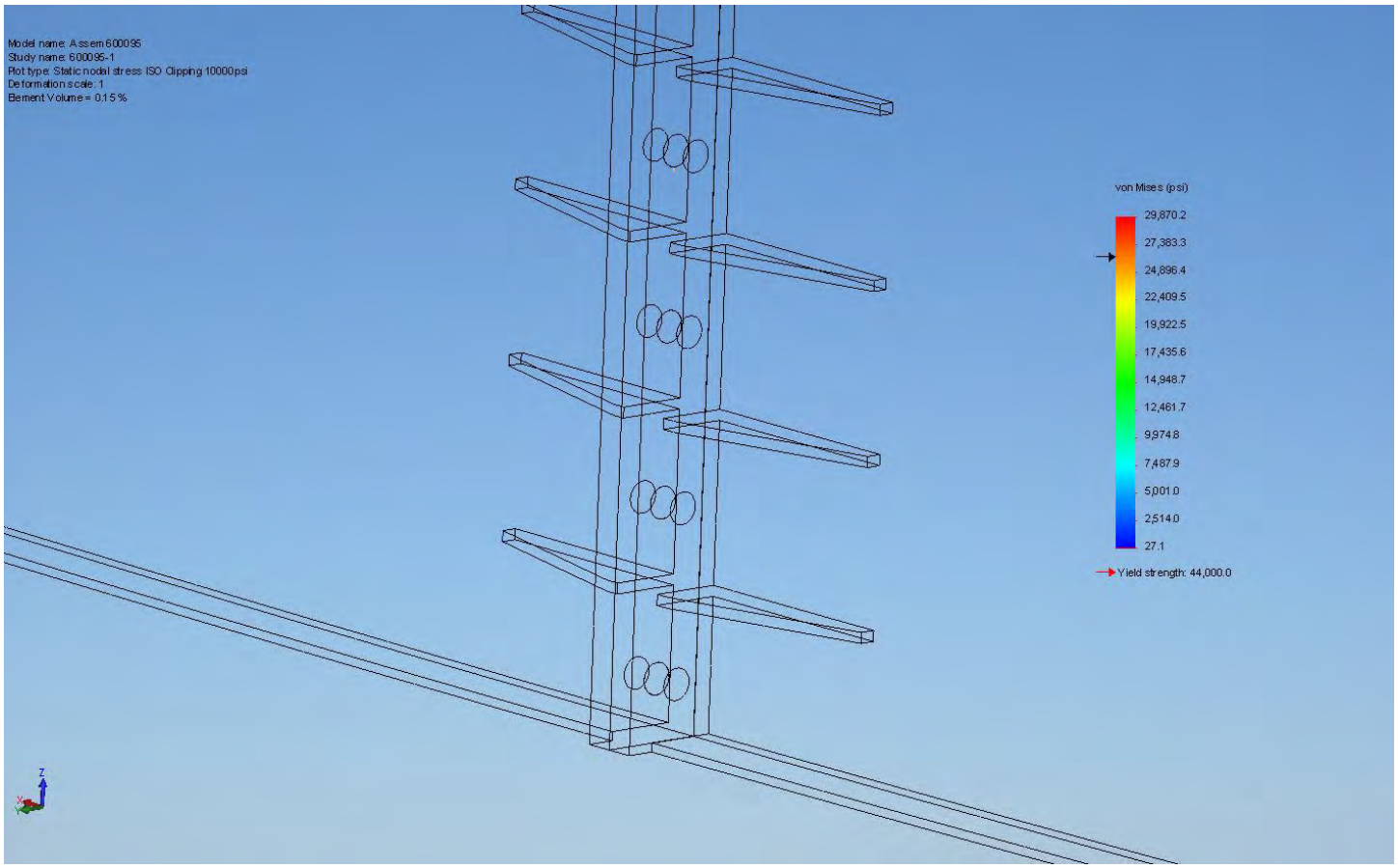

Figure 4: ISO Clipping 0f Stress over 26,347 psi (SF = 1.67)

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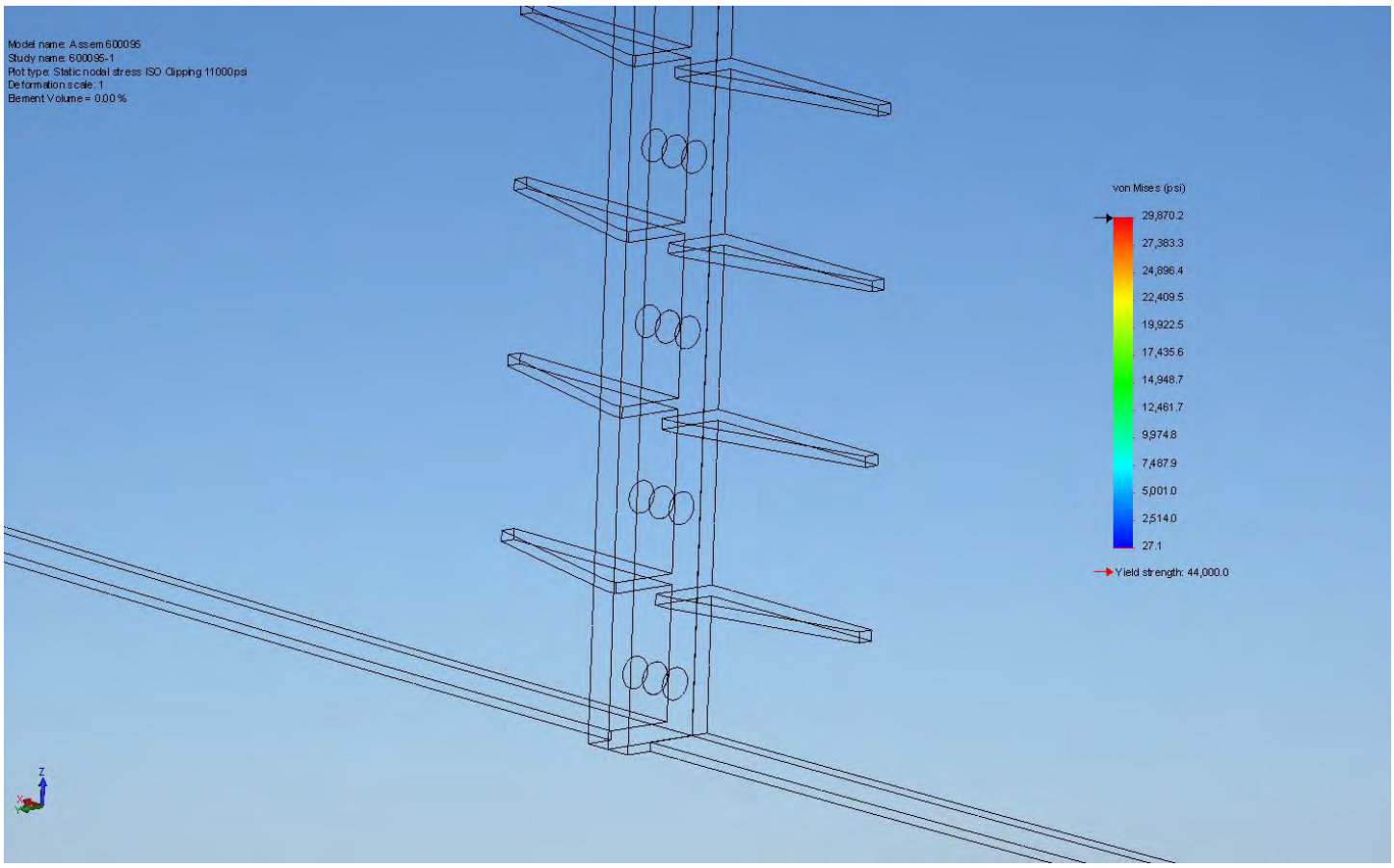

Figure 5: ISO Clipping of Stress over 36,000 psi

Typical E7018 weldment yield strength is over 55ksi. Due to the nature of static application that no fatigue failure will occur and very ductile material is used (high ratio of ultimate strength / yield strength), the very localized stress concentration is not a concern. Some of the stress concentration may be caused by the mathematical model. In our opinion, the flange connection meets the safety factor of 2.5 against the gross yield.

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The maximum deflection at the middle spot of each panel is approximately 0.45” (Fig. 6). The ratio of deflection over panel width is approximately 1:640 (0.45/288) which is acceptable for the application.

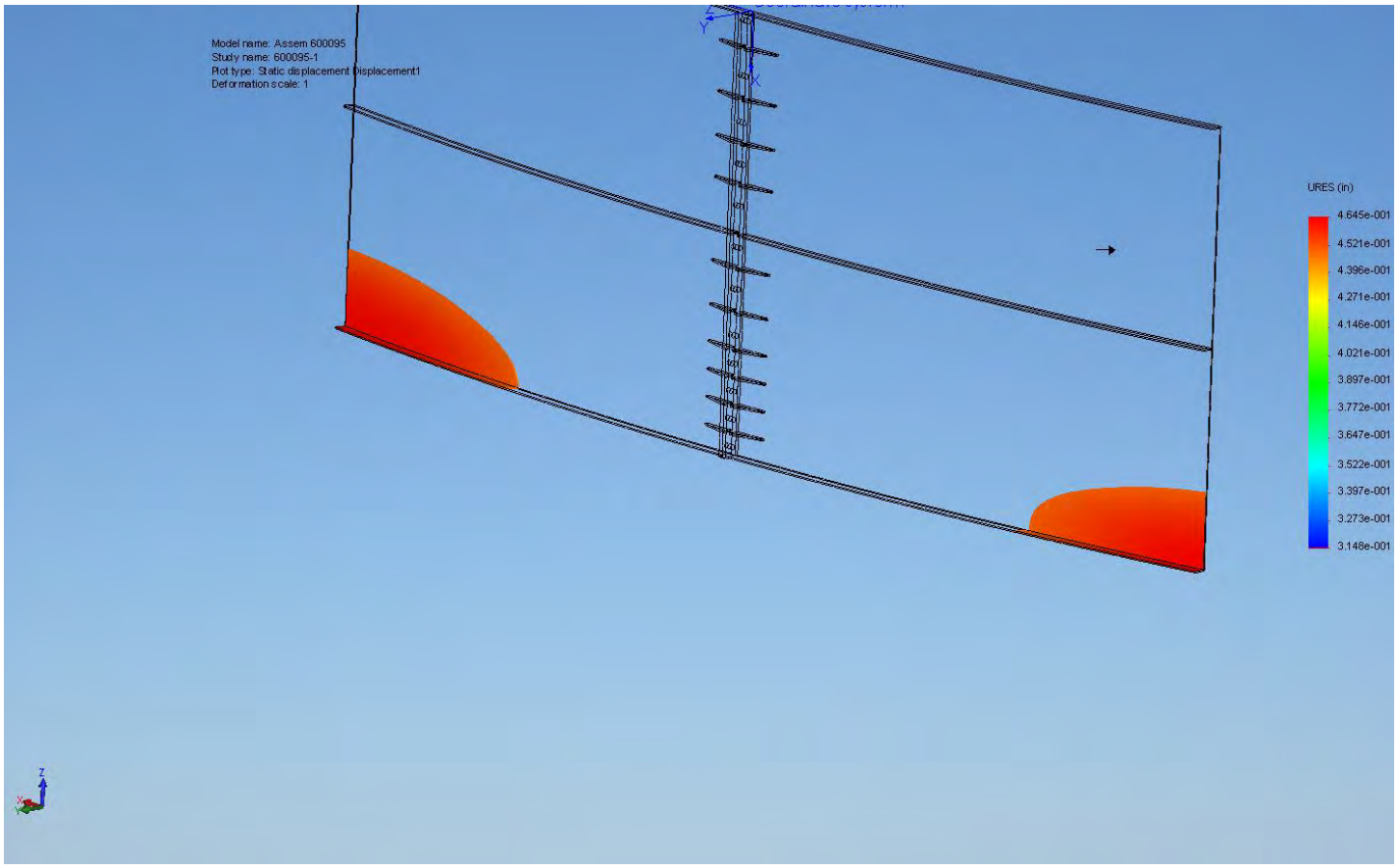

Figure 6 ISO clipping of deflection over 0.45"

4. CONCLUSION

From the calculation results, it can be confirmed that the design of the water ring is suitable to hold 3,400 cubic meter (22,000BBL) with SF of over 2.5 against yield when the specific density of the fluid equals to or less than 1,200kg/m^3.

5. REFERENCES

Prepared by:
George Hu, P.Eng
Cantech Oilfield Equipment Ltd
Permit No. P10445

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July 15, 2015

Our Ref: CT-C029

New Wave Energy Services Group

#1955, 140 - 4th Ave, SW
Calgary, Alberta
Canada, T2P 3N3

Ground Support Requirement and Design Safety Factor of New Wave Water Tank

To whom it may concern:

All New Wave Tanks are engineered with a minimum design safety factor of 2.5 when the specific gravity of a fluid contained is 1.20 kg/m^3.

The flanged connections with 1" Gr. 8 bolts between individual panels are stronger than panel itself. The unleveled ground support will not affect the design safety factor provided that the grade is within 10" over 100ft span. Uneven ground support will not affect the design safety factor of the tank as long as the gap between the bottom flange of the tank and the ground does not exceed 2" in order to prevent liners from being stretched and extruded over the gap.

When the specific gravity of the fluid differ from 1.2 kg/m^3, the design safety factor can be calculated as follows:

Achieved minimum safety factor = 2.5 X 1.2 / fluid specific gravity

For example, when the specific gravity is 1.25, the achieved minimum design safety factor will be 2.5 X 1.2 / 1.25 = 2.4.

Sincerely,

George Hu, P.Eng.
Cantech Oilfield Equipment Ltd
Permit Number: P10445

US 866-375-9749
CAN 800-841-0836

Above Ground Tank Liner Systems - Geomembrane

1. Product Description

High capacity above ground tank liner systems are increasingly being used by the upstream oil & gas sector for containment of drilling fluids associated with hydraulic fracturing operations. Layfield is recognized as a leading manufacturer and fabricator of above ground storage liner systems in North America and internationally. Our Enviro Liner series of geomembranes are highly durable and flexible materials designed to contain the combination of brine fluids and chemicals used in the fracking process. A rapidly growing trend is the use of above ground engineered water storage systems designed to hold large volumes of water. As an example, many tank systems in the market can store from 750,000 to 2,000,000 gallons of frac fluids. Layfield provides one piece prefabricated liners designed for quick installation with no seaming required on site.

2. Technical Data

Materials information is on page 2.

3. Installation

Surface preparation is the key to a successful tank lining installation. When setting up a new tank on the ground, the prepared surface should be uniform, well compacted, and free of sharp rock fragments or stones. In a new frac tank installation (such as a storage tank used in hydraulic fracturing), we usually recommend that a non-woven geotextile be placed on the ground as the first step. Then the outline of the frac tank wall should be marked on the geotextile with spray paint. The liner is placed at the center of the marked geotextile before tank assembly starts. Then the tank is assembled. Once the tank is finished, the liner is unfolded, pulled up over the walls, and secured to the perimeter. Larger tanks, retrofits, and tanks that are field fabricated normally require additional installation details and would be quoted separately. Please contact your Layfield representative for additional details.

4. Availability and Cost

Available from Layfield or distributors. Call
425-254-1075 Pacific time
780-453-6731 Mountain time, or
905-761-9123 Eastern time

5. Warranty

Products sold will meet Layfield's published specifications. Any extended warranty required by the buyer must be negotiated at the time of order. Extended warranties may be available on this product and may be at extra cost. Full warranty details are available from Layfield.

6. Maintenance

Geomembranes should be inspected at least once per year for damage, stress, or any other detrimental condition. The entire containment area should be visually inspected annually. Layfield provides geomembrane maintenance services on request.

7. Filing Systems

9.

18 Oct 2016	Enviro Liner® 1000 Properties				
Style	**ASTM**	**EL 1020**	**EL 1030**	**EL 1040N**	**EL 1040**
Thickness	D5199	20 mil 0.5 mm	30 mil 0.75 mm	36 mil 0.91 mm	40 mil 1.0 mm
Density (Typical)	D792	0.93	0.93	0.93	0.93
Tensile Strength at Break	D6693	76 ppi 13 N/mm	114 ppi 20 N/mm	136 ppi 24 N/mm	152 ppi 27 N/mm
Elongation	D6693	800%	800%	700%	800%
Tear Resistance	D1004	11 lbs 49 N	16 lbs 70 N	19 lbs 84 N	22 lbs 100 N
Puncture Resistance	D4833	28 lbs 120 N	42 lbs 190 N	54 lbs 240 N	56 lbs 250 N
Carbon Black Content	D6370	≥ 2.0%	≥ 2.0%	2.0%	≥ 2.0%
High Pressure OIT	D5885	400 min	400 min	N/A	400 min
Low Temperature Impact Resistance	D746	-69°F -56°C	-69°F -56°C	-40°F -40°C	-69°F -56°C
Service Temperatures	Max Continuous Use	140°F 60°C	140°F 60°C	140°F 60°C	140°F 60°C

WE PROTECT

www.LayfieldContainment.com
Containment@layfieldgroup.com

Safe Work Procedure – Tanks

Title	**Frac Tank Set Up** **SWP-Tanks-05**
Description of Task	Frac Tanks are installed to hold large amounts of liquids for use by our clients.
Applicable Laws and Regulations	Alberta: OHS Act, Regulation and Code BC: OHS Act, Regulation and Code
PPE and Protective Controls	Hard Hat, CSA Approved Footwear, Safety Glasses/Goggles, Hi Visibility outerwear, Hearing Protection (ear plugs or ear muffs), H2S Monitor (if required), Cut Resistant Protective Gloves. Training, Procedure, Programs & Policies, Inspections, Regulations, Pre-Job Meetings.
Required Training:	*Formal:* WHMIS, H2S Alive, CSO, First Aid/CPR, TDG *Informal:* New Wave Orientation, Customer Orientation, Safe Working Procedures, Policies, Codes of Practice, On the Job Training, Competency Assessments, Mentoring
Supervisor Responsibilities	Supervisors are responsible to facilitate and/or provide proper instruction to their workers on site and make sure equipment/tool owner manuals are available on site.
Job Steps	1. Hold a Pre-Job safety meeting before beginning this operation. This will include a review of procedures, hazard assessments, hand signals while performing lifts, emergency response procedures, and roles & responsibilities. Include everyone on site (workers, contractors, equipment operators, etc.). 2. Ensure everyone on site is experienced, trained and competent to perform their task (ex. Equipment operators). 3. Using the transit/laser level ensure that the grade of the site for the tank install is within acceptable specifications. 4. Mark the center of tank per location as appointed by client, keeping in mind that sufficient room is needed on the backsides of the tank for the hoe to pull liner. 5. Remove all debris including but not limited to: sticks, rocks or any foreign material capable of puncturing liner. Watch your footing and be mindful of slip/trip/fall hazards. 6. Mark the center of the tank by digging a shallow hole or using a disc and then measure 4 ways from center and mark with spray paint to reference the size of geo and the size of the liner per the size of the tank. 7. After examining the unroll instructions as marked on the geotextile proceed to unroll the geo. 8. Unfold the geo ensuring that it is square and equal on all four sides per the spray paint marks previously put on the outside of the tank.

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

9. Finding the center of the tank using the hole dug or disc, mark the center of the tank with spray paint and then using a paint stick, mark the circumference of the tank per tank measurements set out in the measurement guide lines.

10. Using the liner bar and picker/excavator/hoe unroll the liner in the same fashion as the geo textile ensuring that the QC manual is removed from the outside of the roll.

11. While rolling out the liner (suspended load) do not put any body part under the suspended load without complete confirmation from the operator that the task is fully stopped, and all movements of equipment have been suspended. While loads are in motion, workers must never be under them.

12. Fold the liner towards the center from 8 points until the outside tank lines on the geo are exposed and in a neat and tidy fashion to ensure a uniform pull of the liner when the tank is erected.

13. While manually pulling the geo and liner, ensure proper communication is established between the crew and everyone pulls together on command. Ensure entire crew has a proper grip on the geo or liner, proper stance for balance and no excess force is used to pull either the geo or liner. Be mindful of slip/trip/fall hazards while pulling the geo and/or liner. 2

14. Mark the center of the tank again by finding the hole or disc by using spray paint and write the outside panel measurement on the floor of the liner with spray paint.

15. Ensure there is always minimal foot traffic on the surface of the liners. The liner is extremely slippery (especially when wet – rain, snow, ice). If a worker needs to walk on the liner, caution needs to be taken. Take slow small shuffling steps (like a penguin) and keep hands out of pockets for balance.

16. From the center point measure to the inside of both ends of the first panel and set in place with the picker and support one end with the A-arm or hoe. Use the hoe/picker to stabilize 7-8 panels before removing (first skid emptied).

17. While placing all the panels with the picker, workers must take extreme caution and must never go under a suspended load.

18. Skids holding the panels occasionally need to be moved and/or relocated. Only straps approved for towing/pulling can be used. Inspect straps prior to use.

19. Trim excess geo, ensuring there is approximately 18-24’ left on the outside of the tank to allow settling.

20. The excess geo that is trimmed off, must be put to the inside of the circumference mark on the geo to be used later to pack into the corner where the tank and geo meet.

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

	21. Continue setting panels ensuring that each panel is measured from the center until the last 4 panels are ready to be set. The last 4 measurements of panels must be measured from panel to panel as set out in the measurement guidelines. 22. Refer to the Safe Work Procedure on Electric Torque Guns for torqueing procedure. Ensure the portable generator used to power the torque gun is placed downwind and/or position yourself so that the exhaust is away from your breathing zone. 23. Once the walls are in place, fold the liner out and secure with clamps and airplane cable. 24. While pulling the liner over the erected tank walls, ensure hoe/picker operator is familiar with the task and constant communication is established (radios). Watch for pinch points while putting the liner into the thumb of the hoe/picker. 25. Ensure that no excess liner is cut off until all the clamps and cable are secure. 26. Remove all excess liner in a neat and straight fashion using a tank ring support as a guideline ensuring that there is 18" below the airplane cable. 27. Install the suctions and equipment per the customer's request. 28. Remove all excess liner and secure on location in a hidden spot to be disposed of later. 29. Walk around the complete tank and check to make sure there is no tools, excess bolts or garbage left over. 30. Ensure all bolts and airplane cable are installed correctly. 31. Supervisor to check 3-4 bolts on every seam with the manual torque wrench while ensuring that the threads are fully exposed from the nut. 32. Ensure that all paperwork is reviewed with and signed by the client. 33. Tank Supervisor and Electric Torque Gun Operator must walk around the tank visually ensuring the bolts are torqued and then both must sign off on the Tank Installation Checklist. 34. Tank Supervisor and Liner Puller must sign off on the Liner Installation Form.
Created By	Workers, General & Operations Managers, Safety Department
Manager Approval	Karmen Hodgson – Tanks General Manager

3

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

Safe Work Procedure – Tanks

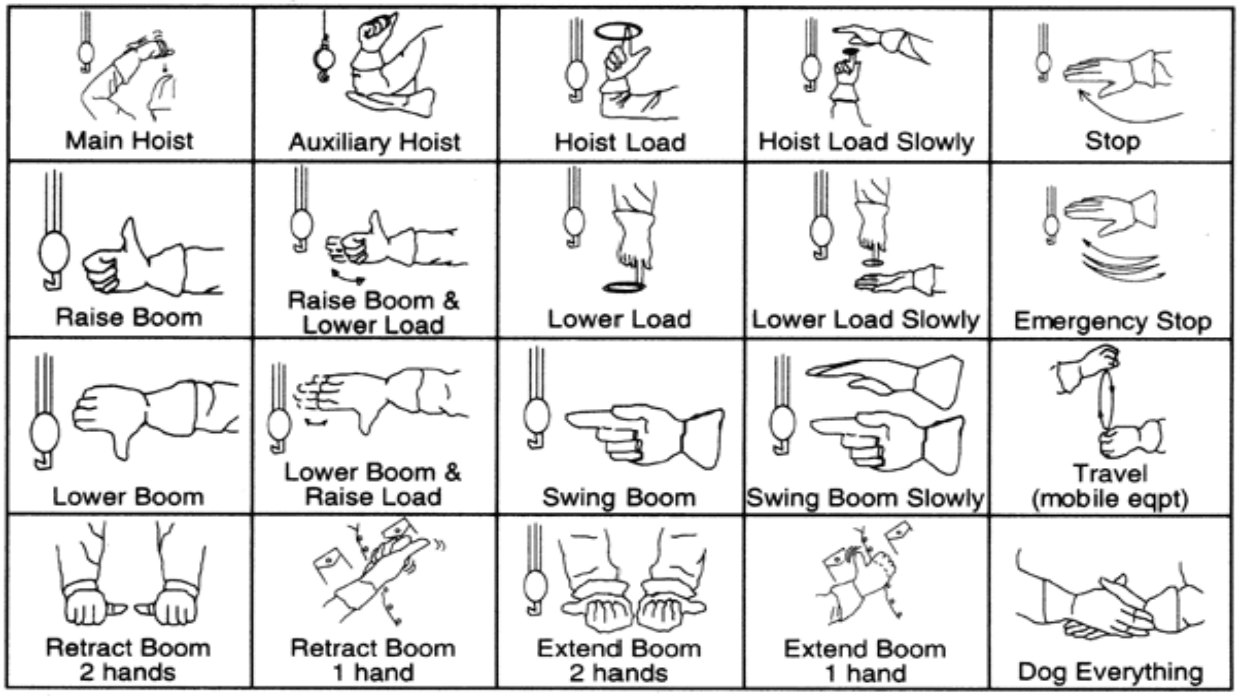
Title	Bolt Up of Piping and Assemblies SWP-Tanks-02
Description of Task	Equipment is prepared and requires fabrication before being used.
Applicable Laws and Regulations	Alberta: OHS Act, Regulation and Code BC: OHS Act, Regulation and Code
PPE and Protective Controls	Hard Hat, CSA Approved Footwear, Safety Glasses/Goggles, Hi Visibility outerwear, Hearing Protection (ear plugs or ear muffs), H2S Monitor (if required), Protective Gloves. Training, Procedure, Programs & Policies, Inspections, Regulations, Pre-Job Meetings.
Required Training:	*Formal:* WHMIS, H2S Alive, CSO, First Aid/CPR, TDG *Informal:* New Wave Orientation, Customer Orientation, Safe Working Procedures, Policies, Codes of Practice, On the Job Training, Competency Assessments, Mentoring
Supervisor Responsibilities	Supervisors are responsible to facilitate and/or provide proper instruction to their workers on site and make sure equipment/tool owner manuals are available on site.
Job Steps	1. All personnel involved in this task must attend a pre-job safety meeting. This will include role designation, review of procedures and hazard assessment/identification. Establish emergency response roles and procedures. 2. Obtain all applicable permits. Only certified/trained personnel can operate lifting equipment (crane, picker, etc.) 3. Ensure potential hazards are identified within the work area. 4. Communicate with all personnel involved of potential hazards. 5. Always watch for pinch points. 6. If using lifting devices, ensure operators are properly trained and all lifting equipment is inspected before use. Communicate with everyone involved the hand signals to be used and who will be giving them. 7. Ensure that all flange and sealing surfaces are cleaned before assembly. 8. Ensure proper gaskets and bolting materials are used. 9. Ensure that the flange alignment is accurate. 10. Ensure that bolting is tightened evenly around flange perimeters. 11. Ensure stud threads protrude thru stud nut at least one full thread. 12. Ensure that all welded threaded connections (i.e. TOL's) have had a thread chaser used on the threads prior to assembly.

1

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

	13. Ensure that proper thread dope and Teflon tape is used on all threaded connections. 14. Perform post job clean up after task is completed.
Created By	Workers, General & Operations Managers, Safety Department
Manager Approval	Karmen Hodgson – Tanks General Manager

INTERNATIONAL HAND SIGNALS:

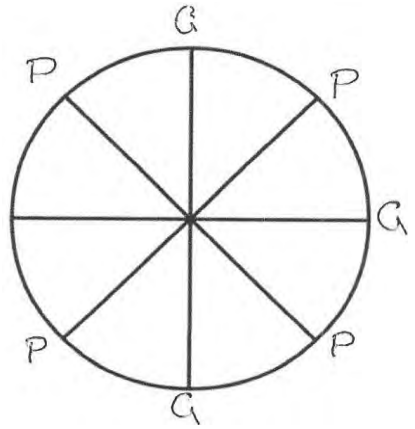


*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

Safe Work Procedure – Tanks

Title	Setting Up a Bird Net SWP-Tanks-07
Description of Task	This task consists of employees building and placing a bird net over top of a tank.
Applicable Laws and Regulations	Alberta: OHS Act, Regulation and Code BC: OHS Act, Regulation and Code
PPE and Protective Controls	Hard Hat, CSA Approved Footwear, Safety Glasses, Fire Resistant Coveralls, Hi Visibility outerwear, Hearing Protection (ear plugs or ear muffs), H2S Monitor (if required), Protective Gloves. Training, Procedure, Programs & Policies, Inspections, Regulations, Pre-Job Meetings, Body Placing and Spacing, Use proper lifting and pulling techniques.
Required Training:	*Formal:* WHMIS, H2S Alive, CSO, First Aid/CPR, TDG *Informal:* New Wave Orientation, Customer Orientation, Safe Working Procedures, Policies, Codes of Practice, On the Job Training, Competency Assessments, Mentoring
Supervisor Responsibilities	Supervisors are responsible to facilitate and/or provide proper instruction to their workers on site and make sure equipment/tool owner manuals are available on site.
Job Steps	1. All personnel involved in this task must attend a pre-job safety meeting. This will include role designation, review of procedures and hazard assessment/identification. Establish emergency response roles and procedures. 1 2. Construct bird net stands. Use proper lifting techniques and watch for pinch points. 3. Ensure all stands have 8 support legs. 4. Attach bolts in specified holes in stand. 5. Ensure all rubber mats on bases are secure and free of debris. 6. Set upright to required height and secure with bolts. 7. Mark out tank floor to indicate where bird net stands will sit. 8. Place the bird net stands with a picker on to the marks on the tank floor. (Picker may need to be moved to reach all marks). Never go under a suspended load. Always maintain eye contact and have constant communication with picker operator. 9. Around the outside of the tank, mark 8 equal points.

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.



10. Mark every second one with a G (for green) and the remainder with a P (for pink). (Green= centre of edge of net. Pink= corner of net. The net is square).

11. Place bird net still in box next to a "G" and open box. DO NOT cut white string.

12. Place end of net over top of tank and pull net to the opposite side of the tank.

13. Ensure net does not get caught on bird net stands.

14. Open up net and secure 2' down on outside of tank. Denoted by green ribbon. On all 4 "G" marks.

15. Lift net over bird net stands using extendable pole.

16. Secure corner of bird net to letter "P"s pulling tight.

17. Work round tank securing bird net to ring clamps. Watch slip/trip/fall hazards.

18. Work around the tank a second time pulling net tight.

19. Use rope to secure net on every seam of tank.

20. Tie up all spare netting on the floor.

2

Created By	Workers, General & Operations Managers, Safety Department
Manager Approval	Karmen Hodgson – Tanks General Manager

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

Safe Work Procedure – Tanks

Title	Setting Up a Rescue Platform SWP-Tanks-08
Description of Task	Setting up and assembling a rescue platform.
Applicable Laws and Regulations	Alberta: OHS Act, Regulation and Code BC: OHS Act, Regulation and Code
PPE and Protective Controls	Hard Hat, CSA Approved Footwear, Safety Glasses/Goggles, Fire Resistant Coveralls, Hi Visibility outerwear, Hearing Protection (ear plugs or ear muffs), H2S Monitor (if required), Protective Gloves, Full Body Harness, Lanyard Training, Procedure, Programs & Policies, Inspections, Regulations, Pre-Job Meetings, Body Placing and Spacing, Use proper lifting and pulling techniques.
Required Training:	*Formal:* WHMIS, H2S Alive, CSO, First Aid/CPR, TDG, Crane/picker/Rigging certification, Fall Protection certification. *Informal:* New Wave Orientation, Customer Orientation, Safe Working Procedures, Policies, Codes of Practice, On the Job Training, Competency Assessments, Mentoring
Supervisor Responsibilities	Supervisors are responsible to facilitate and/or provide proper instruction to their workers on site and make sure equipment/tool owner manuals are available on site.
Job Steps	**Note:** This platform is a prototype platform and may change or be amended by New Wave site supervisor or client representative, all revisions must be approved by New Wave safety advisor. 1. All personnel involved in this task must attend a pre-job safety meeting. This will include role designation, review of procedures and hazard assessment/identification. Establish emergency response roles and procedures. 2. Ensure level compact ground where rescue platform will be set. 3. Place rig mat along tank where platform will be placed. 4. While rescue platform is in collapsed position remove pins 1&2 colored white from frame to free structure so it can be raised to standing position. Watch for pinch points. (NOTE: do not remove any other pins than the ones mentioned above.) 5. Inspect slings and clevises. Hook up slings and clevises to four lifting lugs located on handrails, raise platform to fully erected position with telehandler or picker. Ensure employees are free from the area and do not allow anyone to go under a suspended load. 6. Once platform is raised, insert pins 3 & 4 color white into holes. Be sure that safety keeper is in place on each pin. Watch for pinch points. 7. Once platform is fully pinned, have your New Wave site supervisor inspect platform. Once site supervisor has approved that all pins are in place, you can don safety harness and double lanyard and proceed up platform to unhook slings from telehandler or picker. 100% tie off is mandatory when climbing this platform.

1

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

	8. Use picker and ladders to install supports for the safety jib and insert pins marked 5 & 6 colored white. 9. Use telehandler or picker to place/hang rescue jib crane into jib crane pocket. (NOTE: rescue jib crane is marked "A") 10. Use ladder winch marked "B" to lower ladder into tank. 11. Before operation, New Wave site supervisor must inspect rescue platform.
Created By	Workers, General & Operations Managers, Safety Department
Manager Approval	_____ Karmen Hodgson – Tanks General Manager

*The information in this Safe Work Procedure does not take precedence over applicable government legislation, with which all workers should be familiar.

DESIGN/CONSTRUCTION PLAN
O&M PLAN
CLOSURE PLAN

General

Examination of the engineering drawings and the SOP for set-up (Appendix Engineering Drawings, Liner Specifications, Set Up) plus the history of solid performance of these AST Containments demonstrates that the AST Containment is designed and will be assembled to ensure the confinement of produced water, to prevent releases and to prevent overtopping due to wave action or rainfall. As the AST Containments are generally less than 190 feet in diameter, wave action is not a meaningful consideration.

19.15.34.12 A
(1) The operator shall design and construct a recycling containment to ensure the confinement of produced water, to prevent releases and to prevent overtopping due to wave action or rainfall.

These AST Containments are constructed of 8-12 foot high steel panels and are netted or employ the Mega Blaster Pro avian deterrent system to prevent ingress of migratory birds. AST Containments will be enclosed by a 4-strand barbed wire fence. Thus, complies with the Rule to fence or enclose a recycling containment in a manner that deters unauthorized wildlife and human access and shall maintain the fences in good repair.

19.15.34.12 D
(1) The operator shall fence or enclose a recycling containment in a manner that deters unauthorized wildlife and human access and shall maintain the fences in good repair. The operator shall ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.

The operator shall post an upright sign no less than 12 inches by 24 inches with lettering not less than two inches in height in conspicuous places surrounding the containment. The operator shall post the sign in a manner and location such that a person can easily read the legend. The sign shall provide the following information: the operator's name, the location of the site by quarter-quarter or unit letter, section, township and range, and emergency telephone numbers.

19.15.34.12 C
Signs. The operator shall post an upright sign no less than 12 inches by 24 inches with lettering not less than two inches in height in a conspicuous place on the fence surrounding the containment. The operator shall post the sign in a manner and location such that a person can easily read the legend. The sign shall provide the following information: the operator's name, the location of the site by quarter-quarter or unit letter, section, township and range, and emergency telephone numbers.

Site Preparation

Foundation for AST Containment

Preparation of the soils on site is required to form a dependable base for the AST Containment in accordance with the SOP. If the location of the AST Containment is on an existing pad, the operator has stripped and stockpiled the topsoil for use as the final cover or fill at the time of closure. If the pad is new construction, the operator will strip and stockpile the soil for reclamation upon cessation of site activities.

19.15.34.12 B
Stockpiling of topsoil. Prior to constructing containment, the operator shall strip and stockpile the topsoil for use as the final cover or fill at the time of closure.

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The foundation soils must be roller compacted smooth and free of loose aggregate over ½ inch. Compaction characteristics must meet or exceed 95% of Standard Proctor Density in accordance with ASTM D 698.

19.15.34.12 A
(2) A recycling containment shall have a properly constructed foundation and interior slopes consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. Geotextile is required under the liner when needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity. The operator shall construct the containment in a levee with an inside grade no steeper than two horizontal feet to one vertical foot (2H:1V). The levee shall have an outside grade no steeper than three horizontal feet to one vertical foot (3H:1V). The top of the levee shall be wide enough to install an anchor trench and provide adequate room for inspection and maintenance.

Examination of the SOP shows that the AST Containment contractor will conform to the following mandates of the Rule:

- the AST Containment will have a properly constructed compacted earth foundation and interior slopes (vertical steel) consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear.
- Geotextile will be placed under the liner where needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity.
- If the AST Containment contractor constructs the containment in a levee, the inside grade is no steeper than two horizontal feet to one vertical foot (2H: 1V) and the outside grade no steeper than three horizontal feet to one vertical foot (3H: IV). The vertical steel walls of the AST Containment are the *subject of a requested variance*.

19.15.34.12 A
(6) At a point of discharge into or suction from the recycling containment, the operator shall insure that the liner is protected from excessive hydrostatic force or mechanical damage. External discharge or suction lines shall not penetrate the liner.

The Operator will ensure that at a point of discharge into or suction from the recycling containment, the liner is protected from excessive hydrostatic force or mechanical damage and external discharge or suction lines shall not penetrate the liner.

Liner and Leak Detection Materials

19.15.34.12 A
(4) All primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. All primary liners shall be 30-mil flexible PVC, 45-mil LLDPE string reinforced or 60-mil HDPE liners. Secondary liners shall be 30-mil LLDPE string reinforced or equivalent with a hydraulic conductivity no greater than 1 x 10-9 cm/sec. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

The liner and geotextile specifications show that all primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. All primary liners shall be *an equivalent liner [to that stated in Rule 34] approved by OCD pursuant to a variance.* The liner system is presented in an earlier section of this submission.

All secondary liners shall be *an equivalent liner [to that stated in Rule 34] approved by OCD pursuant to a*

variance. The liner system is presented in an earlier section of this submission.

Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

The AST Containment will have a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet to facilitate drainage.

Install Secondary Liner, Leak Detection System and Secondary Containment

All AST containments holding produced water will have a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. The rule states that the edges of all secondary liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep. *The lack of an anchor trench with an AST Containment is also the subject of requested variance.*

19.15.34.12 A
(3) Each recycling containment shall incorporate, at a minimum, a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.

The AST Containment Contractor will cause the recycling containment will have a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet to facilitate drainage. The leak detection system shall consist of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection.

19.15.34.12 A
(7) The operator of a recycling containment shall place a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet or two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection.

The presence of the secondary containment levee or pre-fabricated secondary containment meets the OCD Rule mandate that a recycling containment shall design the containment to prevent run-on of surface water. The containment shall be surrounded by a berm, ditch or other diversion to prevent run-on of surface water.

19.15.34.12 A
(8) The operator of a recycling containment shall design the containment to prevent run-on of surface water. The containment shall be surrounded by a berm, ditch or other diversion to prevent run-on of surface water.

AST Containment Setup

As with the secondary liner, AST Containment contractor will minimize liner seams and orient them up and down, as much as possible, not across, a slope. Factory welded seams shall be used where possible. AST Containment contractor will employ field seams in

19.15.34.12 A
(5) The operator of a recycling containment shall minimize liner seams and orient them up and down, not across, a slope of the levee. Factory welded seams shall be used where possible. The

geosynthetic material that are thermally seamed. Prior to field seaming, AST Containment contractor shall overlap liners four to six inches and minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the AST Containment bottom. Qualified personnel shall perform field welding and testing.

operator shall ensure field seams in geosynthetic material are thermally seamed. Prior to field seaming, the operator shall overlap liners four to six inches. The operator shall minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the slope's toe. Qualified personnel shall perform field welding and testing.

Fluid Injection/Withdrawal Flow Diverter

The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

19.15.34.13 B
(3) The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

General Specifications

This plan provides additional protocols to cause the proposed recycling containments (AST Containments) to conform to NMOCD Rules.

The operator will maintain and operate the recycling containments and facility in accordance with the following plan to contain liquids and maintain the integrity of the liner to prevent contamination of fresh water and protect public health and the environment.

- The operator will use the treated produced water in the containments for drilling, completion (stimulation), producing or processing oil or gas or both. If other uses are planned, the operator will notify the OCD though the submission of a modified C-147.
- For all exploration and production operations that use produced water, the operator will conduct these activities in a manner consistent with hydrogen sulfide gas provisions in 19.15.11 NMAC or NORM provisions in 19.15.35 NMAC, as applicable.
- The operator will address all releases from the recycling and re-use of produced water in accordance with 19.15.29 NMAC.
- The operator will not discharge into or store any hazardous waste in the recycling containments, but they may hold fluids such was freshwater, brackish water, recycled and treated water, water generated by oil or gas processing facilities, or other waters that are gathered for well drilling or completion. The recycling facility will not be used for the disposal of produced water. The operator will maintain the containments free of miscellaneous solid waste or debris.
- The operator will verify that no oil is on the surface of the contained fluid. If oil is observed, the oil shall be removed using an absorbent boom or other device and properly disposed at an approved facility. An absorbent boom or other device will be maintained on site.
- The operator will install and use a header and diverter described in the design/construction plan in order to prevent damage to the liner by erosion, fluid

19.15.34.10 B
Recycling containments may hold produced water for use in connection with drilling, completion, producing or processing oil or gas or both.

19.15.34.8 A
(5) All operations in which produced water is used shall be conducted in a manner consistent with hydrogen sulfide gas provisions in 19.15.11 NMAC or NORM provisions in 19.15.35 NMAC, as applicable.

19.15.34.8 A
(6) All releases from the recycling and re-use of produced water shall be handled in accordance with 19.15.29 NMAC.

19.15.34.10 B
Recycling containments may hold produced water for use in connection with drilling, completion, producing or processing oil or gas or both. Such fluids may include fresh water, brackish water, recycled and treated water, fluids added to water to facilitate well drilling or completion, water produced with oil and gas, flowback from operations, water generated by an oil or gas processing facility or other waters that are gathered for well drilling or completion but may not include any hazardous waste.

19.15.34.9 G
Recycling facilities may not be used for the disposal of produced water.

19.15.34.13 B
(1) The operator shall remove any visible layer of oil from the surface of the recycling containment
(7) The operator shall install, or maintain on site, an oil absorbent boom or other device to contain an unanticipated release.

19.15.34.13 B
(3) The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

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jets or impact from installation and removal of hoses or pipes during injection or withdrawal of liquids.

- *Pursuant to a requested variance*, the operator will maintain at least 2-feet of freeboard in each AST containment. Under extenuating circumstances, which will be noted on the inspection log as described below, the operator may temporarily exceed the freeboard mandate.

19.15.34.13 B
(2) The operator shall maintain at least three feet of freeboard at each containment.

- If the liner develops a leak or if any penetration of the liner occurs above the liquid's surface, then the operator will repair the damage or initiate replacement of the liner within 48 hours of discovery or will seek a variance from the division district office within this time period.

19.5.34.13 B
(4) If the containment's primary liner is compromised above the fluid's surface, the operator shall repair the damage or initiate replacement of the primary liner within 48 hours of discovery or seek an extension of time from the division district office.

- If visible inspection suggests that the liner developed a leak or if any penetration of the liner occurs below the liquid's surface, then the operator will remove all liquid above the damage or leak line within 48 hours of discovery. The operator will also notify the district division office within this same 48 hours of the discovery and repair the damage or replace the liner.

(5) If the primary liner is compromised below the fluid's surface, the operator shall remove all fluid above the damage or leak within 48 hours of discovery, notify the division district office and repair the damage or replace the primary liner.

- In the event of a leak due to a hole in the liner, the following steps will be followed:
  1. If the source of the fluid is uncertain, comparative field tests may need to be performed on both the water in the containment and that which may have been released (e.g. pH, conductance, and chloride).
  2. If the fluid is found to be coming from the containment, determine the location from which the leak is originating.
  3. Mark the point where the water is coming out of the tank.
  4. Locate the puncture or hole in the liner.
  5. Empty the containment to the point of damage in liner.
  6. Clean area of liner that needs to be repaired.
  7. Cut out piece of material (patch or tape) to overlay liner.

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8. Either weld the patch to the injured area in the liner or apply tape over the rupture.
9. Make sure rupture is completely covered.
10. Monitor as needed.

The operator will inspect and remove, as necessary, surface water run-on accumulated in the secondary containment

Monitoring, Inspections, and Reporting

The containment will contain enough produced water to prevent any shifting of the liner. Weekly inspections shall occur when there is 1-foot depth or more of produced water in the containment. Monthly inspections shall occur when there is less than 1-foot depth of produced water in the containment, as well as when the ASTs are emptied and prior to refilling. An inspection log will be maintained by the operator and will be made available to the division upon request. Inspection will include: freeboard monitoring, leak detection, identifying potential hazards that may have developed, change in site conditions or if the contents of the containment change from the initial use.
An "Inspection Form" meeting the requirements according to NMAC 19.15.34 is to be filled out during these routine inspections. The form also provides a list of observations that will enable early detection of uneven tank panel settlement, soil settlement, liner damage, insufficient liner slack, or leaks. The form is reproduced at the end of this section.

Weekly inspections consist of:

- Reading and recording the fluid height of staff gauges and freeboard
- Recording any evidence of visible oil on surface
- Visually inspecting the containments exposed liners
- Checking the leak detection system for any evidence of a loss of integrity of the primary liner
- Inspect any diversion ditches and berms around the containment to check for erosion and collection of surface water run-on.
- Inspect the leak detection system for evidence of damage or malfunction and monitor for leakage.

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- Inspect netting (may not be used if Mega Blaster Pro avian deterrent is used) for damage or dead wildlife, including migratory birds. Operator shall report the discovery of a dead animal to the appropriate wildlife agency and to the district within 30 days of discovery. Further prevention measures may be required.

19.15.34.12 E
Netting. The operator shall ensure that a recycling containment is screened, netted or otherwise protective of wildlife, including migratory birds. The operator shall on a monthly basis inspect for and, within 30 days of discovery, report the discovery of dead migratory birds or other wildlife to the appropriate wildlife agency and to the division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

Additional monitoring to identify hazards that may have developed, changes in site conditions, tank use, and to enable early detection of structural issues such as uneven tank panel settlement, soil settlement, liner damage, insufficient liner slack or leaks. If changes are noted the AST contractor should be notified

- If observed conditions indicate a potential tank failure is imminent, the vicinity will be immediately cleared and the AST will be drained.

Monthly, the operator will:

- Report to the division, the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148.
- Record sources and disposition of all recycled water.

Cessation of Operations

If less than 20% of the total fluid capacity is utilized every six months, beginning from the first withdraw, operation of the facility has ceased and the division district office will be notified. The division district may grant an extension not to exceed six months to determine the cessation of operations.

19.15.34.13 C
A recycling containment shall be deemed to have ceased operations if less than 20% of the total fluid capacity is used every six months following the first withdrawal of produced water for use. The operator must report cessation of operations to the appropriate division district office. The appropriate division district office may grant an extension to this determination of cessation of operations not to exceed six months.

The operator will remove all fluids from the recycling facility within 60 days of cessation of operations. An extension, not to exceed 2 months, may be granted by the district division for the removal of fluids from the facility.

19.15.34.14 A
Once the operator has ceased operations, the operator shall remove all fluids within 60 days and close the containment within six months from the date the operator ceases operations from the containment for use. The division district office may grant an extension for the removal of all fluids not to exceed two months.

The breakdown of the containments follows the reverse order of the setup steps presented in the set-up manual.

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Inspection Form

Telluride Air Gap AST

(weekly inspection when fluids are present, monthly otherwise)

Date: _____

Tank ID: _____

Fluid Level: _____ Tank contents: _____

Inspection Task	Results		Remarks, Observations, and/or Remedial Actions
Visible Oil on Surface	☐ None Observed	☐ Yes, Describe Action	
An absorbent boom or similar device is located on site to remove visible oil from surface.			
At least 2 ft of freeboard	☐ Yes	☐ No, Measure Freeboard	
Evidence of surface water run-on	☐ None Observed	☐ Yes, Describe	
Check for excessive erosion of perimeter berms.			
Birds or wildlife in net or screen	☐ None Observed	☐ Yes, Describe	
Within 30 days of discovery, report dead birds or wildlife to the appropriate agency (USFWS, NMDGF) and to NMOCD District II.			
Damage to netting or screen	☐ None Observed	☐ Yes, Describe	
Rupture of Liner	☐ None Observed	☐ Yes, Describe	
If rupture is above fluid level, repair within 48 hours. If below fluid level, remove fluid above within 48 hours, notify NMOCD District II, and repair.			
Clips or clamps properly securing liner	☐ Yes	☐ No, Describe	
If low level, enough liner slack on panel wall	☐ Yes	☐ No, Describe	
Uneven gaps between panels	☐ None Observed	☐ Yes, Describe	

Signs of tank settlement	☐ None Observed	☐ Yes, Describe	
Erosion of soil surrounding tank (10 ft radius)	☐ None Observed	☐ Yes, Describe	
Running water on the ground	☐ None Observed	☐ Yes, Describe	
Unusual ponding of fluid inside berm	☐ None Observed	☐ Yes, Describe	
		Field test (pH, Cl-, conductance, etc.) ponded fluid and compare to fluid in tank. If tank is determined as the source, locate and repair rupture within 48 hours. Notify NMOCD District II and repair.	
Rust or corrosion on panels, stairs, or hardware	☐ None Observed	☐ Yes, Describe	
Damage to any hardware	☐ None Observed	☐ Yes, Describe	

Additional Observations or Actions: _____

_____

_____

_____

_____

_____

_____

_____

Inspected by: _____

Closure Plan

The containments are expected to contain a small volume of solids, the majority of which will be windblown sand and dust with some mineral precipitates from the water.

The operator will notify the division district (phone or email) before initiating closure of the containments and/or facility.

Excavation and Removal Closure Plan – Protocols and Procedures

1. Residual fluids in the containments will be sent to disposal at a division-approved facility.
2. The operator will remove all solid contents and transfer those materials to the following division-approved facility:
3. If possible, geomembrane textiles and liners that exhibit good integrity may be recycled for use as an under liner of tank batteries or other use as approved by OCD.
4. Disassemble the recycling containment infrastructure according to manufacturer's recommendations
5. After the disassemble of the containments and removal of the contents and liners, soils beneath the tanks will be tested as follows
    a. Collect a five-point (minimum) composite from beneath the liner to include any obviously stained or wet soils, or any other evidence of impact from the containments for laboratory analyses for the constituents listed in Table I of 19.15.34.14 NMAC.
    b. If any concentration is higher than the parameters listed in Table I, additional delineation may be required, and closure activities will not proceed without Division approval.
    c. If all constituents' concentrations are less than or equal to the parameters listed in Table I, then the operator will backfill the facility as necessary using non-waste containing, uncontaminated, earthen material and proceed to reclaim the surface to pre-existing conditions.

19.15.34.14 B
The operator shall close a recycling containment by first removing all fluids, contents and synthetic liners and transferring these materials to a division approved facility.

19.15.34.14 C
The operator shall test the soils beneath the containment for contamination with a five-point composite sample which includes stained or wet soils, if any, and that sample shall be analyzed for the constituents listed in Table I below.
(1) If any contaminant concentration is higher than the parameters listed in Table I, the division may require additional delineation upon review of the results and the operator must receive approval before proceeding with closure.
(2) If all contaminant concentrations are less than or equal to the parameters listed in Table I, then the operator can proceed to backfill with non-waste containing, uncontaminated, earthen material.

Closure Documentation

Within 60 days of closure completion, the operator will submit a closure report (Form C-147) to the District Division, with necessary attachments to document all closure activities are complete, including sampling results and details regarding backfilling and capping as necessary.

19.15.34.14 D
Within 60 days of closure completion, the operator shall submit a closure report on form C-147, including required attachments, to document all closure activities including sampling results and the details on any backfilling, capping or covering, where applicable. The closure report shall certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in division rules or directives.

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In the closure report, the operator will certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in the closure plan.

19.15.34.14 E
Once the operator has closed the recycling containment, the operator shall reclaim the containment's location to a safe and stable condition that blends with the surrounding undisturbed area. Topsoils and subsoils shall be replaced to their original relative positions and contoured so as to achieve erosion control, long-term stability and preservation of surface water flow patterns. The disturbed area shall then be reseeded in the first favorable growing season following closure of a recycling containment. The operator shall substantially restore the impacted surface area to the condition that existed prior to the construction of the recycling containment.

Reclamation and Re-vegetation

The operator will reclaim the surface to safe and stable pre-existing conditions that blends with the surrounding undisturbed area. "Pre-existing conditions" may include a caliche well pad that existed prior to the construction of the recycling containment and that supports active oil and gas operations.

Areas not reclaimed as described herein due to their use in production or drilling operations will be stabilized and maintained to minimize dust and erosion.

For all areas disturbed by the closure process that will not be used for production operations or future drilling, the operator will substantially restore the surface to the condition that existed prior to the construction of the recycling containment:

1. Replace topsoils and subsoils to their original relative positions
2. Contour so as to achieve erosion control, long-term stability and preservation of surface water flow patterns
3. Reseed in the first favorable growing season following closure

19.15.34.14 G
The re-vegetation and reclamation obligations imposed by federal, state trust land or tribal agencies on lands managed by those agencies shall supersede these provisions and govern the obligations of any operator subject to those provisions, provided that the other requirements provide equal or better protection of fresh water, human health and the environment.

Federal, state trust land, or tribal lands may impose alternate reclamation and re-vegetation obligations that provide equal or better protection of fresh water, human health, and the environment. Re-vegetation and reclamation plans imposed by the surface owner will be outlined in communications with the OCD.

19.15.34.14 F
Reclamation of all disturbed areas no longer in use shall be considered complete when all ground surface disturbing activities at the site have been completed, and a uniform vegetative cover has been established that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds.

The operator will notify the division when the site meets the surface owner's requirements or exhibits a uniform vegetative cover that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds. The operator will notify the Division when reclamation and re-vegetation is complete.

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General Siting Criteria Demonstration and Site Specific Groundwater Data

8.
Siting Criteria for Recycling Containment

Instructions: The applicant must provide attachments that demonstrate compliance for each siting criteria below as part of the application. Potential examples of the siting attachment source material are provided below under each criteria.

General siting	
Ground water is less than 50 feet below the bottom of the Recycling Containment. NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells FIGURES 1-2	☐ Yes ☒ No ☐ NA
Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended. - Written confirmation or verification from the municipality; written approval obtained from the municipality FIGURE 3	☐ Yes ☒ No ☐ NA
Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division FIGURE 4	☐ Yes ☒ No
Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map FIGURE 5	☐ Yes ☒ No
Within a 100-year floodplain. FEMA map FIGURE 6	☐ Yes ☒ No
Within 300 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, or lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). - Topographic map; visual inspection (certification) of the proposed site FIGURE 7	☐ Yes ☒ No
Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image FIGURE 8	☐ Yes ☒ No
Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application. FIGURES 1 and 7 - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within 500 feet of a wetland. FIGURE 9 - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site	☐ Yes ☒ No

Distance to Groundwater

Figure 1, Figure 1a, Figure 2, Figure 2a, and the discussion presented below demonstrate that groundwater (fresh water, as defined by NMOCD Rules) at the location is greater than the required 50 feet below the proposed Telluride Air Gap Above-Ground Storage Tank Containment (Telluride AST). Specifically, the estimated depth to water is 167.6 feet.

Hydrogeology of Telluride Air Gap AST Containment

The proposed site for the Telluride AST is located approximately 30 miles east of the Pecos River and about 10.7 miles north of the Texas state line. It is located 3.25 miles southwest of the intersection of Battle Axe Rd and State Highway 128, south of Antelope Ridge, in the Antelope Ridge area of the Eunice Plain. According to Nicholson and Clebsch, the area is relatively flat with a surface covering of sand, which is underlain by a hard caliche layer. Below the caliche layer is likely the Ogallala Formation. Antelope Ridge itself is an anomalous feature for the area. It is higher than the surrounding plains, and Nicholson and Clebsch posit that Antelope Ridge is a remnant of the High Plains. According to the New Mexico State geologic map (seen on Figures 1 and 2), the Telluride AST is in an area where the surface unit is Quaternary age eolian piedmont deposits (Qe/Qp).

Plate 1 from Ground-Water Report 6, which is a geologic map that shows elevation contours of the erosional surface of the red-beds, which are part the Triassic Dockum Group, we estimate that the elevation of the top of the red-beds is about 3,300 feet above mean sea level (See Figure 2b). These data imply that the surface of the red-beds is approximately 52.6 feet below the surface. In Plate 2 of GWR-6, in the area of the Telluride AST, the source of groundwater is Triassic in age. This is reflected in the USGS wells in Figures 1 and 2. In the area surrounding the Telluride AST, there are several wells whose principal water bearing unit is the Chinle Formation, which is Triassic in age. From these data we conclude:

- Figure 2b suggests the top of the red-beds at this location is at a depth of (3352.6-3300 =) 52.6 feet.
- The principal water bearing unit in the area is Triassic in age, as seen on Plate 2 of GWR 6 and Figures 1 and 2.

Figure 1 is a topographic map overlain by transparent geologic map of the state of New Mexico and associated legend (Figure 1a) that displays the following:

- The Telluride AST identified by a blue square labeled by a yellow callout box.
- Water wells from the USGS database as cyan, purple, and blue triangles. The colors indicate the principle water bearing-unit for each well: Ogallala, Chinle, and units that are Not Defined, respectively. The well number as defined in the USGS database, recorded depth to water value, and date the water level measurement was recorded is displayed next to the corresponding well point.
- Miscellaneous water wells from public and non-public databases that were identified by field inspection or other published documents are represented by yellow, blue, and green squares with black dots at the center. The colors correspond to the depth to water

recorded in the RT Hicks database. The depth to water and date the depth to water value was recorded are also displayed.

- Water wells from the Office of the State Engineer WATERS database as light blue, light green, and dark blue circles with colored triangles that represent the depth to water. Well ID as documented in the OSE WATERS database, depth to water value, and the date the value was recorded.

Figure 2 and Figure 2a is a topographic map overlain by a transparent geologic map of the state of New Mexico and a potentiometric surface map and the associated legend that displays the following:

- The Telluride AST identified by a blue square labeled by a yellow callout box.
- Water wells from the USGS database as cyan, purple, and blue triangles. The colors indicate the principal water bearing-unit for each well: Ogallala, Chinle, and units that are Not Defined respectively. The well number as defined in the USGS database, recorded groundwater elevation value, and date the value was recorded is displayed next to the corresponding well point.
- Miscellaneous water wells from public and non-public databases that were identified by field inspection or other published documents are represented by yellow, blue, and green squares with black dots at the center. The colors correspond to the depth to water recorded in the RT Hicks database. The groundwater elevation and date the ground water elevation value was recorded are also displayed near the representative point on the map.
- Isocontours of a potentiometric surface are generated by RT Hicks Consultants, Ltd. USGS and Miscellaneous wells and their groundwater elevation values were used to create the potentiometric surface.

Depth to Groundwater Assessment

Misc-128, USGS 15087 and USGS-14998

The three measurements shown on Figure 2 about 1.4 miles to the east-northeast of the proposed containment are probably obtained from one or more wells at the same location (Baird Place), which is a corral and windmill site on recent air photos. These were measured by professionals and show a depth to water of 257.5 feet in 1954, 215.36 feet in 1970 and 224.42 feet in 1986. From 1970 to 1986, water levels are stable. We suspect the water level obtained in 1954 may not be 100% accurate.

Misc-304

This well is north of the Telluride AST site (Fairview Windmill) and is a windmill whose water level was obtained from Open File Report 95 and was measured in 1971. It is located 1.75 miles to the north of the site (Figures 1 and 2). The depth to water in MISC-304 is 218 feet, and the groundwater elevation is 3491.95 feet.

SITE USGS-15085

This is the same well as Misc-304 and the 2013 measurement shows a depth of 223.94 feet and a potentiometric surface of 3185. These data suggest that water level dropped by only 6 feet over the 42-year period and thus we contend the water levels are stable over time.

According to the potentiometric surface (as seen in Figure 2), the groundwater elevation in wells beneath the Telluride AST site is approximately 3185 feet. Thus, depth to water is (3352.6-3185=167.60) feet. We conclude the primary water-bearing unit in this area is the Chinle Formation. The analysis that lead to this conclusion is in the above Hydrogeology of the Telluride Air Gap Above-Ground Storage Tank.

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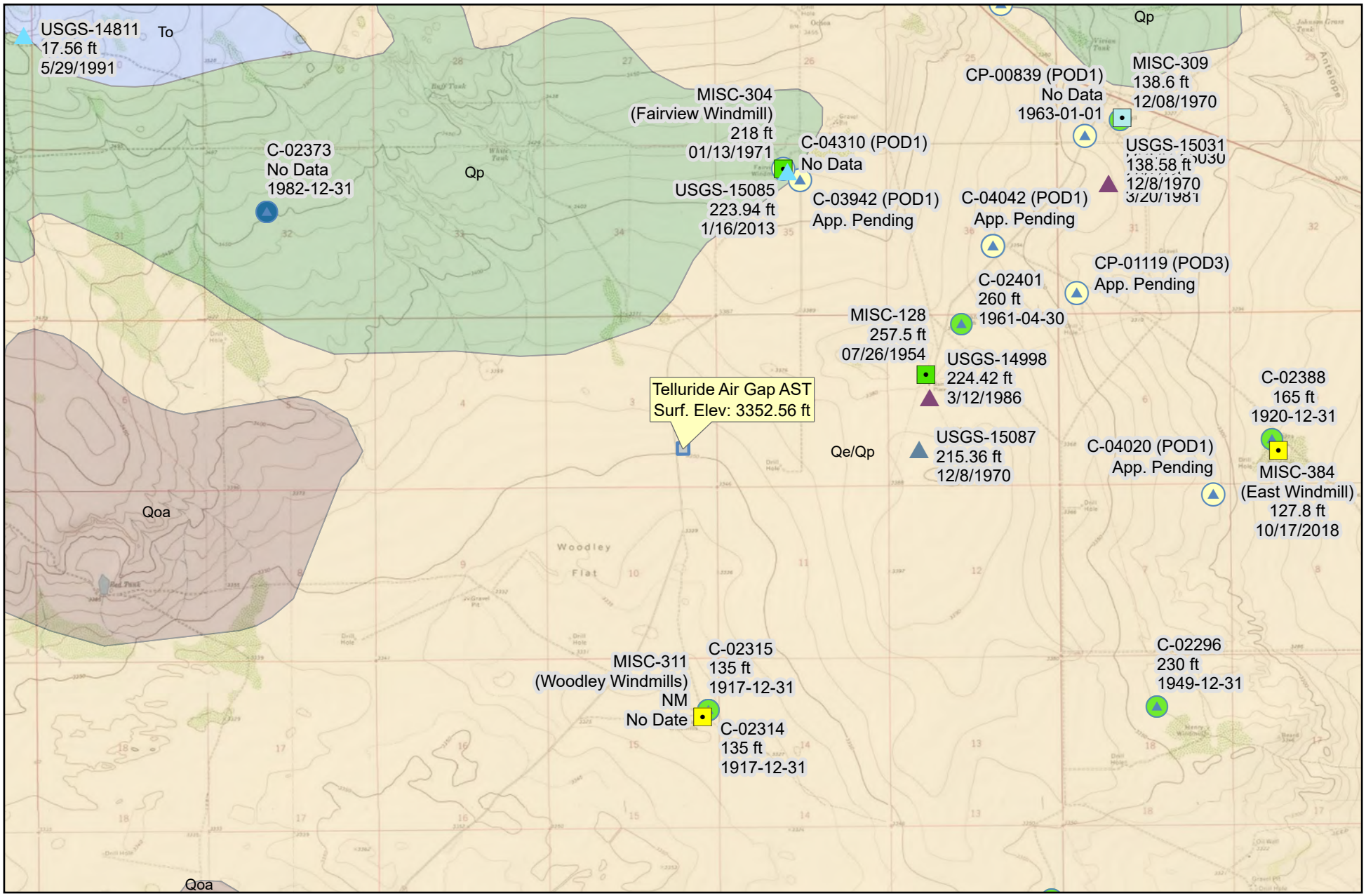

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Depth to Water and Geology

Solaris Water Midstream LLC –
Telluride Air Gap AST

Figure 1

April 2020

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Depth to Water and Geology	Figure 1a
	Solaris Midstream – Eddy State Recycling Containment Facility	April 2020

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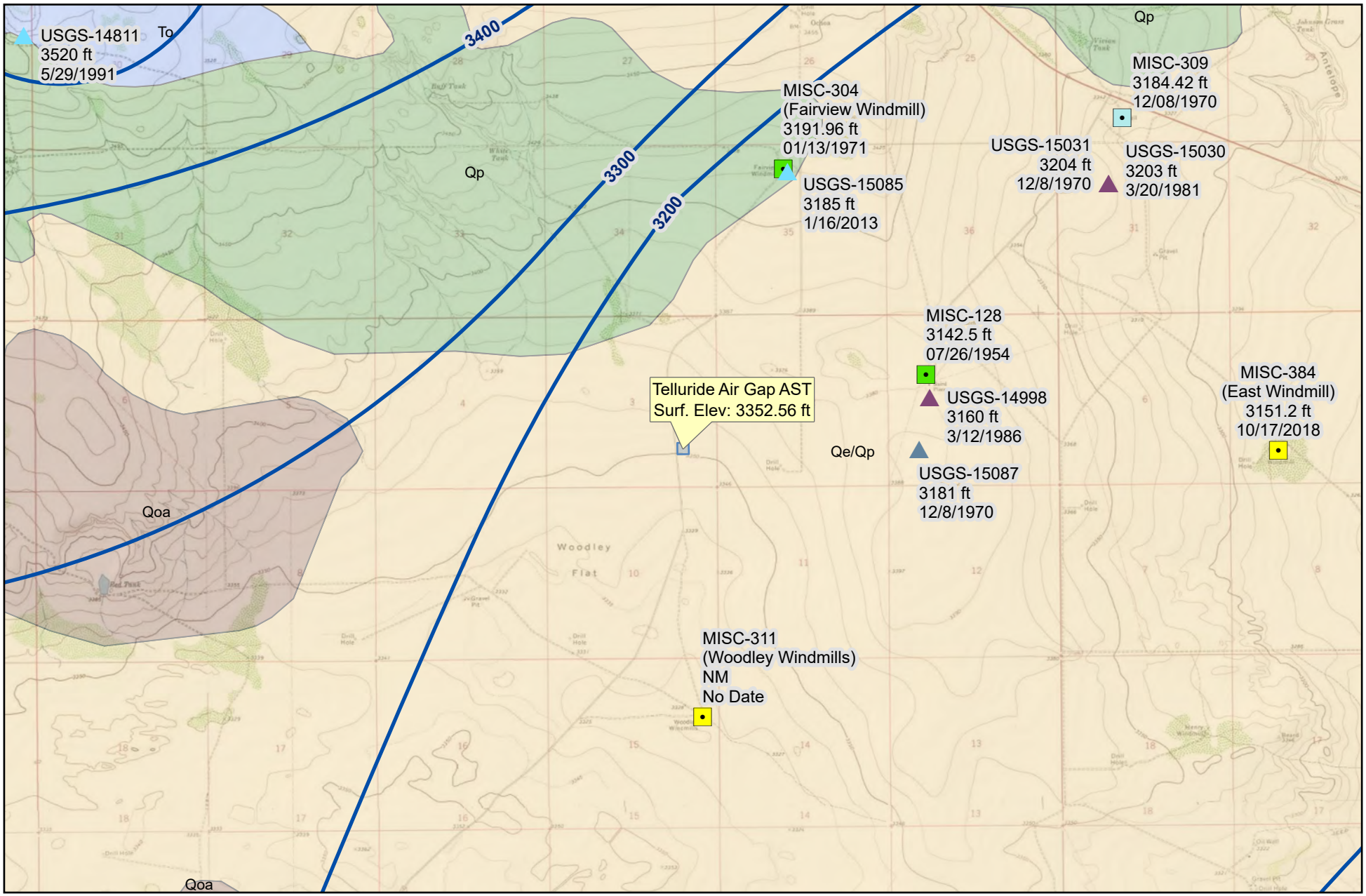

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Groundwater Elevation, Potentiometric Surface, and Geology

Solaris Water Midstream LLC – Telluride Air Gap AST

Figure 2

April 2020

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Ground Water Elevation, Potentiometric Surface, and Geology	Figure 2a
	Solaris Midstream – Eddy State Recycling Containment Facility	April 2020

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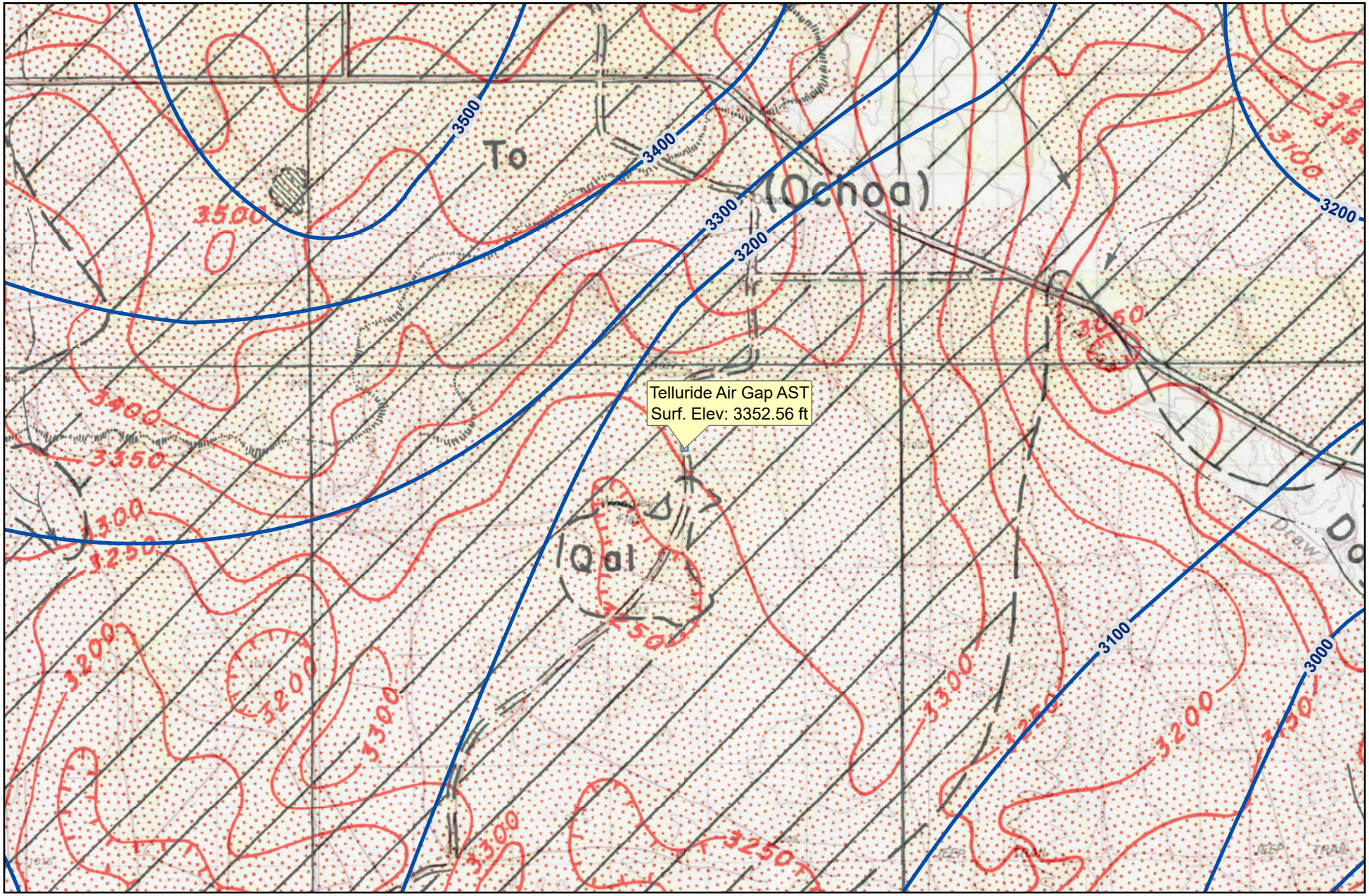

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Groundwater Elevation, Potentiometric Surface, and Red-Bed Surface

Solaris Water Midstream LLC – Telluride Air Gap AST

Figure 2b

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Distance to Municipal Boundaries and Freshwater Fields

Figure 3 demonstrates that the area of interest is not within incorporated municipal boundaries or within defined municipal freshwater well fields covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended

- The closest municipality is Jal, NM, which is about 15.5 miles to the southeast.
- The closest mapped well field is near Jal, NM approximately 11 miles to the southeast.

Distance to Subsurface Mines

Figure 4 and our general reconnaissance of the area demonstrate the absence of subsurface mines in the area.

- The nearest mapped surface mine is a closed and reclaimed gravel pit and lies approximately 1.5 miles to the southwest.
- There are no subsurface mines in the area.

Distance to High or Critical Karst Areas

Figure 5 illustrates the Telluride Recycling Facility's absence of mapped areas of high or critical karst potential.

- The proposed location for the recycling facility is wholly contained within an area considered low karst potential by the Bureau of Land Management.
- The closest area mapped as High Karst Potential is 8.74 miles to the south west.
- Our field investigation found no evidence of unstable ground or karst features

Distance to 100-Year Floodplain

Figure 6 demonstrates the absence of 100-year flood plains with respect to the proposed location for the Telluride Recycling Facility.

- The nearest 100-year flood plain is near the Jal municipality, approximately 15.5 miles to the southeast of the proposed recycling facility.

Distance to Surface Water

Figure 7 and the site visit demonstrate the that the Telluride facility is outside of the setback distances for a continuously flowing watercourse or the next lower order tributary, lakebed, sinkhole, playa lake (measured from the ordinary high-water mark) or spring.

- The Telluride AST site is not within 300 feet of a continuously flowing watercourse, or within 200 feet of any other significant watercourse, lakebed, sinkhole, playa lake (as measured from the ordinary high-water mark), or spring.
- Multiple lake/ponds (stock tank) lie approximately 2 and 2.5 miles to the northwest.
- The nearest watercourses are about 1.2 miles to the west-northwest. Each of these ephemeral streams terminate in a small, shallow depression
- The site visit documents the lack of watercourses within the setback distances.

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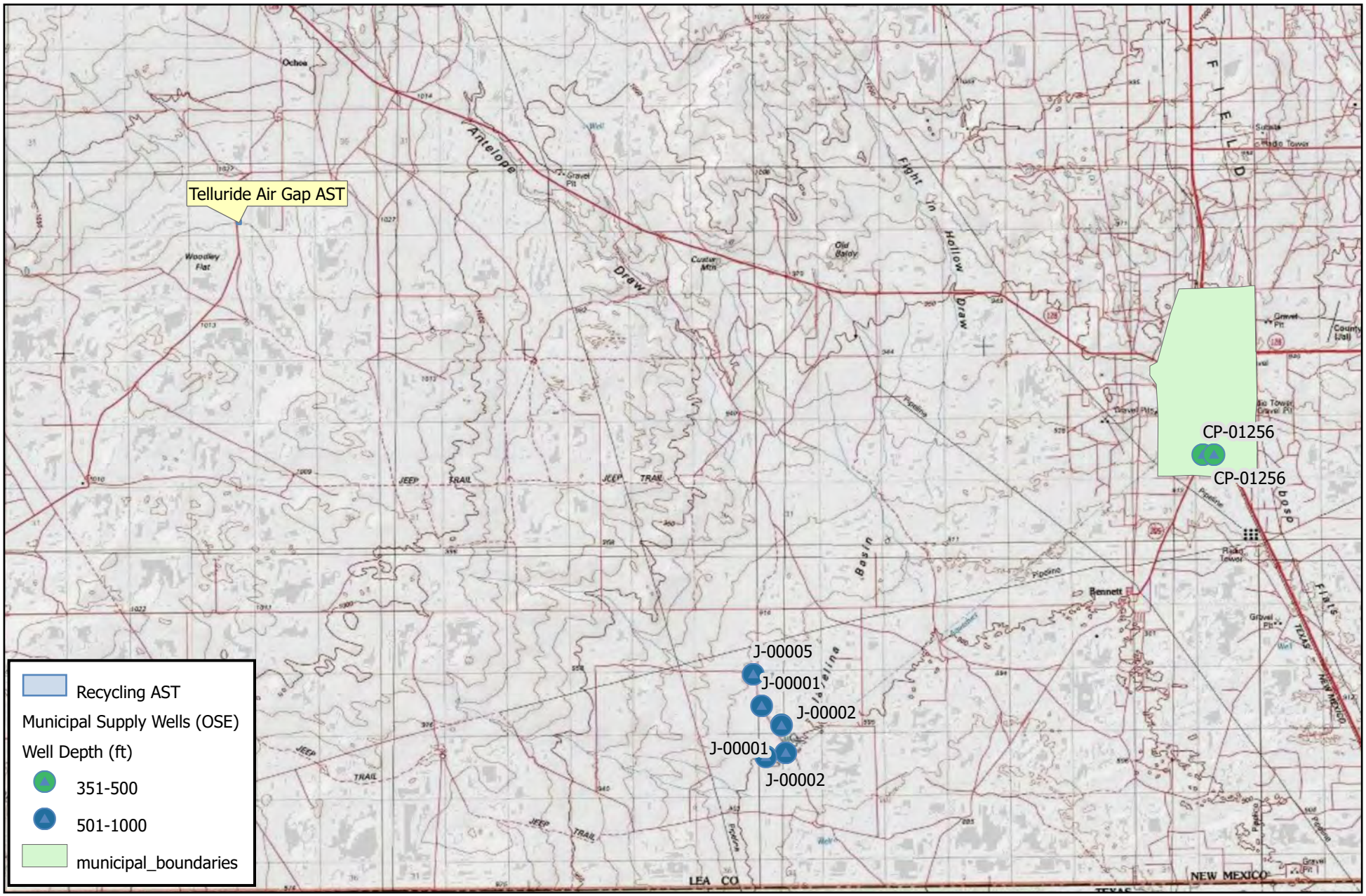

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Well Fields and Municipal Supply Wells

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Figure 3

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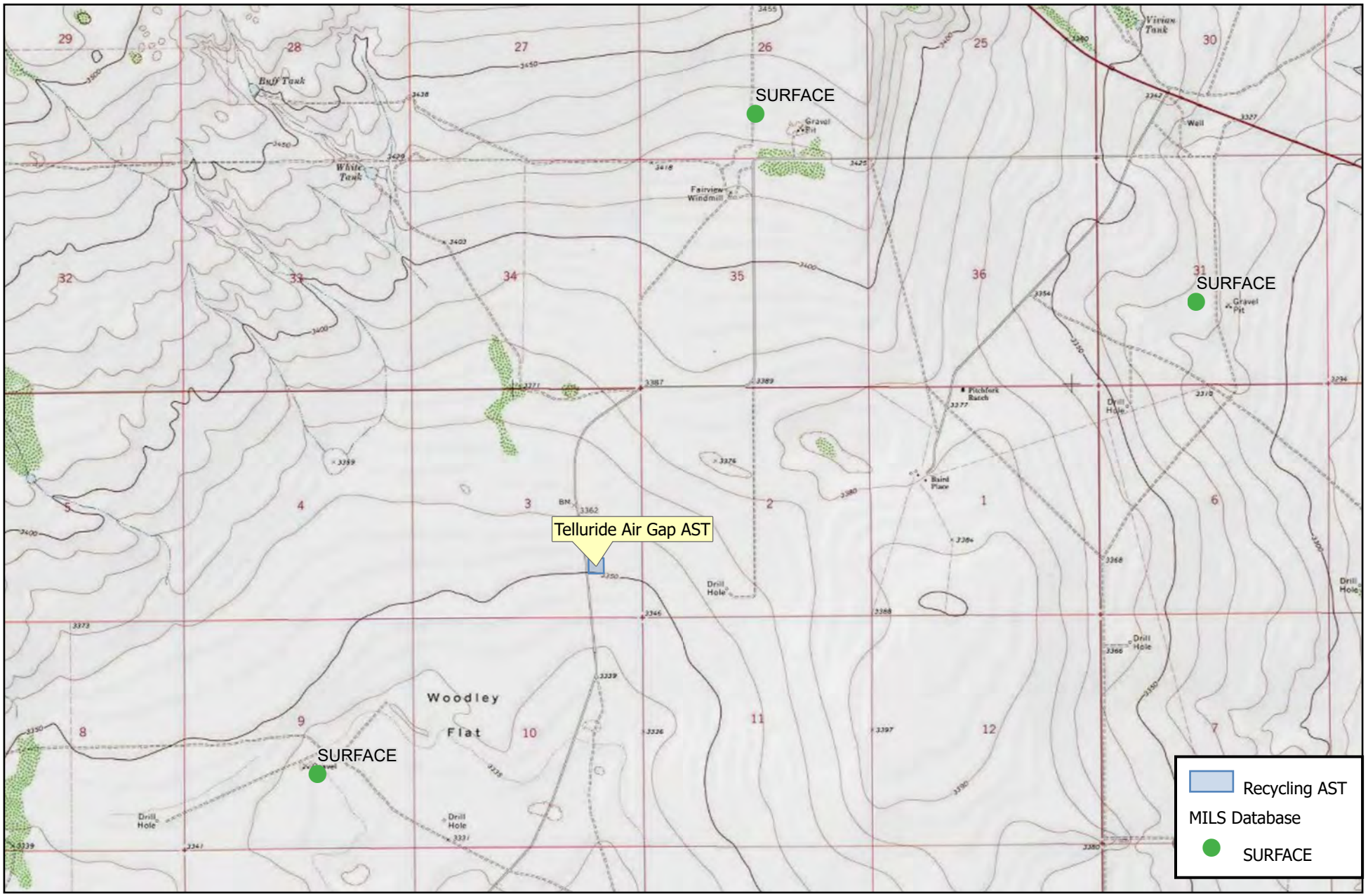

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Mines and Minerals

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Figure 4

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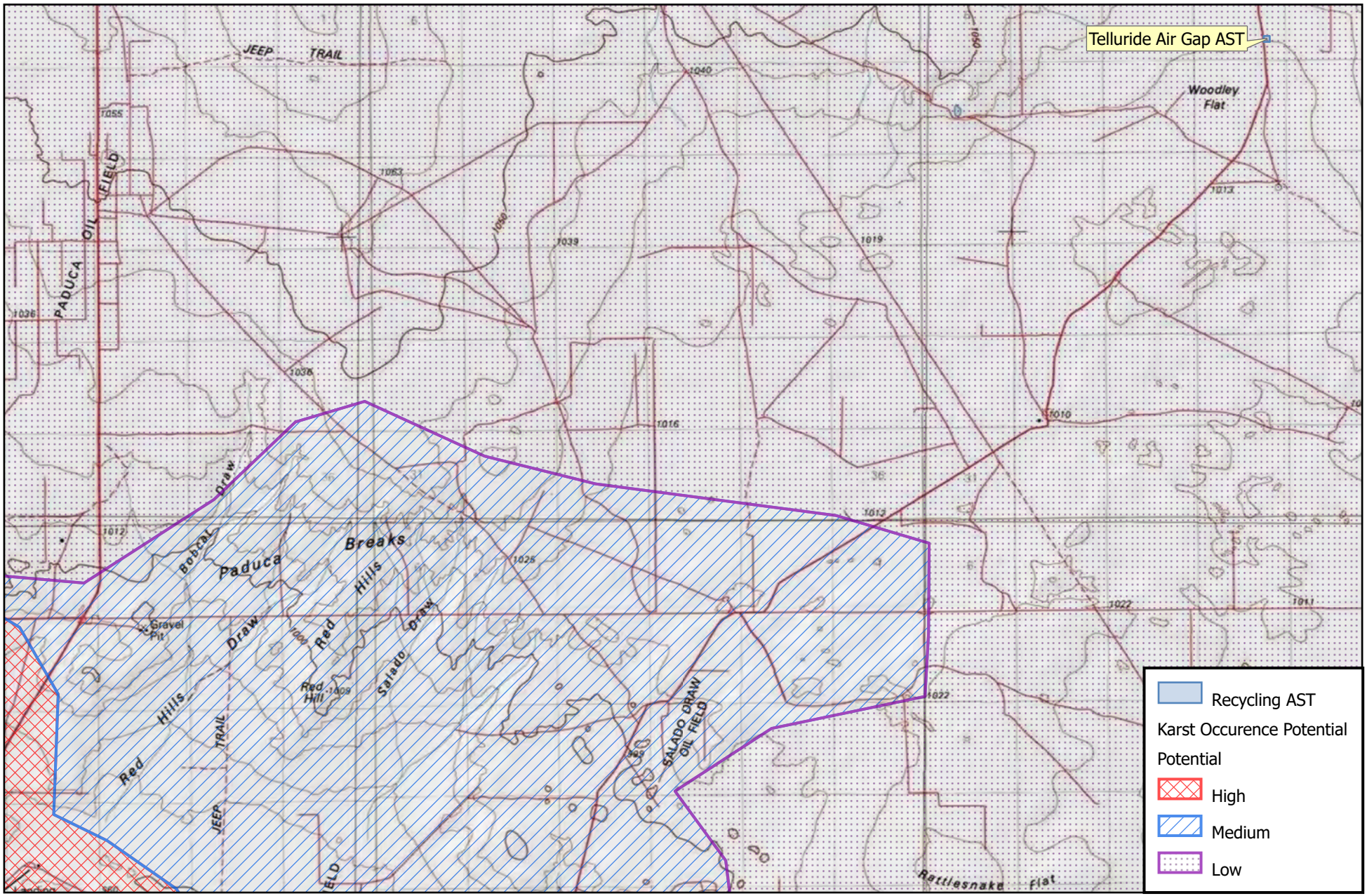

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Karst Potential

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Figure 5

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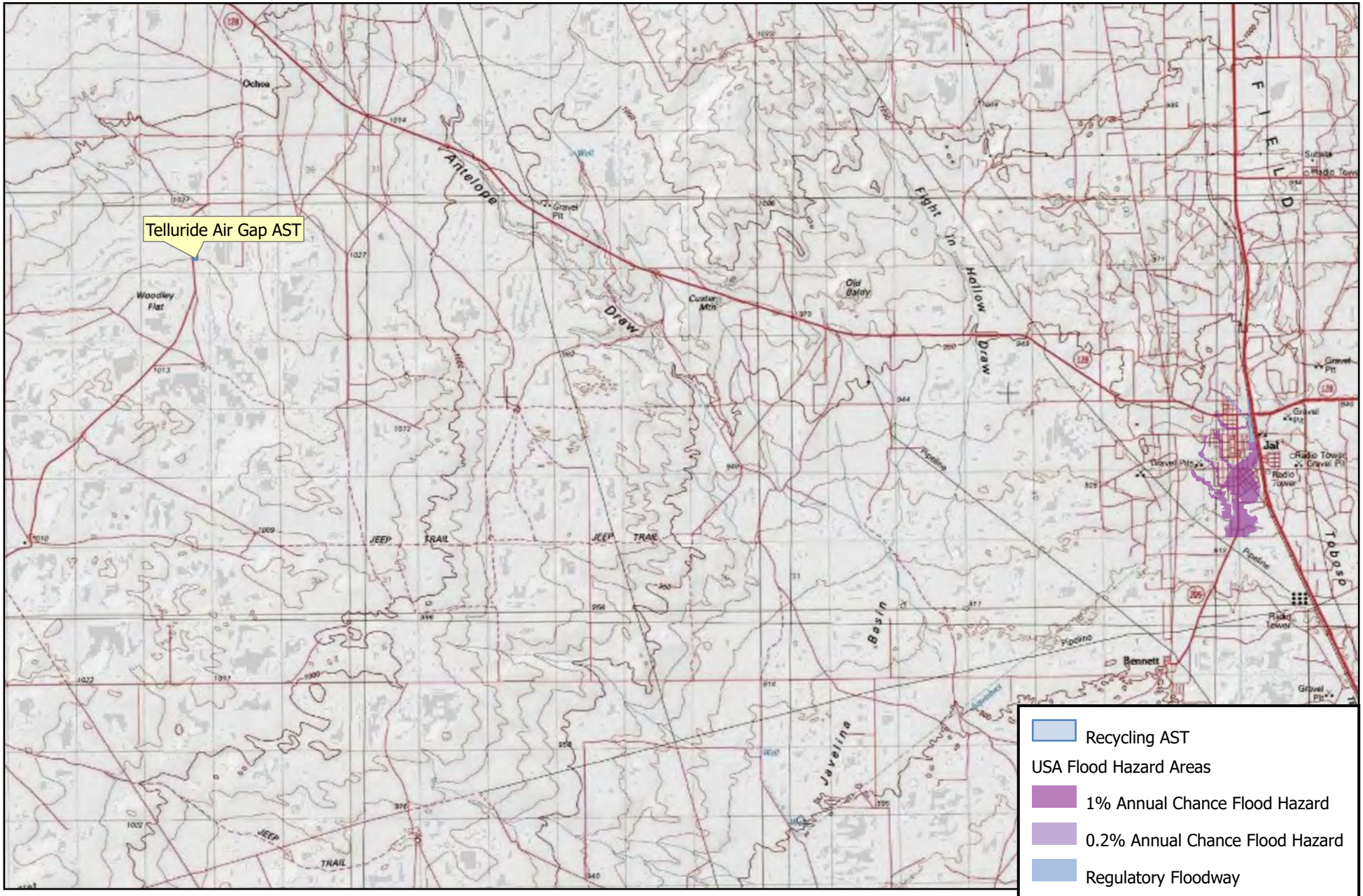

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Flood Hazards

Figure 6

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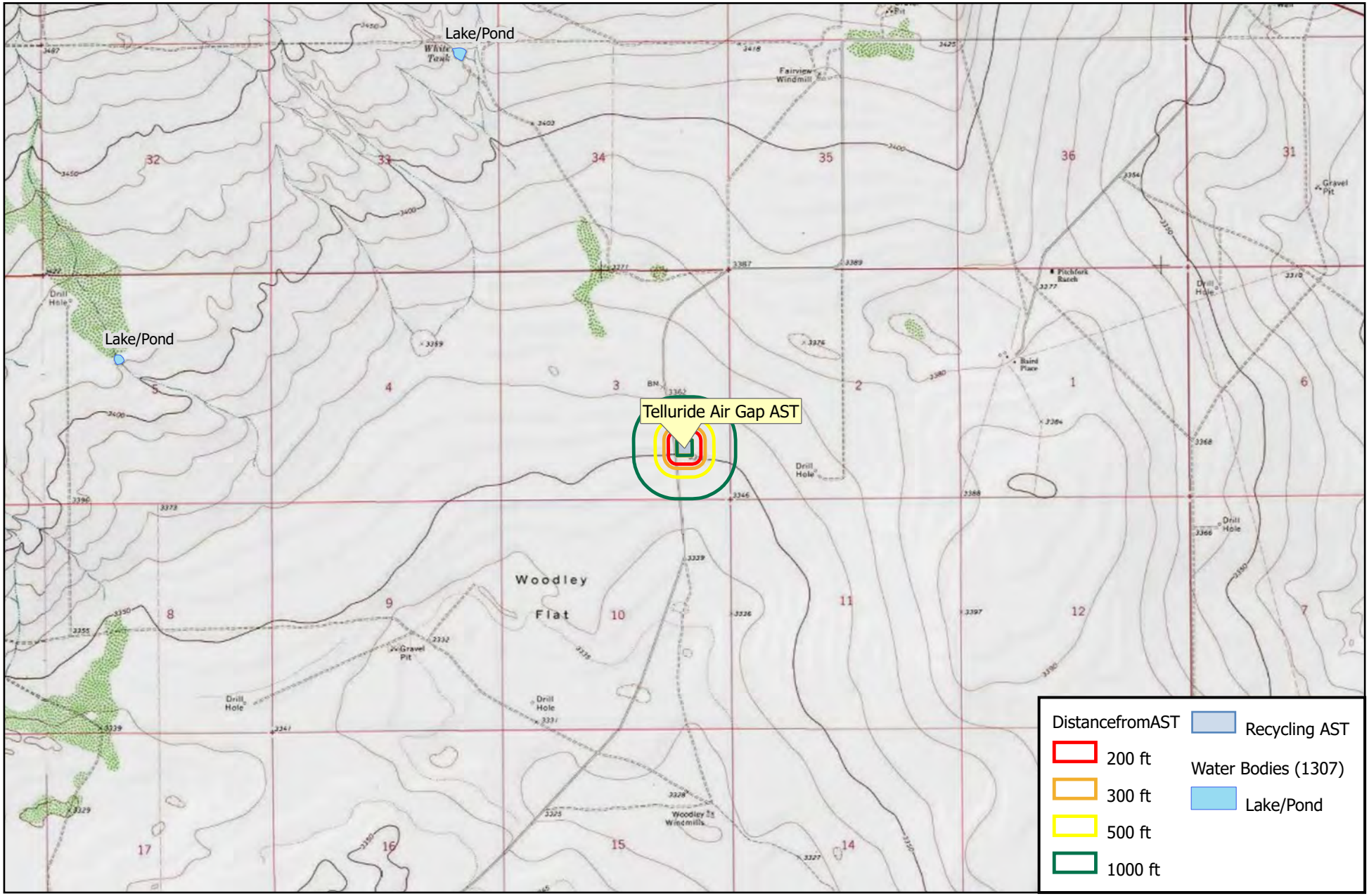

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Surface Water

Solaris Water Midstream LLC –
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Figure 7

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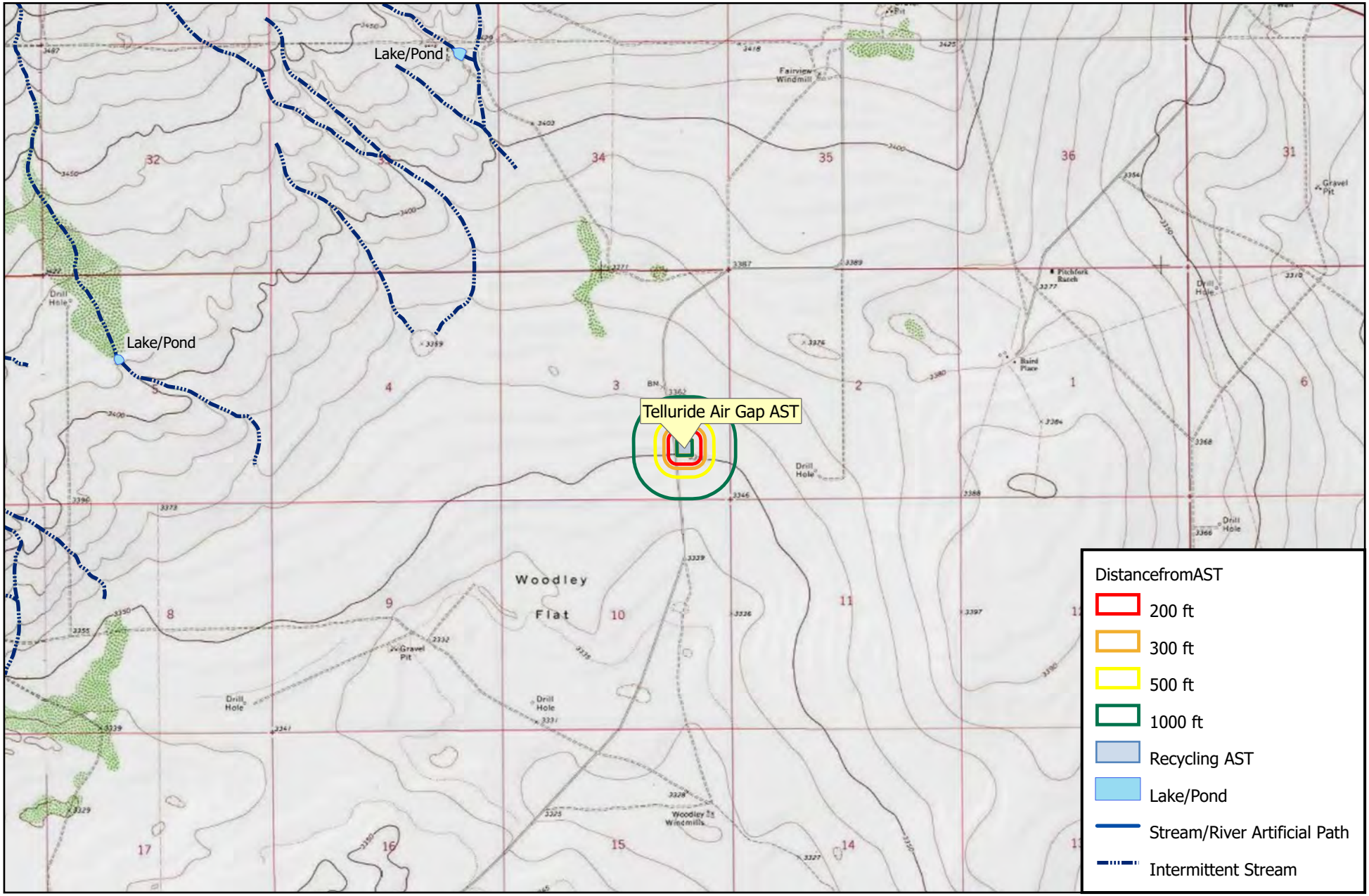

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Surface Water

Solaris Water Midstream LLC –
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Figure 7

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Distance to Permanent Residences or Structures

Figure 8 demonstrates that the proposed site for the Telluride Recycling Facility is not within the setback distances of an occupied permanent residence, school, hospital, institution, church or other structure at the time of the initial application.

- The only structures near the proposed site are the well pads, pipelines, and Battle Axe Road.

Distance to Non-Public Water Supply

Figures 1 and 7 demonstrate the Telluride location is not within the setback distances of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application.

- Figure 1 shows the location of all area water wells. The nearest well is located approximately 1.4 miles to the east of the proposed site (Baird Place wells discussed above).
- No domestic water wells are located within 1,000 feet of the recycling area.
- No springs were identified in the area.
- The facility is not within 500 feet of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application

Distance to Wetlands

Figure 9 demonstrates that the proposed site of the Telluride Recycling Facility is not within the 300-foot setback distance of a wetland.

- The nearest mapped wetland is a freshwater pond (the White stock tank) that is approximately 2 miles to the northwest.

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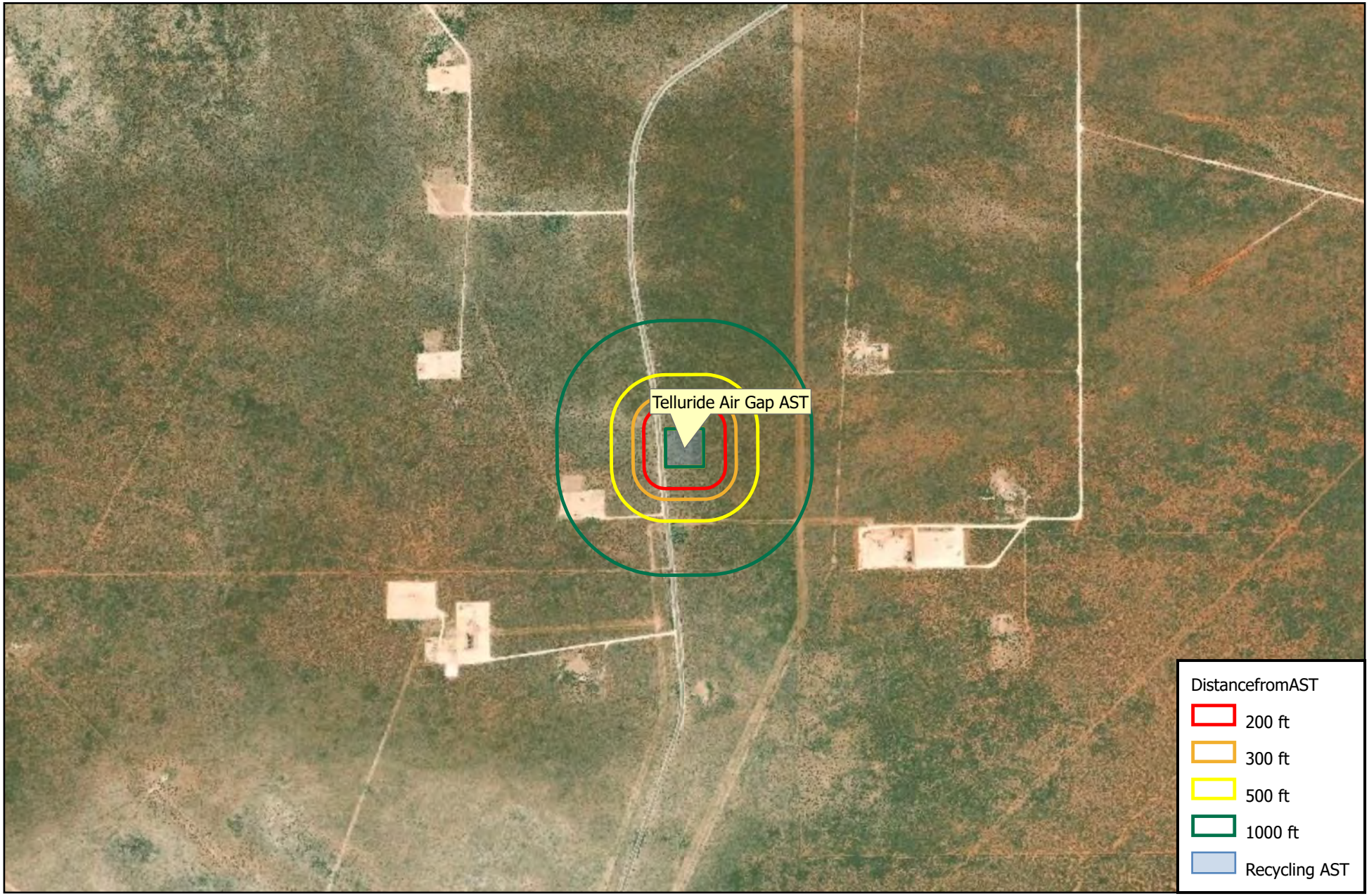

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Nearby Structures

Solaris Water Midstream LLC –
Telluride Air Gap AST

Figure 8

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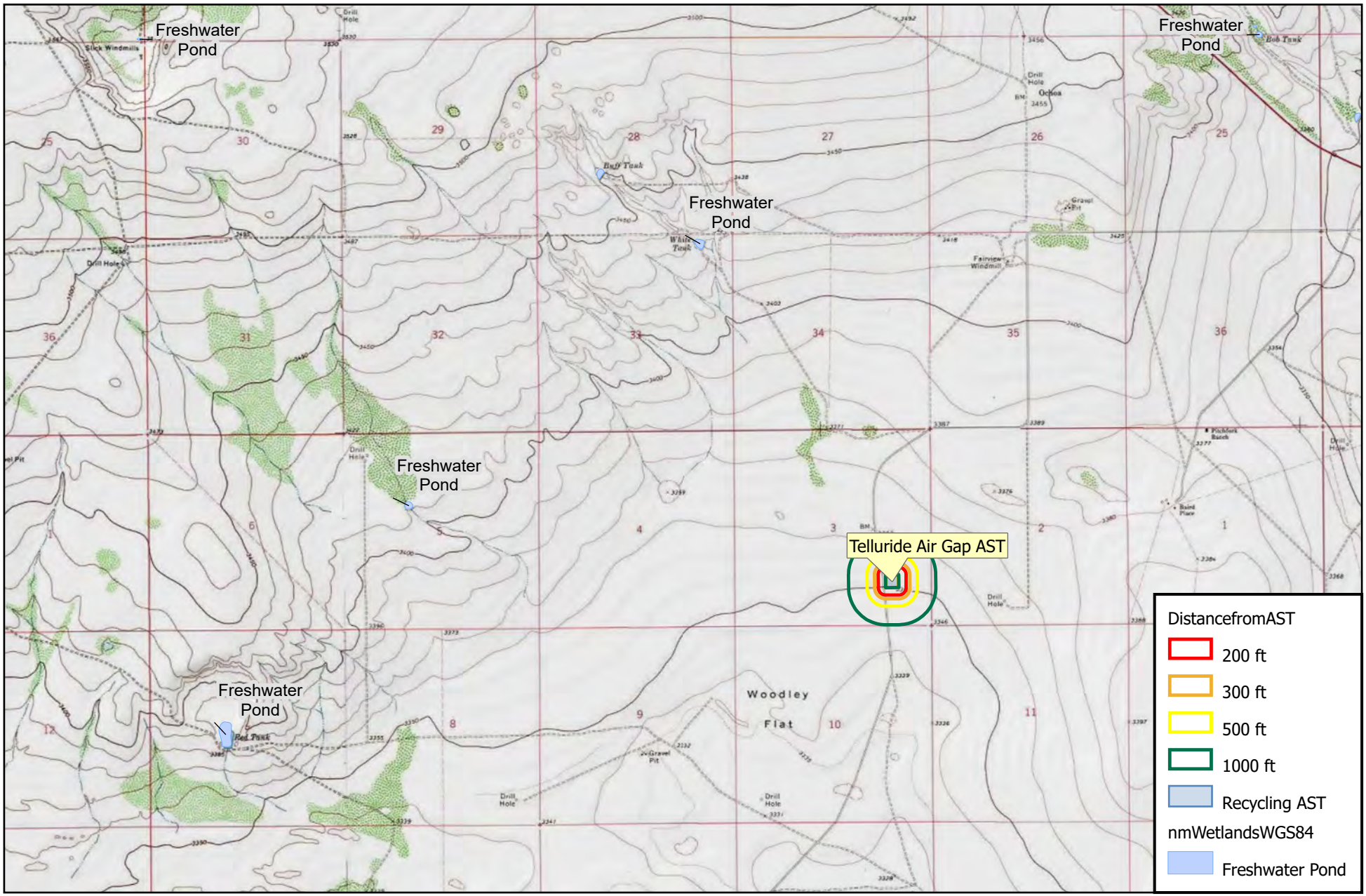

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Nearby Wetlands

Solaris Water Midstream LLC –
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Figure 9

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APPENDIX GROUND WATER REPORT 6 PLATE 2

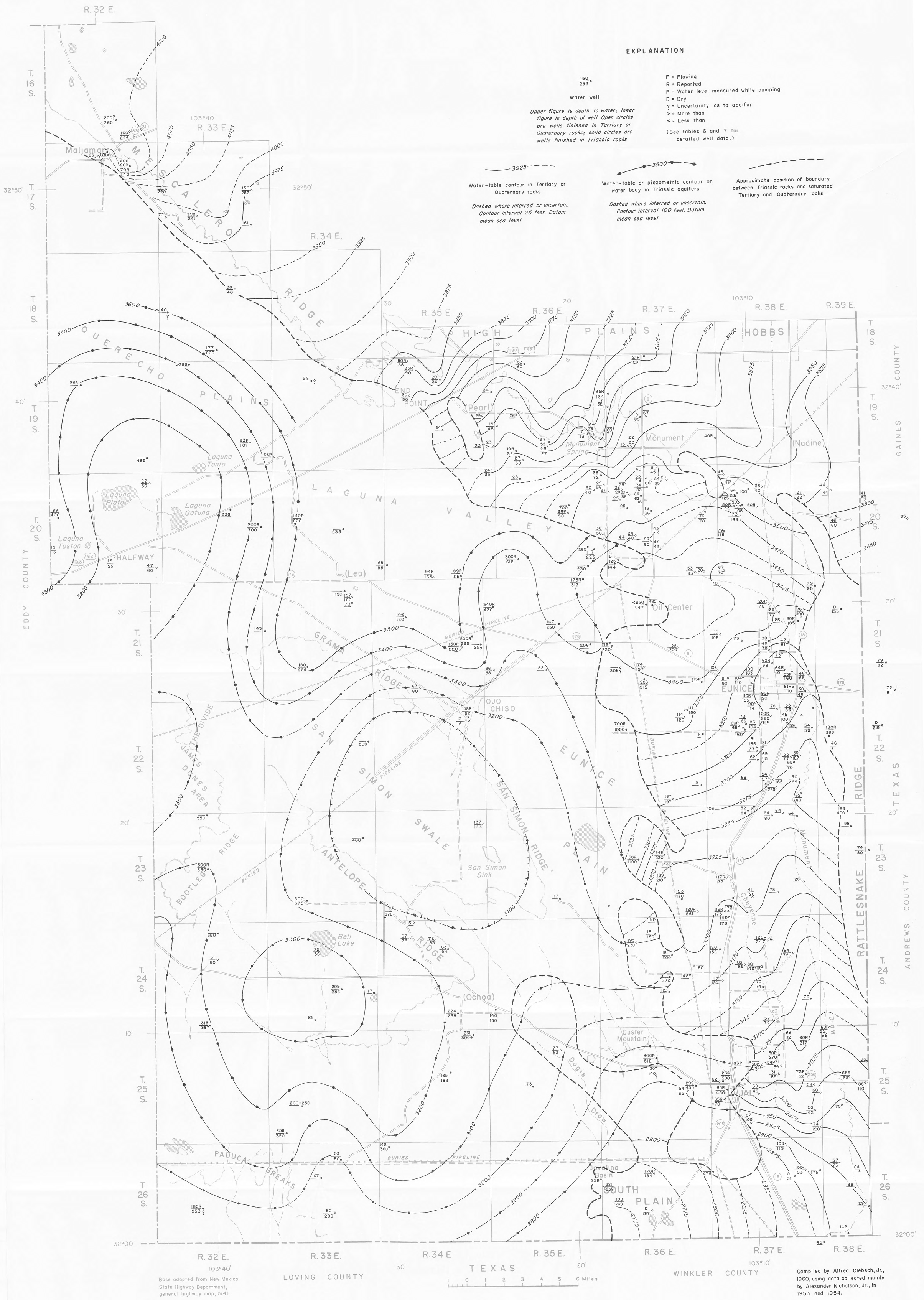

PLATE 2. GROUND-WATER MAP OF SOUTHERN LEA COUNTY, NEW MEXICO