

Sadow Lakes Ranch



**SLR Property I, LP (“SLR”),
Owner**

**Application
for a
New 15,000 af/yr
Simsboro
Operating Permit**

**to be used in conjunction with
SLR’s 15,000 af/yr Historic Use Permit No. 0330
*[cap of 15,000 af/yr on total combined production under both permits]***

**April 2022
(Revised July 2022)**

SLR Property I, LP

2825 Oak Lawn Ave #191577

Dallas, TX 75219

(512) 810-3584

alang@sandowlakesranch.com



July 27, 2022

Mr. Gary Westbrook, General Manager, and
Members of the Board of Directors
Post Oak Savannah Groundwater Conservation District
P. O. Box 92
Milano, Texas 76556

RE: SLR Property I, LP - Applications for Two New Permits

Dear Mr. Westbrook and Members of the Board:

On April 8, 2022, SLR Property I, LP ("SLR"), the purchaser of Sandow Lakes Ranch and successor to Alcoa's groundwater permits and rights, filed with the District applications for two new permits.

On May 20, 2022, representatives of SLR met with the General Manager and the District's geoscientist and its legal counsel, all of whom provided comments on the applications and suggestions that SLR make certain revisions to and clarifications of the applications. On June 14, 2022, SLR informally provided draft updated applications for review and comment by District, and the General Manager and the District's geoscientist and legal counsel subsequently provided additional comments and suggested revisions and clarifications on July 13 and 15, 2022.

This letter incorporates the suggested revisions and clarifications and by itself should be considered an update to and replacement of the previous version of this letter that was an attachment to each of the applications as they were initially filed. With this letter, SLR also submits other parts of the suggested revised and clarified applications. To the extent there is any conflict or inconsistency between this letter and anything contained in any other part of the revised applications, this letter shall control.

This letter is intended first to provide the General Manager and the Board an overall picture of SLR's long-term objectives relating to Sandow Lakes Ranch and descriptions of SLR's current groundwater permits issued by the District. This letter also is intended to state the authorizations requested by each of the two applications as the applications have been revised and clarified as suggested by the General Manager and the District's geoscientist and legal counsel.

SLR and Sandow Lakes Ranch

Sandow Lakes Ranch consists of nearly 32,000 acres of land and groundwater rights in Milam and Lee Counties, of which nearly 25,000 acres are in Milam County. SLR purchased Sandow Lakes Ranch in late October 2021. It intends to continue to develop the groundwater resources of Sandow Lakes Ranch and enter into long-term leases and water supply contracts with new tenants on the property, as well as long-term water supply contracts with suppliers and others in the area. SLR's objectives of course include significant long-term economic development of the Ranch that will also promote economic health for Milam and Burleson Counties.

Hydrologic Impact of the Two New Permits Requested by SLR

SLR currently holds POSGCD permits authorizing production of 40,000 af/yr from the Simsboro formation from the nearly 25,000 acres of lands and groundwater rights owned by SLR in Milam County. The two requested new permits, if granted, will increase the authorized production from SLR's Milam County property by 9,000 af/yr, to a total of not to exceed 49,000 af/yr. This is within the 2 acre-feet-per-acre limitation set forth in the POSGCD rules. A portion of the additional 9,000 af/yr authorized production likely will be from the Hooper, thereby reducing or attenuating impacts on the Simsboro.

POSGCD Permits Currently Held by SLR

Historic Use Permit No. 0330 *(Authorized production of 15,000 af/yr from the Simsboro)*

SLR holds Historic Use Permit No. 0330, which authorizes production of 15,000 af/yr from the Simsboro formation using a well system consisting of 61 authorized wells. When the permit was initially issued in 2007, a total of 60 wells were listed as authorized wells. The permit was amended in 2011 to 61 authorized wells: The Board approved Alcoa's application to amend the permit to add one existing well to the list of authorized wells; to remove from the list six existing wells proposed to be plugged and abandoned; and to add to the list six new wells as replacements for the wells proposed to be plugged and abandoned. The six new replacement wells are identified on Table 1-1; such replacement wells have not yet been drilled. (The Historic Use Permit explicitly authorizes the holder of the permit to apply for and the Board to authorize additional wells to produce water authorized to be produced under the Historic Use Permit: "Permittee is authorized to operate all Wells authorized under the Permit, including such additional wells that may be authorized by amendment, so long as the aggregate production from all Wells under the Permit does not exceed the maximum combined aggregate annual production specified above (15,000 AFY). Permittee may use this historical use permit water for industrial use within that area in Milam County defined in Attachment B.")

Of the 61 authorized wells, 32 are also authorized to produce water under SLR's Operating Permit No. 0148, discussed below.

Water produced under the Historic Use Permit is authorized to be used for industrial use, anywhere within the boundaries of SLR's Milam County property. Alcoa had always viewed the authorized production of 15,000 af/yr from the Simsboro under its Historic Use Permit as the primary supply of groundwater for its Milam County property, and SLR now does also.

Drilling and Operating Permit No. 0148 *(Authorized production of 25,000 af/yr from the Simsboro)*

SLR holds Drilling and Operating Permit No. 0148 (also referred to as D&O Permit No. 0148), which authorizes production of 25,000 af/yr from the Simsboro formation using a well system consisting of 56 wells, 32 of which are included in the 61 wells authorized under the Historic Use Permit, and 24 of which are authorized under Operating Permit No. 0148. Groundwater produced under Operating Permit No. 0148 is authorized to be used for municipal, industrial, manufacturing, and commercial uses, anywhere within Milam County (which is within the District) and anywhere within Williamson County and the three adjacent counties of Lee, Travis and Bell (all four of which are outside the District).

Transport Permit No. 0005 *(Authorized transport of the 25,000 af/yr produced under Drilling and Operating Permit No. 0148)*

SLR holds Transport Permit No. 0005, which authorizes the transport out of the District of 25,000 af/yr produced under Drilling and Operating Permit No. 0148 for use in Williamson, Lee, Travis and Bell Counties.

The Two New Permits Requested by SLR

(1) A new 15,000 af/yr Simsboro Operating Permit to be used in conjunction with SLR's 15,000 af/yr Simsboro Historic Use Permit No. 0330 *(This new operating permit would not increase SLR's current 40,000 af/yr total authorized production because the new permit would impose a cap of 15,000 af/yr on total combined production under both SLR's Historic Use Permit No. 0330 and the new operating permit)*

- SLR has applied for a new operating permit to produce 15,000 af/yr from the Simsboro formation using the same well system consisting of the 61 wells that are authorized under Historic Use Permit No. 0330. There would be a special condition in the new operating permit imposing a cap of 15,000 af/yr on total combined production under the historic use permit and the new operating permit, so the new operating permit would not increase SLR's current total authorized production from SLR's Milam County property of 40,000 af/yr.
- SLR requests that water produced under the new operating permit be authorized to be used for municipal, industrial, manufacturing, and commercial uses, anywhere within Milam and Burleson Counties.
- Upon issuance of the new 15,000 af/yr operating permit, the entire 15,000 af/yr will be assigned to the historic use permit and zero af/yr will be assigned to the operating

permit. From time to time thereafter, SLR will notify the District of the portion of the 15,000 af/yr assigned to the operating permit, and the remaining portion of the 15,000 af/yr will be the amount assigned to the historic use permit. SLR understands from the General Manager that SLR will only have the right to increase the amount assigned to the operating permit and to decrease the amount assigned to the historic use permit by an equal amount, and never to change the assigned amounts in the opposite direction; in other words, the amount assigned to the historic use permit may never be increased above the last amount assigned.

- SLR also understands from the General Manager that, if an historic use permit well does not meet the District's current spacing requirements for property line setback or spacing from an adjoining landowner's well when the historic use permit well is pumped at its approved production capacity, any water pumped from that well under the new operating permit may not be pumped at a rate in excess of the production capacity at which the well can be pumped based on those spacing requirements. Any available capacity above the production capacity at which water is being pumped at any time under the new operating permit may be used at that time to pump water under the historic use permit.
- This overlapping permits approach will allow SLR to maintain whatever special rights and benefits there may be under an historic use permit for whatever part of the currently authorized 15,000 af/yr production may be needed for industrial use within SLR's Milam County property, while providing SLR the flexibility to use the remaining part of the currently authorized 15,000 af/yr production under the new operating permit for authorized uses other than industrial use within SLR's Milam County property, and for all authorized uses anywhere within the District.
- SLR requests that the term of the new operating permit be 40 years from the date of issuance of the permit.
- The historic use permit currently has a term that extends through December 31, 2038. SLR is not at this time requesting an extension of the term of its historic use permit.

(2) A new 9,000 af/yr Simsboro & Hooper Drilling and Operating Permit *(This new drilling and operating permit will increase SLR's total authorized production from 40,000 af/yr to 49,000 af/yr)*

- SLR has applied for a new drilling and operating permit to produce 9,000 af/yr from the Simsboro & Hooper formations. SLR requests authorization to produce up to 9,000 af/yr from the Simsboro, and up to 4,500 af/yr from the Hooper, provided that the total production in any one year may not exceed 9,000 af. Upon issuance of the new 9,000 af/yr operating permit, the entire 9,000 af/yr will be assigned to the Simsboro and zero af/yr will be assigned to the Hooper. From time to time thereafter, SLR will notify the District of the portion of the 9,000 af/yr (up to but not to exceed 4,500 af/yr) assigned to the Hooper, and the remaining portion of the 9,000 af/yr will be the amount assigned to the Simsboro. SLR understands from the General Manager that, because the

maximum possible variation in assigned pumping from either formation is now only half of the 9,000 af/yr, SLR will have the right at any time to either increase or decrease the amount assigned to the Hooper (so long as such amount does not exceed 4,500 af/yr) and to decrease or increase the amount assigned to Simsboro by an equal amount.

- SLR requests authorization to drill up to 60 new wells at 30 defined well sites. Depending upon the conditions found at each well site, a well located at that well site could be designed and constructed to produce groundwater from either the Simsboro formation or the Hooper formation.
- If more than one well is constructed at a given well site, the wells will meet applicable spacing requirements for a given formation if they are screened into the same formation. SLR understands that there is no applicable spacing requirement between a well screened into the Simsboro and a well screened into the Hooper. The total combined maximum pumping rate of all wells constructed at a given site that are screened into the same formation will be less than or equal to the maximum pumping rate defined for production from that formation at that well site.
- SLR requests that the 9,000 af/yr produced under this new operating permit be authorized to be used for municipal, industrial, manufacturing, and commercial uses, anywhere within Milam and Burleson Counties.
- SLR requests that the term of the new drilling and operating permit be 40 years from the date of issuance of the permit.

Thank you for your consideration of these applications. Please let me know if you have any questions or need additional information.

Respectfully,



Alan Gardenhire
Vice President of Operations, SLR Property I, LP

Application Information

Section 1

SLR

SANDOW LAKES RANCH

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT (POSGCD)
Permit Application to Drill or Alter and Operate a Non-Exempt Well

Return this completed form to: POSGCD, PO Box 92 (310 East Ave. C), Milano, TX 76556
Phone: 512-455-9900 FAX: 512-455-9909 Email: admin@posgcd.org
Please type or print legibly. Incomplete applications will be returned to applicant.

Application Date: _____ Well Number: _____
Date received by POSGCD Assigned by POSGCD

Is the property where this well is or will be located within a subdivision or city? ☐ Yes ☒ No

If yes, please write the name of the subdivision or city: _____

PURPOSE FOR THIS APPLICATION (Choose one)

- ☐ New well
- ☐ Replacement well; if selected, please briefly explain: _____
- ☐ Alter an existing well; if selected, please briefly explain: _____
- ☐ Operate an existing well
- ☒ Other; if selected, please briefly explain: See Summary of Application in Section 1

SECTION 1: APPLICANT

Name: SLR Property I, LP Phone: (512) 810-3584
(First, Middle, Last)

Address: 2825 Oak Lawn Ave. #191577 Email: alang@sandowlakesranch.com

City: Dallas State: TX Zip: 75219

Are you requesting an exemption under Post Oak Savannah GCD Rule 7.10? ☐ Yes ☒ No

If yes, please cite applicable rule, or explain: _____

SECTION 2: FEE REQUIRED

If the applicant intends to drill a new well, increase the size of an existing well, increase the size of a pump on an existing well, or replace a permitted well, then a **\$100 NON-REFUNDABLE FEE PER EXISTING, OR PROPOSED WELL** must accompany this application. The applicant may be required to submit any additional information identified by the board during the permitting process as reasonably required or beneficial to the District's decision. Additional funds may be required from the applicant if necessary to complete the District's cost of processing the application.

A charge of \$25.00 will be assessed for all "returned" checks.



POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT (POSGCD)
Permit Application to Drill or Alter and Operate a Non-Exempt Well

SECTION 3: AUTHORIZATION TO DRILL

Has any part of the water rights of the property for this well been leased, sold, or transferred? ☐ Yes ☒ No

If yes, or if the name and address of the property owner is different than the person shown in Section 1, please complete this section and attach proof of authorization to drill and produce groundwater:

Name: _____ Phone: _____
(First, Middle, Last)

Address: _____ Email: _____

City: _____ State: _____ Zip: _____

Is a copy of authorization to drill on property attached according to Rule 7.4.4? ☐ Yes ☐ No

SECTION 4: MAP & SPACING

You must answer yes to each of the following for this application to be complete:

Is map of area according to Rule 7.4.4 attached? ☒ Yes

Is proof of satisfaction of spacing requirements according to Rule 4.1 attached? ☒ Yes

SECTION 5: PURPOSE FOR WATER USE

Type of well (Check one): ☐ Domestic ☒ Municipal ☐ Irrigation ☒ Other

If other, please explain: Municipal, Industrial, Manufacturing, and Commercial

List proposed usage of water produced from well and the amount of usage, including conjunctive use.

Use: Aggregated maximum amount of Amount Used: 15,000 acre-feet/year _____

Use: _____ Amount Used: _____ gallons/day.

Use: _____ Amount Used: _____ gallons/day.

Total Amount to be used: _____ gallons/day.

Location of water usage: within Milam and Burleson Counties

Proposed rate at which water will be withdrawn: no change in maximum well rates requested _____

Aquifer & Formation water is to be drawn from: Simsboro

The total number of acres that overlies the aquifer and formation listed above that is contiguous to the well listed and located above (Rule 7.4.4):

See Responses to Rule 7.4 in Section 1 _____

Total amount of water requested per year: aggregate of 15,000 acre feet (1 acre foot = 325,851 gallons)



POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT (POSGCD)
Permit Application to Drill or Alter and Operate a Non-Exempt Well

SECTION 6: PLANS

Please attach copies of the following studies or plans, or indicate:

☐ Well Closure Plan ☐ Alternative Supply Plan ☒ Conservation Plan ☒ Drought Contingency Plan

Aquifer Impact Study: See attached Section 4 - Response to Rule 7.4.5 - Aquifer Impact Study

☒ Declaration to abide by all Rules and the Management Plan of the District (found in Section 8).
*** In lieu of submitting these plans, the applicant may declare that he/she will abide by the District's Rules and Management Plan as they pertain to these items.*

SECTION 7: Well Information (POSGCD can assist with this Section)

Well location (directions to well site from nearest state or federal highway): See Note below.

Begin at _____ and then go _____
 and then go _____ and then go _____
 and then go _____ and then go _____

Well is located in: Milam County ☐ Burleson County ☐

Well coordinates: Latitude: _____ Longitude: _____

Please attach copies of the following schedules or logs, if available:

Driller's Schedule

Driller's Log/Report

Electric Log

Date well drilled:	Driller's name:	Driller's license number:
Well depth (feet):	Diameter of hole (inches):	Diameter of pipe (inches):
Pump set at (depth of lift in feet):	Depth to water (feet):	Pump size (horse power):
Well capacity (gallons/minute):	Pump power source:	Type of pump:

Request for well to be aggregate with other wells? ☒ Yes ☐ No If yes, list wells below:

Note: No change in the approved and previously drilled wells under SLR's Historic Use Permit is requested. The 61 approved and previously drilled wells are listed in Table 1-1 contained in Section 1.



POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT (POSGCD)
Permit Application to Drill or Alter and Operate a Non-Exempt Well

SECTION 8: Attachments

Please list all items attached to this permit:



Map of location showing spacing (REQUIRED)



Unique property description (REQUIRED)

Other: _____

SECTION 9: Affirmation and Execution

I certify that all statements and information in this application are true and correct. If the name and address in Section 3 of this application is different than that in Section 1, I also certify that I have authorization to act on behalf of the person(s) in Section 2 and that I also have authorization to produce groundwater from this well. I further declare that all groundwater withdrawn will be put to beneficial use at all times. If I have chosen the Declaration option in Section 6, I hereby declare that I will abide by all Rules and the Management Plan of the District according to the District's Rule 7.4.4 D, F, G, and H concerning these items.

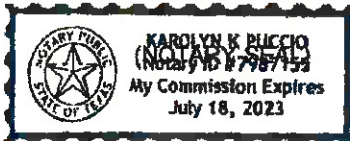

Signature of Applicant

THE STATE OF TEXAS

COUNTY OF Milam

This instrument was acknowledged before me on (date) April 8, 2022

by (applicant) Alan Gardenhire (SLR Property I, LP)




Notary Signature

Can be notarized in the presence of any Notary of your choice. There is a Notary at the POSGCD office.

FOR OFFICE USE ONLY

Has appropriate fee been paid to District to process this application? Yes No Amount Paid:

Is Applicant current with District Rules? Yes No

Is application administratively complete? Yes No

Date of hearing (if applicable): _____

Notes: _____



Summary of Application, Responses to Post Oak Savannah Rule 7.4, and Response to the District's Request for a Description of Flow Measurements

Application by SLR Property I, LP ("SLR") for a New 15,000 af/yr Simsboro Operating Permit to be used in conjunction with SLR's Existing POSGCD Historic Use Permit No. 0330

SUMMARY OF APPLICATION:

SLR Property I, LP (SLR) holds POSGCD Historic Use Permit No. 0330, which authorizes the production of 15,000 af/yr of water from the Simsboro formation by means of a system of 61 authorized wells located on the nearly 25,000 acres of land that SLR owns in Milam County. The water is authorized to be used for industrial use on that land.

SLR seeks a new 15,000 af/yr Simsboro operating permit to be used in conjunction with its historic use permit. Water produced under the new operating permit will be pumped from the same 61 wells authorized for the historic use permit and there would be a special condition in the new operating permit imposing a cap of 15,000 acre-feet per year on total production under both permits. SLR requests that the water produced under the new operating permit be authorized to be used for municipal, industrial, manufacturing, and commercial purposes anywhere within Milam and Burleson Counties.

Upon issuance of the new 15,000 af/yr operating permit, the entire 15,000 af/yr will be assigned to the historic use permit and zero af/yr will be assigned to the operating permit. From time to time thereafter, SLR will notify the District of the portion of the 15,000 af/yr assigned to the operating permit, and the remaining portion of the 15,000 af/yr will be the amount assigned to the historic use permit. SLR understands from the General Manager that SLR will only have the right to increase the amount assigned to the operating permit and to decrease the amount assigned to the historic use permit by an equal amount, and never to change the assigned amounts in the opposite direction; in other words, the amount assigned to the historic use permit may never be increased above the last amount assigned.

SLR also understands from the General Manager that, if an historic use permit well does not meet the District's current spacing requirements for property line setback or spacing from an adjoining landowner's well when the historic use permit well is pumped at its approved production capacity, any water pumped from that well under the new operating permit may not be pumped at a rate in excess of the production capacity at which the well can be pumped based on those spacing requirements. Any available capacity above the production capacity at which water is being pumped at any time under the new operating permit may be used at that time to pump water under the historic use permit.

The portion of the 15,000 af/yr produced from the authorized wells and used for industrial use on SLR's Milam County property will be reported under the historic use permit; and the portion used for industrial use outside the boundaries of SLR's Milam County property, or for uses other than industrial use within or outside the boundaries of SLR's Milam County property, will be reported under the new operating permit.

SLR requests that the term of the new operating permit be 40 years from the date of issuance of the permit.

The historic use permit currently has a term that extends through December 31, 2038. SLR is not at this time requesting an extension of the term of its historic use permit.

RESPONSES TO RULE 7.4. APPLICATION REQUIREMENTS FOR ALL PERMITS.

1. Each original application for a drilling permit, historic use permit, operating permit, transport permit, permit review or renewal, or permit amendment shall be on the form or forms required by the District. The forms will be furnished to the applicant upon request.
2. All permits are granted in accordance with the rules, and acceptance of a permit constitutes an acknowledgment of receipt of the rules and agreement that the permit holder will comply with all of the rules.
3. The application for a permit shall be in writing and sworn to.

The POSGCD application form included in Section 1 includes a sworn statement, and the application is in writing.

4. The following shall be included in the permit application:
 - a. the name and mailing address of the applicant and the owner of the land on which the well is or will be located;

**SLR Property I, LP
2825 Oak Lawn Ave. #191577
Dallas, TX 75219**

- b. documentation establishing ownership of the land on which the well is or will be located; and, if the applicant is other than the owner of the property or if the water rights have been sold or leased, documentation establishing the applicable authority to construct and operate a well on such property for the proposed use; the documentation must be one or more documents recorded in the real property records of the County in which the land is located;

See Table 1-1 in Section 1 for individual well location and unique property description. In Section 2, see Figure 2-1 for a map of property SLR owns in support of this application and Table 2-1 for property descriptions. See Figure 5-1 in Section 5 for a map of the location of each approved well in relation to SLR property utilized in support of this application.

- c. a statement of the nature and purpose of the proposed use and the amount of groundwater to be used for each purpose, including, as applicable, any proposed conjunctive use;

See Summary of Application, above.

- d. a water conservation plan or a declaration that the applicant will comply with the management plan;

See Section 3 for this information. All water will be used beneficially and consistent with

the District management plan.

- e. the maximum rate at which groundwater is proposed to be withdrawn from each well and a map showing the location of the well and the property owned or controlled by the applicant for the production of water; [Amended July 2, 2019]

See Table 1-1 in Section 1 for the individual well's approved location, unique property information, approved production capacity for each approved well, and the production capacity at which the well can be pumped based on the District's current spacing requirements for property line setback or spacing from an adjoining landowner's well, if such capacity is less than the approved production capacity. The wells so affected by the current spacing requirements are further identified by shading on Table 1-1. See Figure 5-1 in Section 5 for a map of the location of each well and SLR property utilized in support of this application.

There are currently 61 wells authorized to produce the 15,000 af/yr under the Historic Use Permit. When the permit was initially issued in 2007, a total of 60 wells were listed as authorized wells. In 2011, the Board approved Alcoa's application to amend the permit to add one existing well to the list of authorized wells; to remove from the list six existing wells proposed to be plugged and abandoned; and to add to the list six new wells as replacements for the wells proposed to be plugged and abandoned. The six new replacement wells are identified on Table 1-1; such replacement wells have not yet been drilled. [The Historic Use Permit explicitly authorizes the holder of the permit to apply for and the Board to authorize additional wells to produce water authorized to be produced under the Historic Use Permit: "Permittee is authorized to operate all Wells authorized under the Permit, including such additional wells that may be authorized by amendment, so long as the aggregate production from all Wells under the Permit does not exceed the maximum combined aggregate annual production specified above (15,000 AFY). Permittee may use this historical use permit water for industrial use within that area in Milam County defined in Attachment B."]

The following information is common to all wells:

For every well location, no part of the water rights has been leased, sold, or transferred. SLR owns all rights to the surface estate and groundwater rights for the location of every well proposed.

No exemption under POSGCD rule 7.10 is requested for any well.

Upon drilling, completing and testing of any replacement well, within 90 days SLR will submit to the POSGCD the following:

- 1. TDLR State Well Report**
- 2. Geophysical Log**

3. Results of Water Quality Testing

4. Results of Pump Testing

- f. a water well closure plan or a declaration that the applicant will comply with well plugging guidelines and report closure to the District;

SLR will comply with all TCEQ, Texas Department of Licensing and Regulation, and/or District well plugging guidelines. SLR will also furnish well plugging records to the POSGCD.

- g. a drought contingency plan if required by state law;

See Section 3 for this information.

- h. an alternative supply plan if required by state law or District Rule;

See Section 3 for this information.

- i. a statement by the applicant that the groundwater withdrawn under the permit will be put to beneficial use at all times;

The groundwater will be put to beneficial use at all times.

- j. the location of the use of the groundwater from the well;

For the new operating permit, the groundwater will be used within Milam and Burleson Counties. For the historic use permit, all industrial use will be within SLR'S Milam County property.

- k. the aquifer and formation or proposed depth from which the applicant intends to produce groundwater;

The production will be from the Simsboro Formation. Anticipated depths of well screens are dependent on each well location. The shallowest wells are anticipated to produce within an interval of approximately 100 to 400 feet below ground level, and the deepest wells are anticipated to produce within an interval of approximately 300 to 600 feet below ground level.

- l. the total acreage that overlies the aquifer and formation listed under (k) above, from which the applicant has the right to produce groundwater;

Summary of SLR property ownership in Milam County overlying the Simsboro Formation:

Full Ownership in Milam County Overlying	Groundwater Rights Only in Milam County	Total of Full Ownership plus Groundwater
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Simsboro	Overlying Simsboro	Rights in Milam County Overlying Simsboro
23,681.35 acres	906.4 acres	24,587.75 acres

See Figure 2-1 in Section 2 for a map of these Milam County properties.

- m. the total number of acres that overlies the aquifer and formation listed under (j) above and that is contiguous to the well(s) listed and located under (e) above; [Amended September 5, 2017]

Summary of SLR contiguous ownership in Milam County overlying the Simsboro Formation:

Full Ownership and Contiguous in Milam County Overlying Simsboro	Groundwater Rights Only and Contiguous in Milam County Overlying Simsboro	Total of Full Ownership plus Groundwater Rights and Contiguous in Milam County Overlying Simsboro
23,377.81 acres	906.4 acres	24,284.21 acres

5. Applications for permits for wells that will have a maximum pumping rate that equals or exceeds 500 gpm shall include:

- a. Predictions of pumping impacts on water levels over the next 30 years within a radial distance of 5 miles of the newly permitted well.

See Section 4 for this information. While no increases in the approved production capacities are requested, SLR submits an Aquifer Impact Study in Section 4.

- b. The predictions will be based on the newly permitted well pumping it's fully permitted amount and will be submitted in report form that describes the assumptions used in the model run.

See Section 4 for this information.

- c. If a MAG exists for the aquifer from which water will be produced, then the predictions will include results based on using the Groundwater Availability Model run used to establish the MAG for the aquifer. [Amended July 2, 2019]

The new Carrizo-Wilcox, Queen City, Sparta GAM was utilized to simulate the operating permit production. See the Aquifer Impact Study in Section 4 for the assumptions used in the model runs.

- d. Predictions made using models other than the GAMs will be accepted by the district.

N/A.

- e. Prior to submitting the report, the applicant will meet with POSGCD to agree to the modeling assumptions and the required deliverables.

SLR representatives met with the District and its Hydrogeologist on November 30, 2021 and again on May 20, 2022.

- f. Following submittal of the report, POSGCD will review and provide comments on the report and the well owner shall provide written responses to all comments.

- g. Wells producing from the Brazos or Little River Alluviums, or wells used for seasonal irrigation (or less than 180 days per year) are exempt from this rule 7.4.5.
[Amended September 5, 2017]

- 6. Payment by the permittee of the appropriate application fee.

A wire transfer was initiated on April 8, 2022 in the amount of \$12,100 - \$6,100 of which is for the District's processing of this application and \$6,000 of which is for the District's processing of the application for a new 9,000 af/yr Simsboro/Hooper Operating Permit.

RESPONSE TO THE DISTRICT'S REQUEST FOR A DESCRIPTION OF FLOW MEASUREMENTS.

In addition to the deliverables requested by the District to be included in the Aquifer Impact Study (submitted under Section 4), the District also requested that the application include a description of how production from each of SLR's wells will be metered and how the flow meter data will be analyzed so that the correct volumes will be reported for the amounts produced from each well under each of SLR's production permits. The requested description is set forth below:

- (1) SLR holds Historic Use Permit No. 0330 (also referred to as "HUP No. 0330") authorizing production of 15,000 af/yr from the Simsboro formation from a system of 61 authorized wells. The water produced under the permit is authorized to be used for industrial use within the boundaries of SLR's Milam County property.
- (2) SLR also holds Drilling and Operating Permit No. 0148 (also referred to as "D&OP No. 0148") authorizing production of 25,000 af/yr from the Simsboro formation from a total of 56 wells, 24 of which are authorized under Operating Permit No. 0148 but not yet constructed, and 32 of which are included in the 61 authorized wells under HUP No. 0330. The groundwater produced under D&OP No. 0148 is authorized to be used for municipal, industrial, manufacturing, and commercial uses anywhere within Milam County (which is within the District), and anywhere within Williamson County and the adjacent Counties of Lee, Travis and Bell (all of which are outside the District). Groundwater produced under D&OP No. 0148 is authorized to be transported for use outside the District under Transport Permit No. 00005.
- (3) SLR has applied for a new operating permit to produce 15,000 af/yr from the Simsboro formation using the same 61 authorized wells under Historic Use Permit No. 0330, with a cap of 15,000 af/yr on total combined production under Historic Use Permit No. 0330 and the new operating permit so the current authorized production of 15,000 af/yr will not be increased. SLR requests that water produced under the new operating permit be authorized to be used for municipal, industrial, manufacturing and commercial uses, anywhere within Milam and Burleson Counties.
- (4) Thus, if the new overlaying operating permit is granted by POSGCD, the currently authorized 15,000 af/yr production of groundwater from the Simsboro formation could be produced from the 61 authorized wells under either the 15,000 af/yr Historic Use Permit No. 0330 or the new overlaying 15,000 af/yr operating permit.
- (5) SLR has also applied for a new drilling and operating permit to produce an additional 9,000 af/yr of groundwater from the Simsboro and Hooper formations. SLR requests authorization to drill up to 60 new wells at 30 defined well sites to produce the additional 9,000 af/yr of groundwater. SLR requests that the additional 9,000 af/yr be authorized to be used for municipal, industrial, manufacturing, and commercial uses, anywhere within Milam and Burleson Counties.
- (6) The flow from each producing well will be metered. For each well other than the 61 authorized wells identified above, one meter is all that is needed to be able to assign the amount produced from that well to a particular permit, and to production from either the Simsboro formation or the Hooper formation.
- (7) Additional meters will be added at appropriate points as necessary to determine the amount of water produced from any of the 61 wells to be assigned to the correct permit. For example, if all of the flow from a single, isolated well is being used only one permit, then no additional meter is needed for that well. If, however, the water produced from a single, isolated well is

being used under two permits, then one additional meter would be added for that well. One of the two meters for that well will measure the amount of water produced under one of the permits and, depending on how the two meters are arranged, the other meter will measure either the total amount of water produced from the well or the amount produced under the other permit. And, in the highly unlikely event that water from a single, isolated well is being used under all three permits, then a third meter will need to be added for that well. If a number of the 61 wells are operated as a well field, the same rules apply, except the well field then is treated as a single isolated well for purposes of arriving at the number of additional meters needed. For example, if a number of the 61 wells are operated as a well field to produce water used under two of the permits, then only one additional meter is needed for that well field, to measure the total amount produced by the well field under one of the permits; the sum of the metered amounts produced from each well in the well field is the total amount produced from the well field, and the difference between that sum and the measured amount produced by the well field under one of the permits is the amount produced under the other permit; and the amount produced by each well under each permit would be assigned proportionally. If that well field is operated to produce water used under only one of the permits, then no additional meter is needed for that well field.

- (8) One or more additional meters will be added at appropriate points to measure the amount of water produced under D&OP No. 0148 that is transported for use outside the District under Transport Permit No. 00005.
- (9) If the District desires that the amounts of water produced under any multi-use production permit for each of the authorized purposes of use be reported separately (instead of allowing all use under the permit to be reported as “municipal, industrial, manufacturing, and/or commercial”), the approach used to arrive at the amounts to be separately reported will depend upon various factors, including the number of customers or end users of each use and the amount of water used by each. For example, if all or most of the water supplied under a particular permit is used for one of the listed uses and there are relatively few customers or end users of that water that fall in the other categories, then the most logical approach might be as follows: Identify those relatively few end users that use water for a use other than the most prevalent use; the metered amounts of water supplied to each of those end users would be assigned the correct use for that end user and subtracted from the total production under the permit to arrive at the amount assigned to the most prevalent use.

TABLE 1-1. THE 61 APPROVED HISTORIC USE PERMIT WELLS

Well Count	Site Designation	Latitude	Longitude	Location of Well - Milam County Appraisal District Property ID	Approved Production Capacity (GPM)	Production Capacity based on Current Spacing Requirements for Property Line Setback or Spacing from an Adjoining Landowner's Well (If less than Approved Production Capacity) (GPM)
1	58-32-502	30.33340°N	97.04030°W	10354	500	-
2	58-32-503	30.33230°N	97.04180°W	10354	500	-
3	58-32-504	30.56083°N	97.06778°W	10354	500	-
4	58-32-505	30.55942°N	97.06879°W	10354	500	-
5	A-9-2	30.55511°N	97.04182°W	10354	540	-
6	A-9-3	30.55482°N	97.04309°W	10354	540	-
7	AT-1 *	30.54091°N	97.05737°W	20520844	500	-
8	AT-2 *	30.56416°N	97.02223°W	20519037	500	-
9	C4052A	30.57223°N	97.02831°W	20519037	300	-
10	C4245	30.57988°N	97.02349°W	20519037	240	-
11	C4246	30.57911°N	97.02407°W	20519037	250	-
12	C4247	30.57784°N	97.02452°W	20519037	240	-
13	C4248A	30.57674°N	97.02479°W	20519037	230	-
14	C4250A	30.57393°N	97.02559°W	20519037	290	-
15	C4440A	30.58688°N	97.02000°W	20519037	440	-
16	C5245B	30.57941°N	97.00878°W	10354	410	-
17	C-9-12	30.56138°N	97.02401°W	20519037	440	-
18	C-9-13	30.56657°N	97.01864°W	20519037	320	-
19	C-9-14	30.56227°N	97.02189°W	20519037	420	-
20	C-9-15	30.57191°N	97.00947°W	10354	250	198
21	C-9-16	30.57370°N	97.00835°W	10354	420	237
22	C-9-17	30.57550°N	97.00838°W	10354	260	-
23	C-9-18	30.57744°N	97.00833°W	10354	510	302
24	C-9-19	30.58184°N	97.00811°W	10354	460	257
25	C-9-20	30.56734°N	97.01604°W	20519037	450	-
26	C-9-23	30.56489°N	97.02366°W	20519037	420	-
27	C-9-26	30.58430°N	97.01025°W	10354	620	-
28	C-9-27	30.58484°N	97.01057°W	10354	500	-
29	C-9-29	30.57276°N	97.00874°W	10354	370	-
30	C-9-30	30.57448°N	97.00817°W	10354	420	140
31	C-9-31	30.58076°N	97.00835°W	10354	450	386
32	DP-S-A-3	30.57033°N	97.03935°W	20519037	250	-
33	DP-S-A-4	30.56881°N	97.04432°W	20519037	250	-
34	DP-S-A-5	30.564578°N	97.047136°W	13054	250	-
35	DP-S-A-6	30.56225°N	97.04861°W	10354	250	-
36	DP-S-A-7	30.55998°N	97.05018°W	10354	250	-
37	E-1 *	30.58835°N	97.01944°W	20519037	1000	-
38	E-2 *	30.54073°N	97.06448°W	20520844	1000	-
39	E-3 *	30.53970°N	97.06348°W	20520844	1000	-
40	E-4 *	30.53892°N	97.06204°W	20520844	1000	-
41	F1 Sims	30.51378°N	97.07286°W	20519037	560	-
42	F10 Sims	30.52283°N	97.06630°W	20519037	250	-
43	F11 Sims	30.52264°N	97.06762°W	20519037	250	-
44	F12 Sims	30.51527°N	97.07801°W	20519037	250	-

45	F13 Sims	30.51867°N	97.07272°W	20519037	250	-
46	F14 Sims	30.51614°N	97.07222°W	20519037	250	-
47	F15 Sims	30.51738°N	97.07004°W	20519037	250	-
48	F2 Sims	30.51536°N	97.07445°W	20519037	250	-
49	F3 Sims	30.51442°N	97.07441°W	20519037	250	-
50	F4 Sims	30.51329°N	97.07452°W	20519037	250	-
51	F5 Sims	30.51402°N	97.07085°W	20519037	250	-
52	F5222A	30.50352°N	97.10667°W	11598	500	-
53	F5222B	30.50301°N	97.10691°W	11598	200	-
54	F6 Sims	30.51804°N	97.06758°W	20519037	250	-
55	F8 Sims	30.51959°N	97.06777°W	20519037	250	-
56	F9 Sims	30.52120°N	97.06688°W	20519037	250	-
57	NFD-02 Sims	30.51388°N	97.07195°W	20519037	250	-
58	P-5	30.58484°N	97.01220°W	10354	500	-
59	South Crusher	30.52158°N	97.10150°W	11598	500	-
60	Storm Shelter	30.50569°N	97.10631°W	11598	500	-
61	Wash Rack	30.55158°N	97.07546°W	10354	500	-

- The wells identified above in Table 1-1 by an asterisk (AT-1, AT-2, E-1, E-2, E-3, and E-4) are the six replacement wells that were approved by the POSGCD Board in 2011 to produce water under the Historic Use Permit. The six wells they replace were constructed, used to produce water under the Historic Use Permit, and then plugged and abandoned. The six replacement wells have not yet been constructed.

Land Ownership

Section 2

SLR
SANDOW LAKES RANCH

**Table 2-1. SLR Property I, LP (SLR)
Property Ownership Overlying the
Simsboro Formation**

Milam County Appraisal District Property ID*	Milam County Appraisal District Geographic ID	SLR Ownership Type
10354	A207-321-001-00	Full Ownership
11236	A369-317-007-00	Full Ownership
11598	A414-318-002-00	Full Ownership
12630	A223-293-051-00	Full Ownership
14414	A378-304-014-00	Full Ownership
14547	A265-321-002-00	GW Rights Only
15510	A196-295-018-00	Full Ownership
17115	A228-321-001-00	GW Rights Only
19675	A340-295-001-00	Full Ownership
20126	A089-320-004-00	Full Ownership
25057	A288-302-001-00	Full Ownership
27832	A087-238-003-00	Full Ownership
20501277	A089-320-006-50	Full Ownership
20512490	A369-317-005-00	Full Ownership
20519037	A207-321-001-02	Full Ownership
20519071	A207-321-001-03	Full Ownership
20519072	A207-321-001-04	Full Ownership
20519948	A207-321-001-05	GW Rights Only
20519949	A207-321-001-06	GW Rights Only
20519950	A207-321-001-07	GW Rights Only
20519951	A207-321-001-08	GW Rights Only
20520283	A207-321-001-00	GW Rights Only
20520445	A207-321-001-09	GW Rights Only
20520844	A207-321-001-10	Full Ownership
20520847	A207-321-001-05	Full Ownership
20520848	A207-321-001-05	Full Ownership
20520849	A207-321-001-11	Full Ownership
20520850	A207-321-001-12	Full Ownership
20520851	A207-321-001-13	Full Ownership

Groundwater rights overlying the Simsboro Formation

Total Acres in Milam County: 24,585.95

Total Contiguous Acres in Milam County: 24,282.41

Note: Property acreages based on survey conducted for Alcoa by:
Bruce L. Bryan RPLS No. 4249
Bryan Technical Services, Inc. TBPLS Firm No. 10128500

* All Alcoa MCAD parcels listed above were purchased by SLR Property I, LP (SLR) on November 1, 2021. Once ownership changes are finalized in MCAD records, the SLR Property ID numbers may be different.

**Table 2-1. Alcoa Property Ownership
Overlying the Simsboro Formation**

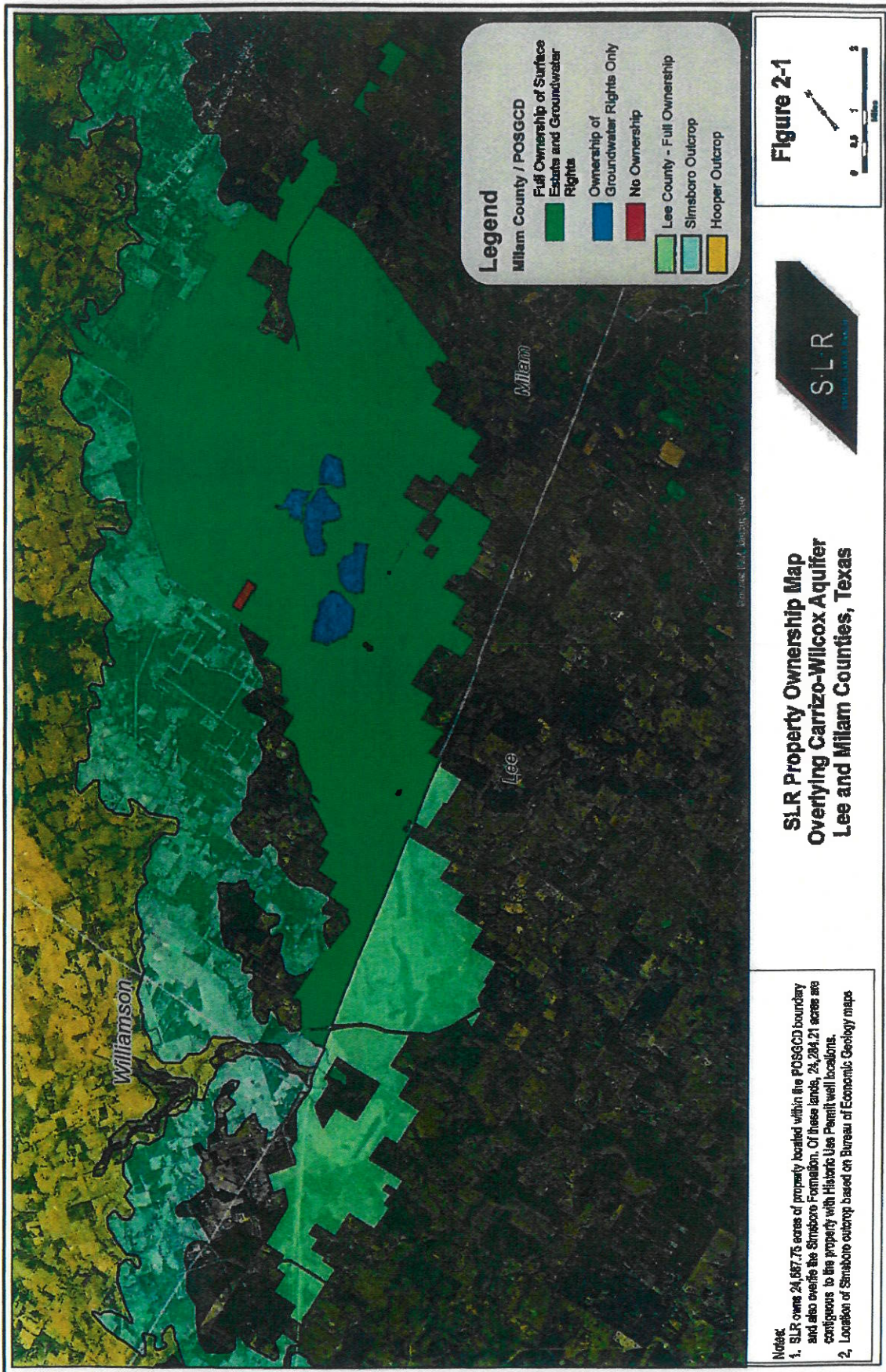
Milam County Appraisal District Property ID	Milam County Appraisal District Geographic ID	Alcoa Ownership Type
10354	A207-321-001-00	Full Ownership
11236	A369-317-007-00	Full Ownership
11598	A414-318-002-00	Full Ownership
12630	A223-293-051-00	Full Ownership
14414	A378-304-014-00	Full Ownership
14547	A265-321-002-00	GW Rights Only
15510	A196-295-018-00	Full Ownership
17115	A228-321-001-00	GW Rights Only
19675	A340-295-001-00	Full Ownership
20126	A089-320-004-00	Full Ownership
25057	A288-302-001-00	Full Ownership
27832	A087-238-003-00	Full Ownership
20501277	A089-320-006-50	Full Ownership
20512490	A369-317-005-00	Full Ownership
20519037	A207-321-001-02	Full Ownership
20519071	A207-321-001-03	Full Ownership
20519072	A207-321-001-04	Full Ownership
20519948	A207-321-001-05	GW Rights Only
20519949	A207-321-001-06	GW Rights Only
20519950	A207-321-001-07	GW Rights Only
20519951	A207-321-001-08	GW Rights Only
20520283	A207-321-001-09	GW Rights Only
20520445	A207-321-001-09	GW Rights Only
20520844	A207-321-001-10	Full Ownership
20520847	A207-321-001-05	Full Ownership
20520848	A207-321-001-05	Full Ownership
20520849	A207-321-001-11	Full Ownership
20520850	A207-321-001-12	Full Ownership
20520851	A207-321-001-13	Full Ownership

Groundwater rights overlying the Simsboro Formation

Total Acres in Milam County: 24,585.95

Total Contiguous Acres in Milam County: 24,282.41

Note: Property acreages based on survey conducted for Alcoa by:
 Bruce L. Bryan RPLS No. 4249
 Bryan Technical Services, Inc. TBPLS Firm No. 10128500



Water Conservation Drought Contingency

Section 3

SLR

SANDOW LAKES RANCH

WATER CONSERVATION AND DROUGHT CONTINGENCY PLAN

For many decades, Alcoa and its predecessor entities utilized and conserved groundwater resources underlying Sandow Lakes Ranch. Prior groundwater use has been primarily in conjunction with lignite mining operations in Milam County and Lee County and industrial operations and power generation in Milam County. This past use includes significant groundwater pumping from the Milam County property within Sandow Lakes Ranch under permits issued by the Post Oak Savannah Groundwater Conservation District (POSGCD).

Looking forward with respect to Sandow Lakes Ranch, groundwater will be produced under amended and new permits issued by the POSGCD and used for municipal, industrial, manufacturing, and commercial uses where the new owner of Sandow Lakes Ranch, SLR Property I, LP (SLR), will not be the end user of the produced groundwater. Future groundwater use may involve the sale of groundwater to a wholesale water supplier and then the resale to one or more retail water utilities or industrial, manufacturing, or commercial users, or the direct sale to one or more retail water utilities or users. In each case, the wholesale water supplier, retail water utility, or user will have water conservation plans and drought contingency plans as required by Texas Administrative Code Title 30, Chapter 288.

Groundwater production will be monitored individually at each well head and at primary pump stations associated with any groundwater delivery contract. Groundwater production will be reported to POSGCD. Ultimately, produced groundwater may be delivered to retail water utilities or, industrial, manufacturing, or commercial users located within, or outside, the boundaries of the POSGCD. The potential counties that groundwater may be delivered to include Milam, Burleson, Lee, Williamson, Travis, and Bell Counties. A transport permit will be sought for the transfer of any groundwater outside of the POSGCD boundaries.

Upon execution of a water supply contract, the applicable water conservation plans and drought contingency plans of a wholesale water provider, retail public utility or industrial, manufacturing, or commercial user (as applicable) will be provided to the POSGCD prior to production and delivery of supply. Per current requirements of Administrative Code Title 30, Chapter 288, these plans will have specific and quantified five-year and ten-year targets for water savings including, where appropriate, target goals for municipal use in gallons per capita per day for the delivery service area, maximum acceptable water loss, and the basis for the development of these goals. Any industrial, manufacturing, or commercial user will have a process design to minimize water use for the user's application. Where applicable, these plans will include details of conjunctive use of alternative supplies to optimize water savings and increase drought contingency.

Typically, the retail water utilities employ a stage-based drought contingency plan commensurate with the intensity and duration of drought conditions. Many of these drought contingency plans are triggered based on public health and safety concerns that arise when reductions in storage of surface water occur due to drought. When invoked, the stage-based restrictions can include specific water days for landscape irrigation, restrictions on filling of swimming pools, etc., and more heightened stage restrictions can include restriction on additional landscape plantings, vehicle washings, restaurant serving of water only on request and other restrictions.

A retail water utility that ultimately receives groundwater produced from SLR groundwater operating permits issued by the POSGCD shall have a record management system capable of reporting water use by residential, single and multi-family, commercial, institutional, industrial, manufacturing, and wholesale categories. The retail water utility shall utilize a water rate structure that is not promotional and does not encourage the excessive use of water. For any retail public water utility that serves a current

population of 5,000 or more and/or a projected population of 5,000 or more within the next ten years subsequent to the effective date of its water conservation plan, the utility shall have a program of leak detection, repair and water loss accounting for the water transmission, delivery, and distribution system. The utility's water conservation plan shall also address, as applicable or as required by the Texas Commission of Environmental Quality, conservation-oriented water rates and water rate structures; the adoption of ordinances, plumbing codes, and/or rules requiring water-conserving fixtures; the reuse or recycling of wastewater or graywater; a program and/or ordinance(s) for landscape water management; and a program for pressure control and/or reduction in the distribution system and/or customer connections.

As applicable, an industrial, manufacturing, or commercial water user will have a description of how the water is utilized, and the estimated quantity of water consumed in any process or operation and therefore not available for reuse or discharge. Water metering requirements will be identified, as well as a leak detection, repair and accounting for water loss in water distribution system. If applicable, the water conservation plan will describe the application of state-of-the-art equipment and/or process modifications to improve water efficiency.

Each wholesale water provider, retail public water utility, or industrial, manufacturing, or commercial water user will review and update its water conservation and its drought contingency plans (as applicable) every five years to coincide with regional water planning. These updated plans will be submitted to POSGCD for the life of the operating permit.

Groundwater would be provided to one or more public water suppliers or industrial, manufacturing, or commercial users who may engage in conjunctive use. Opportunities for conjunctive use are favorable, as groundwater from the Carrizo-Wilcox is a drought resistant supply that would reduce risk of water shortages during droughts for entities that currently rely solely on surface water. Implementation of these conjunctive use opportunities will likely require coordination and cooperation of different entities — both public water suppliers and wholesale water providers. These conjunctive use opportunities are long-term investments for improving safety and reliability of public water systems, and management of water resources.

Response to POSGCD Rule 7.4.5 Aquifer Impact Study

Section 4



Response to Post Oak Savannah Rule 7.4.5 - Aquifer Impact Study

SLR Property I, LP

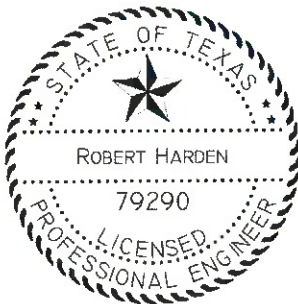
Application for a 15,000 af/yr Simsboro Operating Permit
(to be used in conjunction with SLR's 15,000 af/yr Historic Use Permit No. 0330)

Prepared by:



HARDEN
HYDROLOGY &
ENGINEERING

July 26, 2022



Bob Harden

The seal appearing on this document was authorized
by Robert Harden, P.E. 79290
on July 26, 2022.
Firm Registration Number: F-19082

Response to Rule 7.4.5 - Aquifer Impact Study

SLR Property I, LP

Application for a 15,000 af/yr Simsboro Operating Permit

(to be used in conjunction with SLR's 15,000 af/yr Historic Use Permit No. 0330)

At the request of Sandow Lakes Ranch I, LP (SLR), Harden Hydrology & Engineering, PLLC (HHE) has prepared this Aquifer Impact Study for purposes of addressing the requirements of Rule 7.4.5 of the Post Oak Savannah Groundwater Conservation District (District). SLR Property I, LP (SLR) holds POSGCD Historic Use Permit No. 0330, which authorizes the production of 15,000 af/yr of water from the Simsboro formation by means of a system of 61 wells located on the nearly 25,000 acres of land that SLR owns in Milam County.

SLR seeks a new 15,000 af/yr Simsboro operating permit to be used in conjunction with its historic use permit. Water produced under the new operating permit will be pumped from the same 61 wells authorized for the historic use permit and there would be a special condition in the new operating permit imposing a cap of 15,000 acre-feet per year on total production under both permits. SLR requests that the water produced under the new operating permit be authorized to be used for municipal, industrial, manufacturing and commercial purposes anywhere within Milam and Burleson Counties.

Upon issuance of the new 15,000 af/yr operating permit, the entire 15,000 af/yr will be assigned to the historic use permit and zero af/yr will be assigned to the operating permit. From time to time thereafter, SLR will notify the District of the portion of the 15,000 af/yr assigned to the operating permit, and the remaining portion of the 15,000 af/yr will be the amount assigned to the historic use permit. SLR understands from the General Manager that SLR will only have the right to increase the amount assigned to the operating permit and to decrease the amount assigned to the historic use permit by an equal amount, and never to change the assigned amounts in the opposite direction; in other words, the amount assigned to the historic use permit may never be increased above the last amount assigned.

SLR also understands from the General Manager that, if an historic use permit well does not meet the District's current spacing requirements for property line setback or spacing from an adjoining landowner's well when the historic use permit well is pumped at its approved production capacity, any water pumped from that well under the new operating permit may not be pumped at a rate in excess of the production capacity at which the well can be pumped based on those spacing requirements. Any available capacity above the production capacity at which water is being pumped at any time under the new operating permit may be used at that time to pump water under the historic use permit.

The portion of the 15,000 af/yr produced from the authorized wells and used for industrial use on SLR's Milam County property will be reported under the historic use permit; and the portion used for industrial use outside the boundaries of SLR's Milam County property, or for uses other than industrial use on or outside the boundaries of SLR's property, will be reported under the new operating permit.

SLR requests that the term of the new operating permit be 40 years from the date of issuance of the permit.

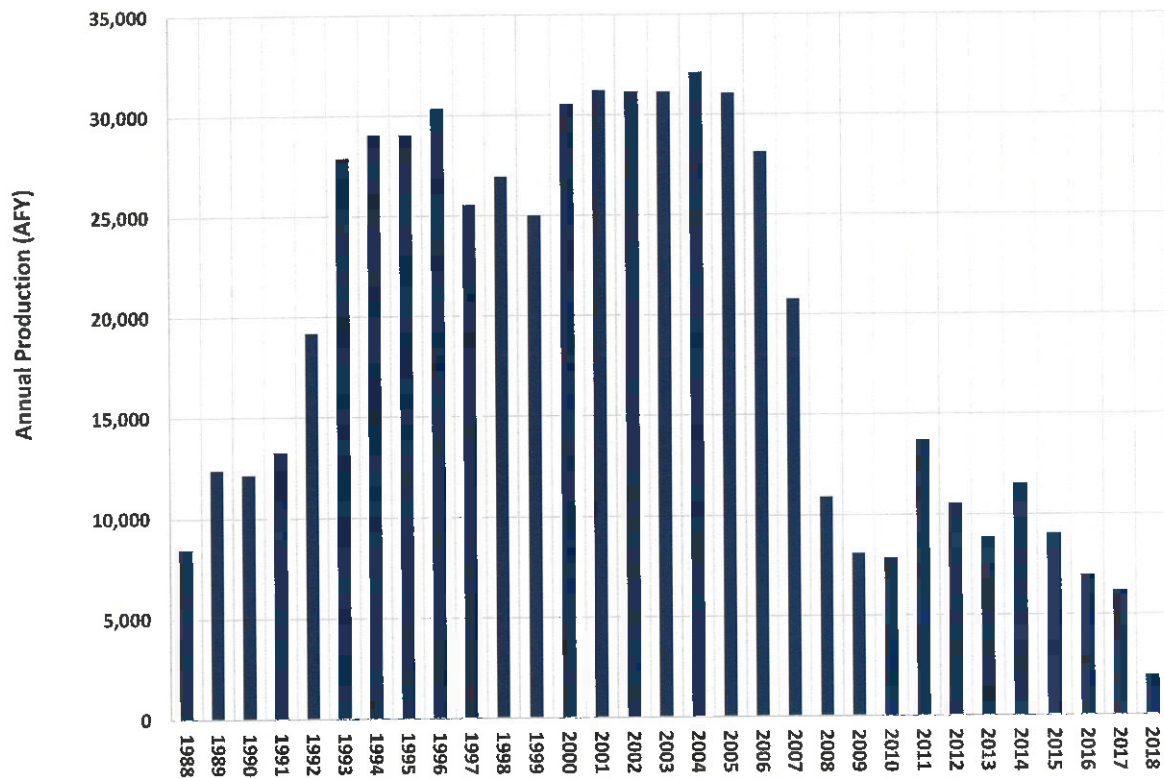
The historic use permit currently has a term that extends through December 31, 2038. SLR is not at this time requesting an extension of the term of its historic use permit.

This report presents historical information collected by Alcoa regarding Alcoa's historical Simsboro production at its Sandow Mine and Rockdale Operations, as well as past well mitigation activities conducted by Alcoa in compliance with mining regulations. This report also presents the results of modeling projections of future groundwater conditions through the requested 40-year term of the new operating permit in response to District Rule 7.4.5.

Alcoa Historical Simsboro Production

Alcoa began producing Simsboro aquifer groundwater in significant quantities in the 1980s, in large part to depressurize the Simsboro aquifer for safe mining of lignite to fuel the electric generation units located at Alcoa's Rockdale Operations. Before then and thereafter, Simsboro water was also used for cooling and industrial processes. Figure 4-1 shows Alcoa's annual Simsboro production from wells located at the Sandow Mine during the period from 1988 through 2018. As shown, withdrawals during the late 1980s and early 1990s averaged about 12,000 af/yr. Average production increased as mining progressed at Sandow, where an average production rate of about 30,000 af/yr was maintained for about 14 years, peaking at about 33,000 af/yr. Simsboro production from the Sandow mine area started decreasing in 2007 as primary mining operations were transferred to the neighboring Three Oaks Mine. Reclamation activities at Sandow mine continued for 10+ years with total use of about 10,000 af/yr. Most recently, after the closure of Alcoa's primary aluminum smelter and the cessation of power generation at Alcoa's Rockdale Operations, groundwater use has declined further.

Figure 4-1. Estimated Historical Simsboro Production at Sandow Mine



Note: Simsboro production shown in Figure 4-1 reflects all industrial pumping from Simsboro Formation wells associated with the Sandow Mine in Milam and Lee Counties.

Modeling Assumptions and Deliverables

Two different model runs, and twelve specific deliverables, were prepared for this application. The model runs and their assumptions, and the deliverables, are listed below in Table 1.

List of Assumptions for Groundwater Model Runs	
A-1	The baseline GAM simulation is GMA 12 Pumping Scenario #19 (S-19). This simulation is called GAM A-1 (or GAM Run A-1 or Model Run A-1). GAM Run A-1 period of simulation is from January 1, 2011 through December 31, 2070.
A-2	A modified GAM A-1 simulation that includes pumping up to 15,000 af/yr from the 61 SLR wells associated with the combination of the Historical Permit 0330 and the new, proposed 15,000 af/yr operating permit from Jan 1, 2023 to December 31, 2062, and up to 25,000 af/yr under SLR's approved 25,000 af/yr Operating Permit 0148 at the 56 wells from Jan 1, 2024 to Dec 31, 2062, and then continuing through December 31, 2070 to align with GAM Run A-1. This simulation is called GAM B-2 (or GAM Run B-2 or Model Run B-2).
List of Deliverables for Groundwater Model Runs	
D-1	A table that contains the following information for the 61 historical wells: (1) latitude; (2) longitude; (3) current ground elevation; (4) depth of top of well screen below current ground elevation; and (5) depth of bottom of screen below current ground elevation.
D-2	Documentation, as available, that the well screen information in Item D-1 is valid for the historical wells (e.g. driller report, geophysical log, and/or well setting report).
D-3	A table that lists the maximum pumping rate for the 61 wells.
D-4	A table that lists the average drawdown for the entire Simsboro Aquifer (GAM Layer 9) within POSGCD for GAM Runs A-1 and B-2 for time periods: 2010 to 2020, 2010 to 2030, 2010 to 2040, 2010 to 2050, 2010 to 2060, and 2010 to 2070.
D-5	A spreadsheet list of the annual pumping rates assigned to the 61 wells from Jan 1, 2023 to December 31, 2070 for GAM Run B-2.
D-6	A table listing of the annual pumping rates assigned to the 61 Simsboro Aquifer wells from Jan 1, 2023 to December 31, 2070 for GAM Run B-3.
D-7	A table that includes the average drawdown that occurs in GAM Layer 2 for the Simsboro Aquifer outcrop and for entire Carrizo-Wilcox Aquifer (combined Hooper, Simsboro, Calvert Bluff and Carrizo) outcrop for GAM Runs A-1 and B-2. For each GAM Run, provide the average drawdowns for the two outcrop sections for: 2010 to 2020, 2010 to 2030, 2010 to 2040, 2010 to 2050, 2010 to 2060, and 2010 to 2070.
D-8	A table that includes differences between GAM Runs A-1 and B-2.
D-9	Contours of predicted drawdown in the Hooper, Simsboro, and Calvert Bluff aquifers from January 1, 2020 to December 31, 2062 for GAM Run B-2. In addition, a second set of contours that show the difference in drawdowns between GAM Runs A-1 and B-2 in the Hooper, Simsboro, Calvert Bluff aquifers, and in the outcrop of the Carrizo-Wilcox aquifer. Registered wells within five miles of approved SLR production wells should be shown in the figures.
D-10	An assessment of changes in land subsidence that will occur from the difference in drawdown between GAM Runs A-1 and B-2. The assessment needs to discuss the applicability of the recent TWDB tool for estimating risk associated with land subsidence.
D-11	An assessment of changes in surface water -groundwater interaction that will occur from the difference in drawdown between GAM Runs A-1 and B-2.
D-12	Electronic files for model inputs and outputs for GAM Runs A-1 and B-2.

SLR representatives met with the District and its Hydrogeologist on November 30, 2021. Based on the results of this meeting, SLR provided the District, via email dated December 14, 2021, with suggested assumptions and deliverables for this permit application. SLR representatives again met with District representatives on May 20, 2022, and based on the results of this meeting SLR made certain revisions to the application.

Pumping Input Specific to Sandow Lakes Property

The first step in preparing the model runs was to inspect the A-1 model run and identify the amount of assumed historical Alcoa pumping and future SLR pumping in the model simulation that could be attributed to the Milam County portion of SLR's Sandow Lakes Ranch. This work effort indicates that assumed pumping of approximately 23,600 af/yr is assigned in the model nodes associated with SLR's Milam County property.¹ Table 2 is a summary of the assumed SLR pumping by decade assigned in these model nodes for SLR's Milam County property.

SLR's Milam County property (which consists of nearly 25,000 acres) supports currently permitted production of 40,000 af/yr (15,000 af/yr under SLR's historic use permit and 25,000 af/yr under the operating permit). The assumed SLR future pumping in Model Run A-1 (23,600 af/yr) is less than SLR's currently permitted production (40,000 af/yr), and it is not clear what the basis of distributing SLR pumping was used in the pumping assumptions in GAM Run A-1.

To construct Model Run B-2 pumping input, SLR pumping was substituted for each permitted Historic Permit 0330 and Operating Permit 148 well location considering the well's hydrogeologic location, and approved production capacity and the total of the individual permitted well approved production capacities, for each permit's wells. This ratio was then multiplied by the annual production limit (15,000 af/yr for the historic use permit, and 25,000 af/yr for the operating permit) to arrive at an annual production associated with each permitted well location. This creates a pumping file equal to SLR's currently permitted 40,000 af/yr. Since the 15,000 af/yr Historic Use permit term is through December 31, 2038 and the requested new overlaying 15,000 af/yr operating permit term is through approximately 2062, the model run assumes the 15,000 af/yr production authorization would be continued through 2070. Likewise, since the existing 25,000 af/yr operating permit term is through November 13, 2052, the model run assumes the 25,000 af/yr production authorization would be continued through 2070. Table 3 is a listing of the permitted maximum, instantaneous well rates, and the assumed average pumping rate by well for Model Run B-2. Table 4 is a summary by decade of model grid node pumping input for Model Run B-2 in the SLR Milam Sandow Lake property.

¹ Based on permitted well locations, it also appears there is about 45 to 65 af/yr of assumed pumping placed in the model in nodes 156238, 156239, 156888, and 157595. It is believed that pumping in nodes 156238 and 156239 represent Rockdale Country Club pumping, and it is assumed pumping in nodes 156888 and 157595 are small amounts of exempt use.

**Table 2. Simulated Pumping Schedule by Year for
GAM Runs A-1 and B-2 for SLR Milam County Property**

		MODEL PUMPING BY YEAR (af/yr)		
		GAM Run A-1	GAM Run B-2	
Stress Period	Year	GMA 12 Run S- 19	25,000 af/yr Production (currently authorized under Operating Permit 0148)	15,000 af/yr Production (proposed to be authorized under new Operating Permit and Historic Permit 0330)
1	2011	13,139	0	0
2	2012	8,638	0	0
3	2013	8,665	0	0
4	2014	11,365	0	0
5	2015	8,489	0	0
6	2016	5,794	0	0
7	2017	4,837	0	0
8	2018	913	0	0
9	2019	47	0	0
10	2020	48	0	0
11	2021	48	0	0
12	2022	44	0	0
13	2023	45	0	2,000
14	2024	45	14,000	3,000
15	2025	45	17,000	5,000
16	2026	46	17,000	7,000
17	2027	46	20,000	9,000
18	2028	47	21,000	12,000
19	2029	47	23,000	13,000
20 - 60	2030 - 2070	23,609 to 23,626	25,000	15,000

**Table 3. Pumping by Decade for Model Nodes
Associated with Sandow Lakes Property in Milam County
Model Run A-1**

Model Node	MODEL A-1 PUMPING BY DECADE (af/yr)					
	2020	2030	2040	2050	2060	2070
156215		394.79	394.79	394.79	394.79	394.79
156217		394.79	394.79	394.79	394.79	394.79
156222		394.79	394.79	394.79	394.79	394.79
156225		789.58	789.58	789.58	789.58	789.58
156226		394.79	394.79	394.79	394.79	394.79
156238	22.62	22.33	24.31	26.29	28.26	30.24
156239	22.62	22.33	24.31	26.29	28.26	30.24
156888	1.29	1.42	1.57	1.73	1.91	2.11
156890		789.58	789.58	789.58	789.58	789.58
156892		394.79	394.79	394.79	394.79	394.79
156894		789.58	789.58	789.58	789.58	789.58
156898		394.79	394.79	394.79	394.79	394.79
156901		689.87	689.87	689.87	689.87	689.87
156902		789.58	789.58	789.58	789.58	789.58
157595	1.29	1.42	1.57	1.73	1.91	2.11
157597		3,947.88	3,947.88	3,947.88	3,947.88	3,947.88
157598		1,579.15	1,579.15	1,579.15	1,579.15	1,579.15
157599		394.79	394.79	394.79	394.79	394.79
157601		789.58	789.58	789.58	789.58	789.58
157604		394.79	394.79	394.79	394.79	394.79
157607		789.58	789.58	789.58	789.58	789.58
157608		394.79	394.79	394.79	394.79	394.79
157609		1,973.94	1,973.94	1,973.94	1,973.94	1,973.94
157610		1,184.36	1,184.36	1,184.36	1,184.36	1,184.36
157612		394.79	394.79	394.79	394.79	394.79
157614		394.79	394.79	394.79	394.79	394.79
157615		1,973.94	1,973.94	1,973.94	1,973.94	1,973.94
158242		368.47	368.47	368.47	368.47	368.47
158247		789.58	789.58	789.58	789.58	789.58
158248		1,973.94	1,973.94	1,973.94	1,973.94	1,973.94
Totals:	47.81	23,608.75	23,613.00	23,617.28	23,621.60	23,625.95

Table 4.
Assumed Pumping Rate by Well for Model Run B-2

Well Designation	Approved Permit	Model Node	Approved Production Capacity (GPM)	Assumed Rate for Model Run B-2 (gpm)	Assumed Rate for Model Run B-2 (ft3/day)
58-32-502	Dual HUP - OP	156226	500	443	85,331.89
58-32-503	Dual HUP - OP	156225	500	443	85,331.89
58-32-504	HUP	156225	500	209	40,289.86
58-32-505	HUP	156225	500	209	40,289.86
A-9-2	HUP	157601	540	226	43,513.05
A-9-3	HUP	157601	540	226	43,513.05
AT-1	Dual HUP - OP	157599	500	290	85,331.89
AT-2	HUP	157610	500	209	40,289.86
C4052A	Dual HUP - OP	157608	300	267	51,391.63
C4245	Dual HUP - OP	157609	240	214	41,113.31
C4246	Dual HUP - OP	157609	250	222	42,665.94
C4247	Dual HUP - OP	157609	240	214	41,113.31
C4248A	Dual HUP - OP	157609	230	205	39,368.17
C4250A	Dual HUP - OP	157609	290	259	49,838.99
C4440A	HUP	157612	440	184	35,455.08
C5245B	Dual HUP - OP	157614	410	361	69,433.15
C-9-12	Dual HUP - OP	157607	440	390	75,053.56
C-9-13	Dual HUP - OP	157610	320	283	54,496.91
C-9-14	Dual HUP - OP	157607	420	374	71,948.28
C-9-15	HUP	158247	250	105	20,144.93
C-9-16	HUP	158248	420	176	33,843.48
C-9-17	HUP	158248	260	109	20,950.73
C-9-18	HUP	158248	510	213	41,095.66
C-9-19	HUP	157615	460	193	37,066.67
C-9-20	Dual HUP - OP	158247	450	398	76,606.20
C-9-23	HUP	157610	420	176	33,843.48
C-9-26	HUP	157615	620	260	49,959.43
C-9-27	HUP	157615	500	209	40,289.86
C-9-29	HUP	158248	370	155	29,814.50
C-9-30	HUP	158248	420	176	33,843.48
C-9-31	HUP	157615	450	188	36,260.88
DP-S-A-3	Dual HUP - OP	156902	250	222	42,665.94
DP-S-A-4	Dual HUP - OP	156902	250	222	42,665.94
DP-S-A-5	Dual HUP - OP	156901	250	222	42,665.94
DP-S-A-6	Dual HUP - OP	156901	250	222	42,665.94
DP-S-A-7	Dual HUP - OP	156898	250	222	42,665.94
E-1	Dual HUP - OP	157613	1000	580	170,663.77
E-2	HUP	156894	1000	419	80,579.72
E-3	HUP	156894	1000	419	80,579.72
E-4	HUP	156894	1000	419	80,579.72
F1 Sims	HUP	157597	560	234	45,124.64
F10 Sims	Dual HUP - OP	157598	250	222	42,665.94

Table 4.
Assumed Pumping Rate by Well for Model Run B-2 – (con't)

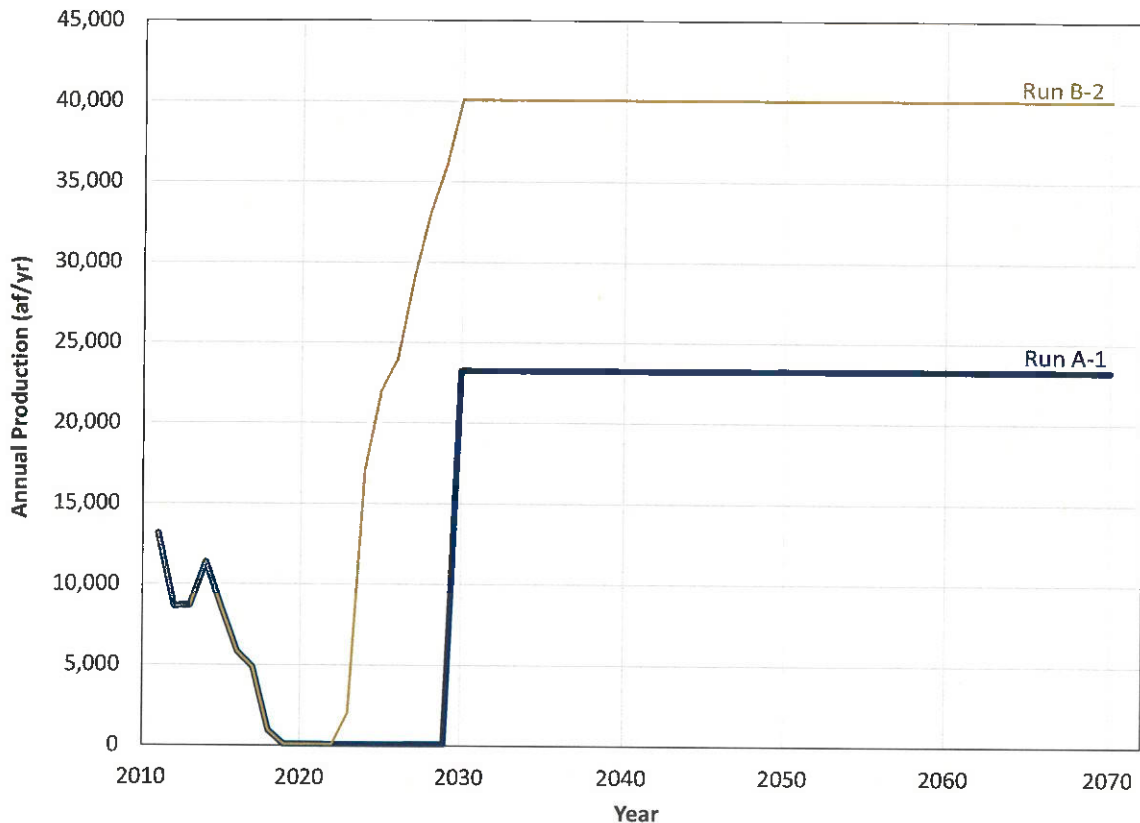
Well Designation	Approved Permit	Model Node	Approved Production Capacity (GPM)	Assumed Rate for Model Run B-2	
				(gpm)	(ft3/day)
F11 Sims	Dual HUP - OP	157598	250	222	42,665.94
F12 Sims	Dual HUP - OP	156892	250	222	42,665.94
F13 Sims	Dual HUP - OP	157597	250	222	42,665.94
F14 Sims	Dual HUP - OP	157597	250	222	42,665.94
F15 Sims	Dual HUP - OP	157597	250	222	42,665.94
F2 Sims	Dual HUP - OP	157597	250	222	42,665.94
F3 Sims	HUP	157597	250	105	20,144.93
F4 Sims	Dual HUP - OP	157597	250	222	42,665.94
F5 Sims	HUP	157597	250	105	20,144.93
F5222A	HUP	156890	500	209	40,289.86
F5222B	HUP	156890	200	84	16,115.94
F6 Sims	Dual HUP - OP	157597	250	222	42,665.94
F8 Sims	Dual HUP - OP	157598	250	222	42,665.94
F9 Sims	Dual HUP - OP	157598	250	222	42,665.94
NFD-02 Sims	HUP	157597	500	209	40,289.86
P-5	Dual HUP - OP	157615	500	443	85,331.89
South Crusher	HUP	156217	500	209	40,289.86
Storm Shelter	HUP	156215	500	209	40,289.86
Wash Rack	HUP	156222	500	209	40,289.86
OP-1	OP	156916	1000	120	23,100.00
OP-2	OP	156911	1000	160	30,800.00
OP-3	OP	157617	1000	180	34,650.00
OP-4	OP	157614	1000	250	48,125.00
OP-5	OP	157614	1000	265	51,012.50
OP-6	OP	158246	1000	500	96,249.99
OP-7	OP	158246	1000	500	96,249.99
OP-8	OP	158246	1000	500	96,249.99
OP-9	OP	158245	1000	500	96,249.99
OP-10	OP	158245	1000	500	96,249.99
OP-11	OP	158245	1000	500	96,249.99
OP-12	OP	158245	1000	500	96,249.99
OP-13	OP	158245	1000	500	96,249.99
OP-14	OP	158244	1000	500	96,249.99
OP-15	OP	158244	1000	500	96,249.99
OP-16	OP	158244	1000	500	96,249.99
OP-17	OP	158243	1000	500	96,249.99
OP-18	OP	157597	1000	420	80,849.99
OP-19	OP	157596	1000	350	67,375.00
OP-20	OP	157596	1000	330	63,525.00
OP-21	OP	157595	1000	330	63,525.00
OP-22	OP	157595	1000	325	62,562.50
OP-23	OP	156889	1000	325	62,562.50
OP-24	OP	156889	1000	300	57,750.00

**Table 5. Pumping by Decade for Model Nodes Associated with
Sandow Lakes Property in Milam County - Model Runs B-2**

Model Node	MODEL B-2 PUMPING BY YEAR (af/yr)					
	2020	2030	2040	2050	2060	2070
156215		337.60	337.60	337.60	337.60	337.60
156217		337.60	337.60	337.60	337.60	337.60
156222		337.60	337.60	337.60	337.60	337.60
156225		1,390.21	1,390.21	1,390.21	1,390.21	1,390.21
156226		715.02	715.02	715.02	715.02	715.02
156238	22.62	22.33	24.31	26.29	28.26	30.24
156239	22.62	22.33	24.31	26.29	28.26	30.24
156888	1.29	1.42	1.57	1.73	1.91	2.11
156889		1,008.13	1,008.13	1,008.13	1,008.13	1,008.13
156890		472.64	472.64	472.64	472.64	472.64
156892		357.51	357.51	357.51	357.51	357.51
156894		2,025.59	2,025.59	2,025.59	2,025.59	2,025.59
156898		357.51	357.51	357.51	357.51	357.51
156901		715.02	715.02	715.02	715.02	715.02
156902		715.02	715.02	715.02	715.02	715.02
156911		258.08	258.08	258.08	258.08	258.08
156916		193.56	193.56	193.56	193.56	193.56
157595	1.29	1,057.94	1,058.09	1,058.25	1,058.43	1,058.63
157596		1,096.84	1,096.84	1,096.84	1,096.84	1,096.84
157597		3,875.82	3,875.82	3,875.82	3,875.82	3,875.82
157598		1,430.03	1,430.03	1,430.03	1,430.03	1,430.03
157599		715.02	715.02	715.02	715.02	715.02
157601		729.21	729.21	729.21	729.21	729.21
157607		1,231.76	1,231.76	1,231.76	1,231.76	1,231.76
157608		430.62	430.62	430.62	430.62	430.62
157609		1,793.99	1,793.99	1,793.99	1,793.99	1,793.99
157610		1,077.82	1,077.82	1,077.82	1,077.82	1,077.82
157612		297.09	297.09	297.09	297.09	297.09
157613		1,430.03	1,430.03	1,430.03	1,430.03	1,430.03
157614		1,412.50	1,412.50	1,412.50	1,412.50	1,412.50
157615		2,085.67	2,085.67	2,085.67	2,085.67	2,085.67
157617		290.34	290.34	290.34	290.34	290.34
158243		806.50	806.50	806.50	806.50	806.50
158244		2,419.51	2,419.51	2,419.51	2,419.51	2,419.51
158245		4,032.51	4,032.51	4,032.51	4,032.51	4,032.51
158246		2,419.51	2,419.51	2,419.51	2,419.51	2,419.51
158247		810.70	810.70	810.70	810.70	810.70
158248		1,336.89	1,336.89	1,336.89	1,336.89	1,336.89
Totals:	47.81	40,047.49	40,051.74	40,056.02	40,060.33	40,064.69

Figure 4-2 shows the timing and magnitude of the pumping input for GAM Run A-1 and GAM Run B-2 for the Sandow Lakes Property.

Figure 4-2. Simulated SLR Milam County Production by GAM Run



Regional Pumping in GAM Run A-1

As stated earlier in this report, GAM Run A-1 is a model run scenario that was developed during the current GMA 12 Joint Planning activities. GAM Run A-1 contains the base regional pumping assumptions that are carried forward into the HUP/ proposed operating permit run (GAM Run B-2). GAM Run A-1 contains increases in future pumping distributed within Bastrop, Lee, Milam, Burleson, Brazos, and Robertson counties. Table 5 presents the GAM Run A-1 total Simsboro pumping in the Brazos Valley Groundwater Conservation District (BVGCD), the Lost Pines Groundwater Conservation District (LPGCD), and the POSGCD.

**Table 6. Simsboro Aquifer Pumping for Model Run A-1 by Decade
for Lost Pines, Post Oak Savannah, and Brazos Valley
Groundwater Conservation Districts (af/yr)**

GCD	2020	2030	2040	2050	2060	2070
BVGCD	76,936	91,284	105,633	119,982	134,331	147,245
LPGCD	21,274	65,845	69,941	74,045	78,161	81,875
POSGCD	40,774	66,469	75,763	78,776	79,111	79,435

Table 7 presents the assumed pumping in GAM Run B-2 for the Simsboro aquifer totaled by groundwater conservation district.

**Table 7. Simsboro Aquifer Pumping for Model Run B-2 by Decade
for Lost Pines, Post Oak Savannah, and Brazos Valley
Groundwater Conservation Districts (af/yr)**

GCD	2020	2030	2040	2050	2060	2070
BVGCD	76,936	91,284	105,633	119,982	134,331	147,245
LPGCD	21,274	65,845	69,941	74,045	78,161	81,875
POSGCD	40,774	83,276	92,570	95,583	95,918	96,242

In tabulating Tables 6 and Table 7, pumping in model nodes 156889, 156890, 157595, 157596, 157597, 158243, and 158244 was attributed to Milam County where the operating permit wells reside.

Model Simulations

New GAM for Carrizo-Wilcox Aquifer

Groundwater Management Area 12 (GMA 12) originally adopted a new groundwater availability model (GAM) for the Central Portion of the Sparta, Queen City, and Carrizo-Wilcox Aquifers for use in the third round of joint planning activities (Ewing, Jigmond, Jones & Young, 2018). This model was updated in October 2020 (D.B. Stephens, et al). Rule 7.4.5.c of the POSGCD states “if a MAG exists for the aquifer from which the water will be produced, then the predictions will include results based on using the Groundwater Availability Model run used to establish the MAG for the aquifer”. Per POSGCD requirements, the new updated GAM be used to simulate the required analysis.

Existing GAM Representation of Hooper Aquifer

At the request of the POSGCD, the following technical evaluation of the GAM’s representation of the Carrizo-Wilcox Aquifer and specifically the Hooper Aquifer is included as part of SLR’s application.

The Hooper Aquifer is the deepest zone of the Carrizo-Wilcox Aquifer group. Correspondingly, the Hooper zone is relatively undeveloped throughout Milam County, because of the abundance of groundwater resources in overlying and shallower portions of the Carrizo-Wilcox Aquifer. Throughout the area covered by the model, most wells are constructed in either the Carrizo, Calvert Bluff, or Simsboro aquifers. The lack of well development in the Hooper limits the number of data points from which estimations of aquifer parameters were derived for the model. Thus, the current model inputs for the aquifer are relatively coarse estimates.

Based on test drilling conducted to date on the SLR property, there are sequences of interbedded clays and sands through the Simsboro, and the lowest sands in such sequences should be considered to be Simsboro sands. At some test hole locations, the lowest Simsboro sands exhibit thin sand thickness and low resistivity similar to, or even lower than, deeper sands of the Hooper. In other locations, the lowest Simsboro sands are thicker and more massive. As such, there is not always a clear stratigraphic boundary between the base of the Simsboro and top of the Hooper.

Estimates of transmissivity of lower sands encountered thus far at SLR range from less than 1,000 gpd/ft to 3,000 gpd/ft, while the GAM currently represents transmissivity of 5,000 gpd/ft to 8,000 gpd/ft. However, the SLR testholes to date do not penetrate the full thickness of the Hooper as represented in the GAM. Based on review of scattered oil and gas logs, it is currently believed the most productive sands occur in the upper 200 feet of the Hooper.

It is likely with additional test drilling, well drilling, groundwater pumping, and water level measurements that much greater heterogeneity of the aquifer characteristics will be discovered. This is a normal experience with GAMs even with more developed aquifer zones. GAMs are regional models and continuously undergo modification as additional data become available.

Required Deliverables

As shown in Table 1, a series of contour maps and tables is provided to satisfy the requirements of District Rule 7.4.5. One series of maps reflect the changes in water levels (drawdown) for the period January 1, 2021 through December 31, 2062 (Model Run B-2). For naming simplicity, these maps are designated as declines in piezometric surface from Year 2020 to Year 2062, and are intended to demonstrate effects over the proposed operating permit term. Another set of maps are for the period January 1, 2021 through December 31, 2061, and represent the difference in simulated piezometric head for GAM Run A-1 and GAM Run B-2. These maps are labeled with the descriptive timeframe of Year 2020 to Year 2062.

Contour maps of the declines in piezometric surface are provided for the model layers corresponding to the confined portions of the Simsboro, Hooper, and Calvert Bluff aquifers, as well as the shallow portion of the combined outcrop areas of the Carrizo-Wilcox group which comprise portions of model layer 2. Figures 4-3 through 4-6 show these maps for the period of Year 2020 to Year 2062 (Model Run B-2), and Figures 4-7 through 4-10 depict the differences between GAM Run A-1 and GAM Run B-2 in piezometric surface from the Year 2020 to 2062,

and for the confined portions of the Simsboro, Hooper, and Calvert Bluff aquifers, as well as the shallow portion of the combined outcrop areas of the Carrizo-Wilcox group.

Table 8 lists the average drawdown for Model Layer 9 (the confined portion) of the Simsboro aquifer within POSGCD, for GAM model runs A-1 B-2 and for time periods: 2010 to 2020, 2010 to 2030, 2010 to 2040, 2010 to 2050, 2010 to 2060, and 2010 to 2070.

**Table 8. Average Drawdown in Model Layer 9
(confined portion) of the Simsboro Aquifer (feet)**

Area	GAM Run#	2010 to 2020	2010 to 2030	2010 to 2040	2010 to 2050	2010 to 2060	2010 to 2070
POSGCD	A-1	57	152	207	244	271	295
POSGCD	B-2	57	163	219	258	286	313

Table 9 lists the average drawdown for Model Layer 2 (the outcrop portion) ,of the Simsboro aquifer within POSGCD, for GAM model runs A-1, B-2, B-3, and B-4 and for time periods: 2010 to 2020, 2010 to 2030, 2010 to 2040, 2010 to 2050, 2010 to 2060, and 2010 to 2070.

**Table 9. Average Drawdown in Model Layer 2
(outcrop portion) of the Simsboro Aquifer (feet)**

Area	GAM Run#	2010 to 2020	2010 to 2030	2010 to 2040	2010 to 2050	2010 to 2060	2010 to 2070
POSGCD	A-1	3	6	11	16	22	28
POSGCD	B-2	3	6	12	19	25	31

Table 10 lists the average drawdown for Model Layer 2 for the entire Carrizo-Wilcox Aquifer (combined Hooper, Simsboro, Calvert Bluff, and Carrizo) outcrop within POSGCD, for GAM model runs A-1 and B-2 and for time periods: 2010 to 2020, 2010 to 2030, 2010 to 2040, 2010 to 2050, 2010 to 2060, and 2010 to 2070.

**Table 10. Average Drawdown in Model Layer 2
for the Entire Carrizo-Wilcox Aquifer Outcrop (feet)**

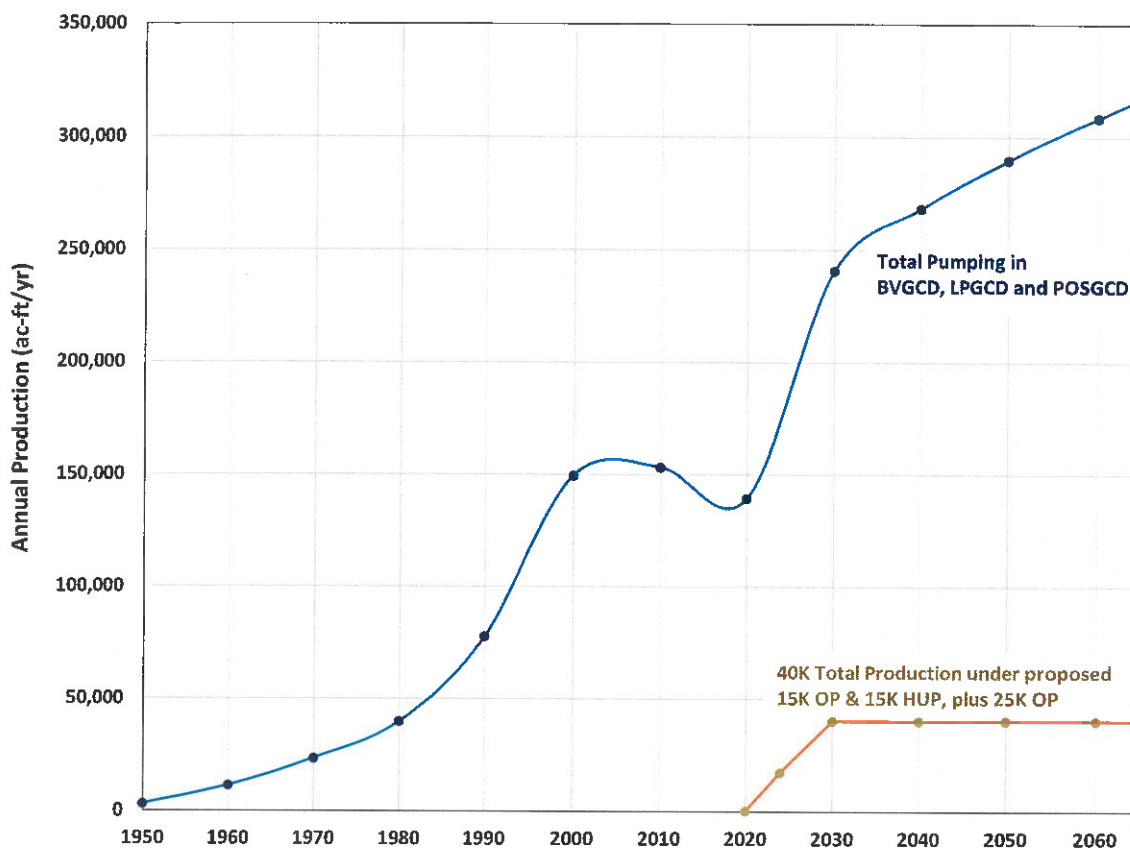
Area	GAM Run#	2010 to 2020	2010 to 2030	2010 to 2040	2010 to 2050	2010 to 2060	2010 to 2070
POSGCD	A-1	1	3	6	9	12	15
POSGCD	B-2	1	4	7	10	14	17

Discussion of Modeling Results

The model results indicate the regional effects of pumping on reductions in artesian pressure and water table decline. Model results shown on Figures 4-3 through 4-5, and Figures 4-7 through 4-9 are largely changes in artesian pressure, while changes shown on Figures 4-6 and 4-10 (GAM Layer 2) represent smaller changes in water table decline. These predicted changes are the result of: 1) the assumed continuation of regional existing pumping, 2) assumed increases in regional future pumping largely in the LPGCD and the BVGCD, and 3) the additional assumed pumping by SLR as discussed above under Pumping Input Specific to Sandow Lakes Property. The future increases in pumping are largely within the LPGCD and BVGCD (see Table 5 and Table 6).

Figure 4-11 shows the total historical and future pumping assumed in the model through 2060 for the POSGCD, the LPGCD and the BVGCD. Also shown is SLR's current authorized production of 40,000 af/yr from the Simsboro consisting of the 15,000 af/yr production under the proposed new 15,000 af/yr operating permit and Historic Use Permit 0330, together with the 25,000 af/yr production under Operating Permit 0148. Figure 4-11 demonstrates that SLR's 40,000 af/yr total authorized production is small compared to both the historical pumping that has occurred regionally, and the total future production rates assumed in GAM Run A-1 in the LPGCD, BVGCD, and the POSGCD; the proposed new 15,000 af/yr operating permit is very important to SLR primarily because of the flexibility it provides, but even at face value it represents only a relatively small part of the total authorized production.

Figure 4-11. Estimated Historical and Future Simulated Simsboro Production in BVGCD, LPGCD, and POGCD - GAM Run B-2



Future increases in pumping will cause regional effects that are primarily reductions in artesian pressure, and as these pressure reductions propagate to the shallower zones of the Simsboro outcrop, then subsequent reductions in the water table can occur. The degree and magnitude of these responses is largely dependent on the aquifer's vertical hydraulic conductivity, recharge rates, the amount of groundwater that is naturally discharged via direct evaporation, transpiration by plants, and seeps and springs, and the degree of capture of the natural discharge that occurs in response to aquifer pumping. Each of these components of the groundwater system are difficult to measure directly. Nevertheless, the subsequent response of the capture of recharge will naturally occur, and this can reduce wasteful discharge to the extent it is occurring, and will naturally increase the sustainability of water supplies.

Experience has shown that any reductions in the water table zones will be very slow to occur or will occur in a very gradual, mostly unnoticeable manner. For example, groundwater pumping from the Carrizo aquifer in the Wintergarden Area occurred for many decades with total pumping rates between 200,000 to over 300,000 af/yr. Long-term water level records in shallow, water table wells exhibited little or relatively small response. Similar experience has been documented

over the past century of pumping in the Northern Trinity aquifer and the Gulf Coast aquifer, as well.

Analysis of Potential for Land-Surface Subsidence

Land-surface subsidence is known to occur in some groundwater settings. Groundwater pumping from sand and gravel zones can cause seepage of water from adjacent clay or silt zones. The loss of pore water pressure in the clay or silt reduces the load bearing capacity of the clays or silts, and the overbearing weight of soil, groundwater and buildings causes the clay or silt zones to compact. This compaction occurs at the depth of the clays or silts, and some amount of this compaction can translate into subsidence at land surface.

In Texas, subsidence is documented to have occurred in the greater Houston area (Gabrysch, 1984). Near Pecos, Texas (Chi and Reilinger, 1984), and in the area of El Paso, Texas (Land and Armstrong, 1985).

TWDB Subsidence Risk Study

In 2016, the TWDB contracted with LRE Water, LLC “to identify and characterize areas within Texas’ major and minor aquifers that are susceptible to land subsidence related to groundwater pumping” (TWDB, 2020). In 2017, a report was issued and titled “Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping”, and an EXCEL analytical model was released for assigning a risk factor for subsidence based on lithologic, geotechnical, water level change and other factors (Furnans et al. 2017).

Based on the risk methodology employed, the authors state that of the 9 major aquifers in Texas, 5 of these aquifers are classified with a “high subsidence risk over large areas of the aquifer” (Furnans, 2017). The major aquifers of Texas with a high-risk subsidence rating are the Gulf Coast, Pecos Valley, Hueco-Mesilla Bolson, Ogallala, and Carrizo-Wilcox aquifers. Two minor aquifers, the Yegua-Jackson, and the Brazos River Alluvium are ranked as high risk for subsidence.

It is helpful to look at the underlying technique and data the authors used to determine the subsidence risk rating for an aquifer. The factors used to calculate the subsidence risk are saturated clay thickness, an estimate of clay compressibility, the assumed type of aquifer lithology, historic water levels compared to current water levels (pre-consolidation water level), and the potential of for future water level declines. Of these factors, the authors state they were unable to gather actual geotechnical data on clays, and instead relied on generalized values of clay compressibility based on aquifer lithology.

Factors not considered in the study are the permeability, depth, age, or lateral continuity of the clays, nor the degree of compaction at depth that may translate to actual land surface subsidence. The study also does not try to calibrate the methodology utilized in the report with known data on clay thickness, water level change, and measured subsidence.

Past Experience in the Carrizo-Wilcox

As addressed previously, Alcoa has conducted groundwater pumping in Milam County for the safe mining of lignite reserves, and for power generation and industrial processes. The largest amounts of this pumpage were related to depressurization of the Simsboro aquifer for mining operations. Pressure declines in the Simsboro occurred over a multi-decade period with maximum pressure decline of about 200 feet occurring. Numerous high-capacity wells were originally constructed prior to this depressurization pumping, and the construction included cementing of steel casing and stainless steel screen at the depths of the Simsboro aquifer. If land-surface subsidence had occurred due to compaction of overlying sediments, then the well casings and foundations would have been noticeably higher relative to adjoining ground level. No land-surface subsidence was ever detected or revealed as a result of the Alcoa pumping.

Groundwater pumping has also occurred in the Carrizo-Wilcox aquifer in Texas for many decades. Production has historically occurred in the Wintergarden Area of Southwest Texas, the Tyler area of Northeast Texas, and the Bryan-College Station area in Central Texas. Numerous Texas Water Development Board (TWDB) groundwater availability reports from early 1960 to the near present and spanning the extents of the Carrizo-Wilcox in Texas have studied the groundwater conditions, and/or effects of groundwater pumping (Ex: Reports 4, 032, 109, 110, 150, 160, 210, 327, 332). No concerns of land-surface subsidence resulting from pumping groundwater from the Carrizo-Wilcox are presented in these historical reports.

The Explanatory Report developed by GMA 12 during the second round of joint planning (Ewing et al., 2017) states subsidence has not been detected anywhere within GMA 12 despite large-scale pumping and associated drawdowns, and concluded the risk for land-surface subsidence is negligible.

The TWDB GAM for the Gulf Coast aquifer in southeast Texas, known as the Houston Area Groundwater Model (HAGM), was developed for an area of Texas where land-surface subsidence is a known issue. The HAGM specifically includes a subsidence modeling package for purposes of simulating land-surface subsidence due to groundwater pumping (Kasmarek, 2012). In contrast, the new GAM for the Central Portion of the Sparta, Queen City, and Carrizo-Wilcox Aquifers does not include a subsidence modeling package (Ewing et al., 2018). Similarly, other historic and current GAMs of the Carrizo-Wilcox, including all Southern, Central and Northern portion models, have not included a subsidence modeling package. This is empirical evidence that across the State of Texas, subsidence has not been a concern in the Carrizo-Wilcox over the many decades of actual groundwater development experience.

The natural conditions of the Carrizo-Wilcox, and past experience with development and documented long-term effects, support the position there are little concerns for subsidence being a factor in limiting development of the resource.

Analysis of Effect on Surface and Groundwater Interaction

POSGCD Rule 7.6(3) requires consideration of what impact a permit application will have on surface water resources. As described by C.V. Theis, the source of the produced water from a well follows a natural dynamic from 1) a reduction of artesian storage to the extent artesian conditions exist at the well site, 2) subsequent propagation of the cone of depression laterally and possibly vertically until the cone of influence encounters water table conditions, at which time pore water storage is reduced, 3) the reduction of pore water storage causes a redirection towards the pumping well of groundwater that previously was discharged naturally through evaporation, transpiration, seepage, or larger springflow (Theis, 1940). This natural, dynamic response to pumping has been occurring in the Carrizo-Wilcox for many decades.

Alcoa, in conjunction with its prior mining operations at both the Sandow Mine and the Three Oaks Mine near Elgin, Texas, conducted numerous surveys related to surface and groundwater interaction. Both surface water resources and groundwater resources were surveyed and studied. Studies included aerial surveys stretching from the Colorado River to the Brazos River, ground surveys along creek beds to identify areas of groundwater seepage and springflow prior to mining, as well as surface water flow monitoring in area creeks to identify the nature of rainfall-runoff and baseflow characteristics of local drainages.

These studies indicate there were no large springs present in eastern Bastrop, Lee or Milam Counties, and no State parks are designated throughout this area to recognize culturally or environmentally important springflows. Area streams are classified as intermittent yet with the headwaters classified as ephemeral where the stream channel is above the local water table. Areas of seepage and wet, muddy locations were observed in low-lying areas, of the intermittent streams, and many of which would be dry in summer months. Additionally, many stock ponds have been built throughout the area. All of these features increase discharge of groundwater via transpiration plants and/or direct evaporation.

Due to the location of historic and likely future pumping in combination with the regional transmissivity and artesian pressure conditions, a regional response spanning many counties and GCDs will occur. Figure 4-3 indicates any effects of Simsboro groundwater pumping on surface water resources in the Central portions of GMA 12 will be attributable to groundwater production in numerous counties including groundwater production located in the LPGCD, the POSGCD, and the BVGCD. This includes both any affects which have occurred to date, and any long-term effects into the future.

Most importantly for review of this permit application, any effects on surface water resources due to the proposed operating permit, or the renewal of the historic use permit through 2062 would necessarily be small considering the past history of Alcoa production, the comparatively low amount of HUP and proposed operating permit pumping compared to total regional aquifer pumping, and the regional response of pumping that can span across many counties of GMA 12.

Past Mitigation Activities of Alcoa

A large part of Alcoa's historical Simsboro pumping levels shown in Figure 4-1 were necessary to safely and successfully mine the lignite reserves at the Sandow mine. Alcoa historically produced up to 33,000 af/yr from the Simsboro and demonstrated the aquifer response and groundwater availability characteristics of this production. Groundwater production associated with mining operations at the Sandow Mine was permitted and regulated by the Railroad Commission of Texas, which required monitoring of the ongoing, regional impacts associated with that pumpage and mitigation of any affected water supplies. The monitoring and mitigation program was conducted for more than 20 years and included:

- Conducting field inventories/assessments of over 1,600 well sites in order to document both pre-mining, active-mining, and post-mining hydrogeologic conditions,
- Monitoring of an extensive network of both Alcoa and private wells specifically to document and establish mitigation responsibility under the regulations of the Railroad Commission,
- Lowering of pumps or other modifications in more than 360 wells in which water level declines due mining-related pumping were observed or predicted to occur, and
- Construction of over 125 deeper, replacement wells for landowners whose original wells were completed in the shallowest, upper portions of the Simsboro Formation.

The locations of past well mitigations are coincident with the area of primary effects from the approved historic use permit and proposed operating permit production of 15,000 af/yr. Consequently, many existing users in the area are uniquely protected from adverse hydrologic impacts due to past mitigations efforts of Alcoa. In addition, since cessation of mine reclamation and monitoring activities, Alcoa assisted the POSGCD to convert Alcoa's regional monitoring well program to be incorporated into the POSGCD monitoring well network.

Summary

The proposed operating permit production will largely replicate the effects of historic pumping conducted by Alcoa for mining operations beginning in 1988. The primary effect of this production is the reduction of artesian pressure, and the amount of reduction is largely related to the peak pumping rate. Alcoa mining production reached a peak rate of about 33,000 af/yr, and the same type of effects associated with this past pumping will re-occur upon a return to this pumping rate. Unique to this area, Alcoa has also conducted extensive mitigation efforts to address these effects, and the benefit of these past efforts will continue into the future.

The proposed operating permit production is much smaller than known, existing, and potential future pumping located in Bastrop, Lee, Burleson, Robertson, and Brazos Counties. Cumulative hydrologic effects will occur throughout a large part of GMA 12 due to current and future collective pumping primarily in LPGCD, POSGCD, and BVGCD, and the regional, continuous extent of the sands of the Simsboro. The effects of pumping are primarily reductions in artesian pressure, with subsequent reductions in the water table. Any effects on the water table will be very slow and gradual compared to the changes in artesian pressure, and the water table effects will be small compared to aquifer storage.

Overall, it is most likely that further development of the groundwater resources will occur, and in some cases modifications to existing wells will be required to sustain the supplies in the region. As demonstrated by past mitigation activities conducted by Alcoa, this is very feasible to conduct, and the Post Oak Savannah Groundwater District is one of the few groundwater districts in Texas with an established mitigation program. From a State Water planning perspective, the proposed operating permit's requested change in use to include municipal, industrial, commercial and manufacturing can provide meaningful, drought-proof groundwater supplies useful for enhancing supply reliability and increasing conjunctive use on a regional basis for a growing area of the State.

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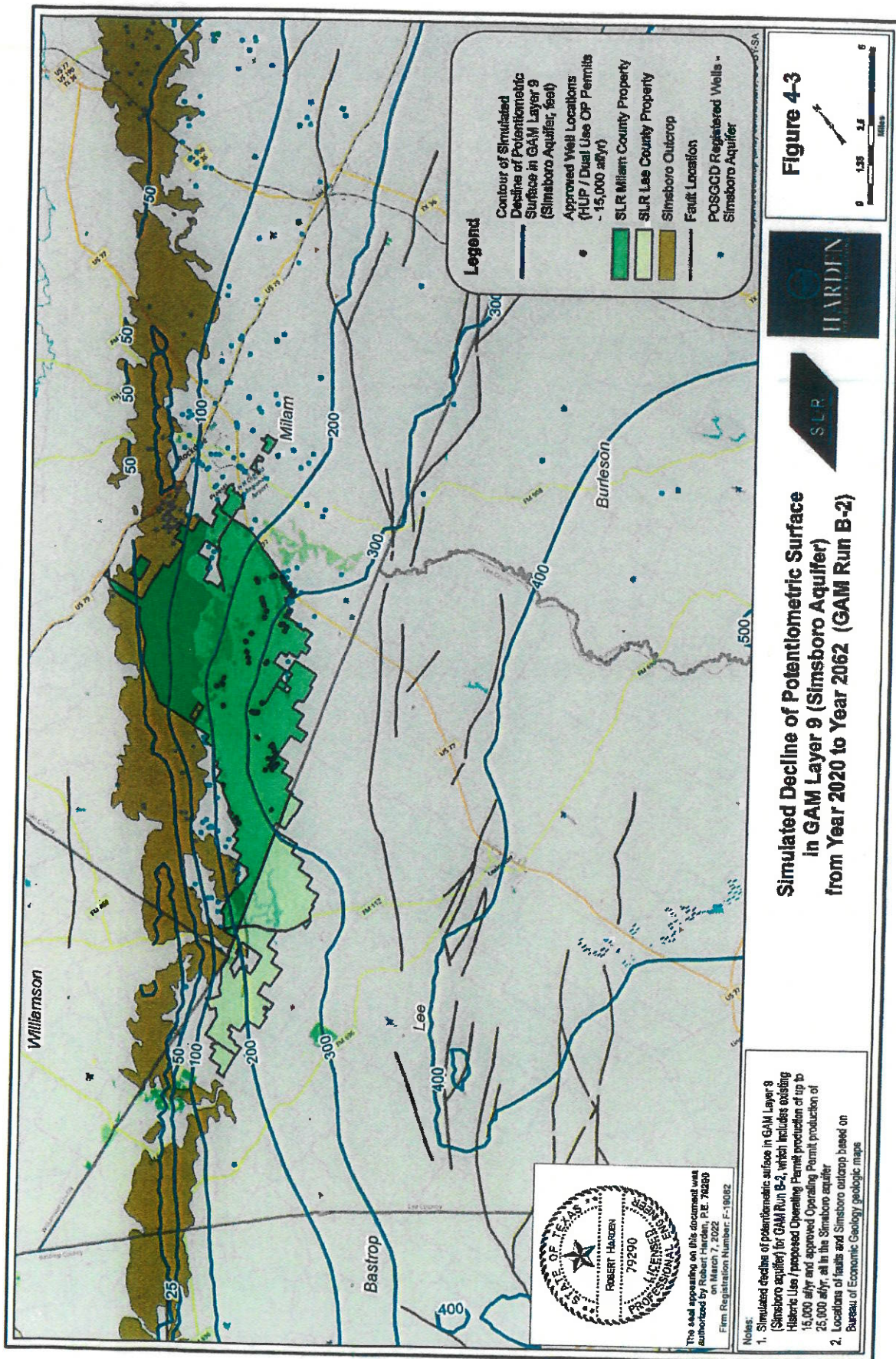
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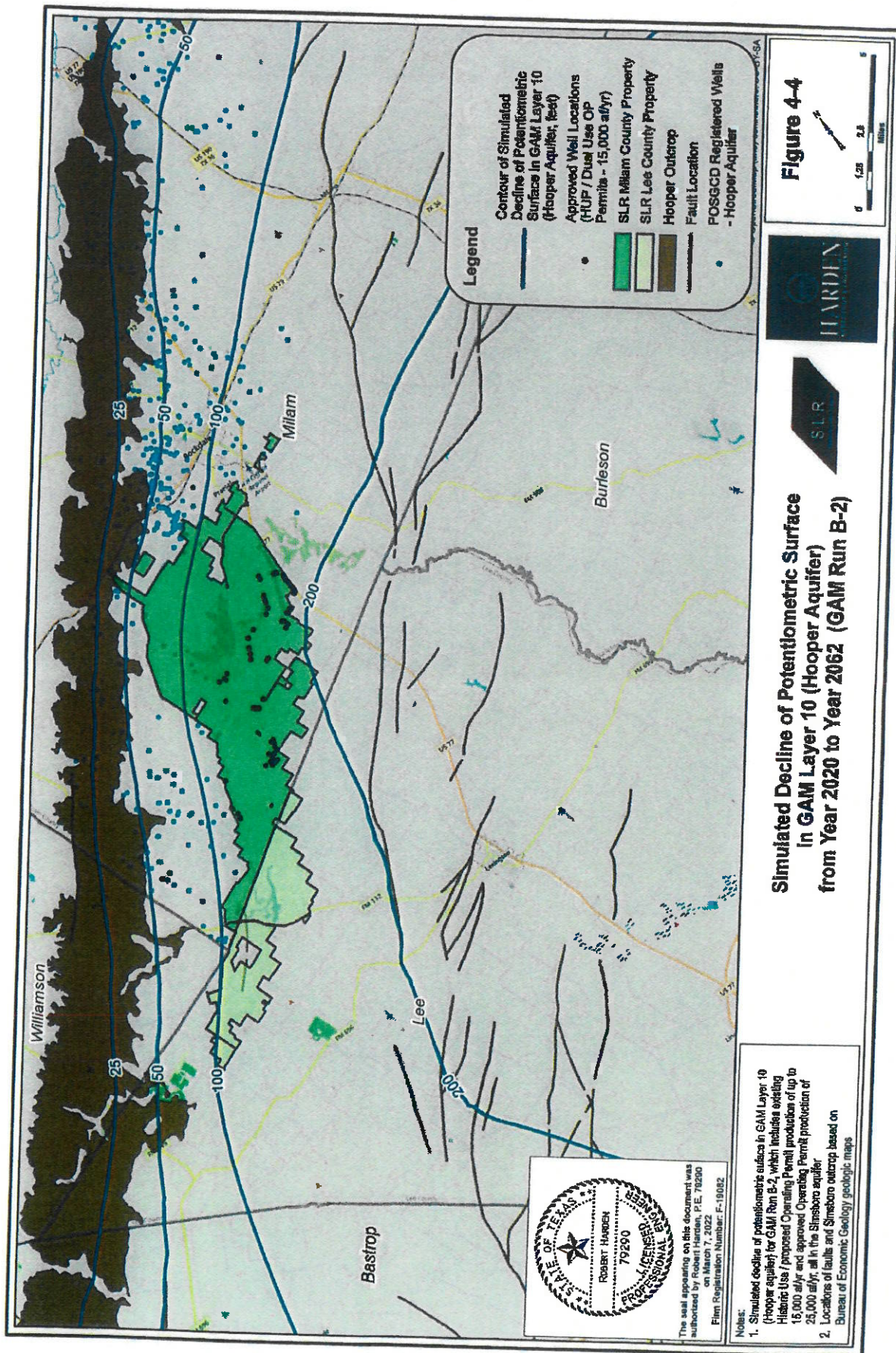
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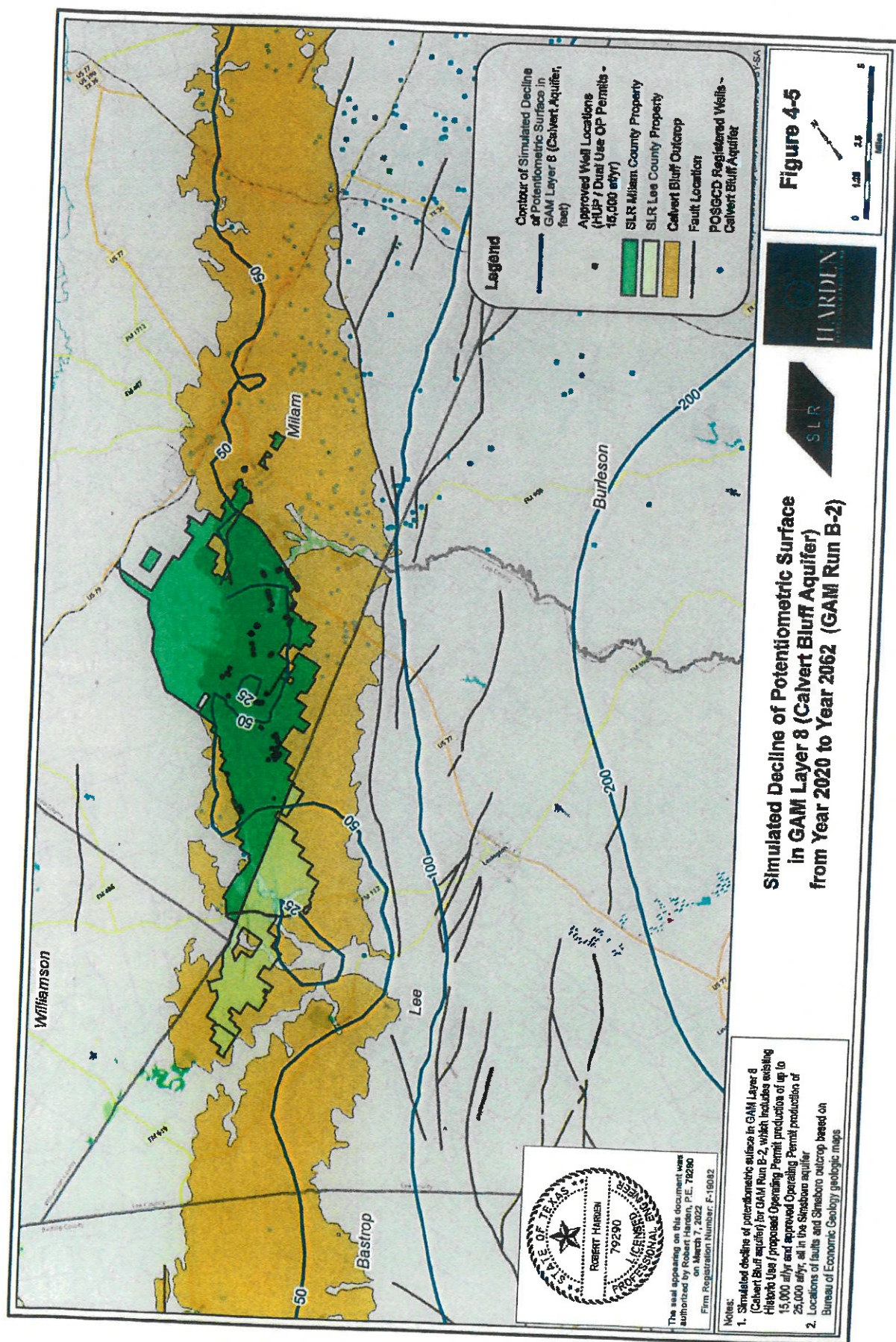
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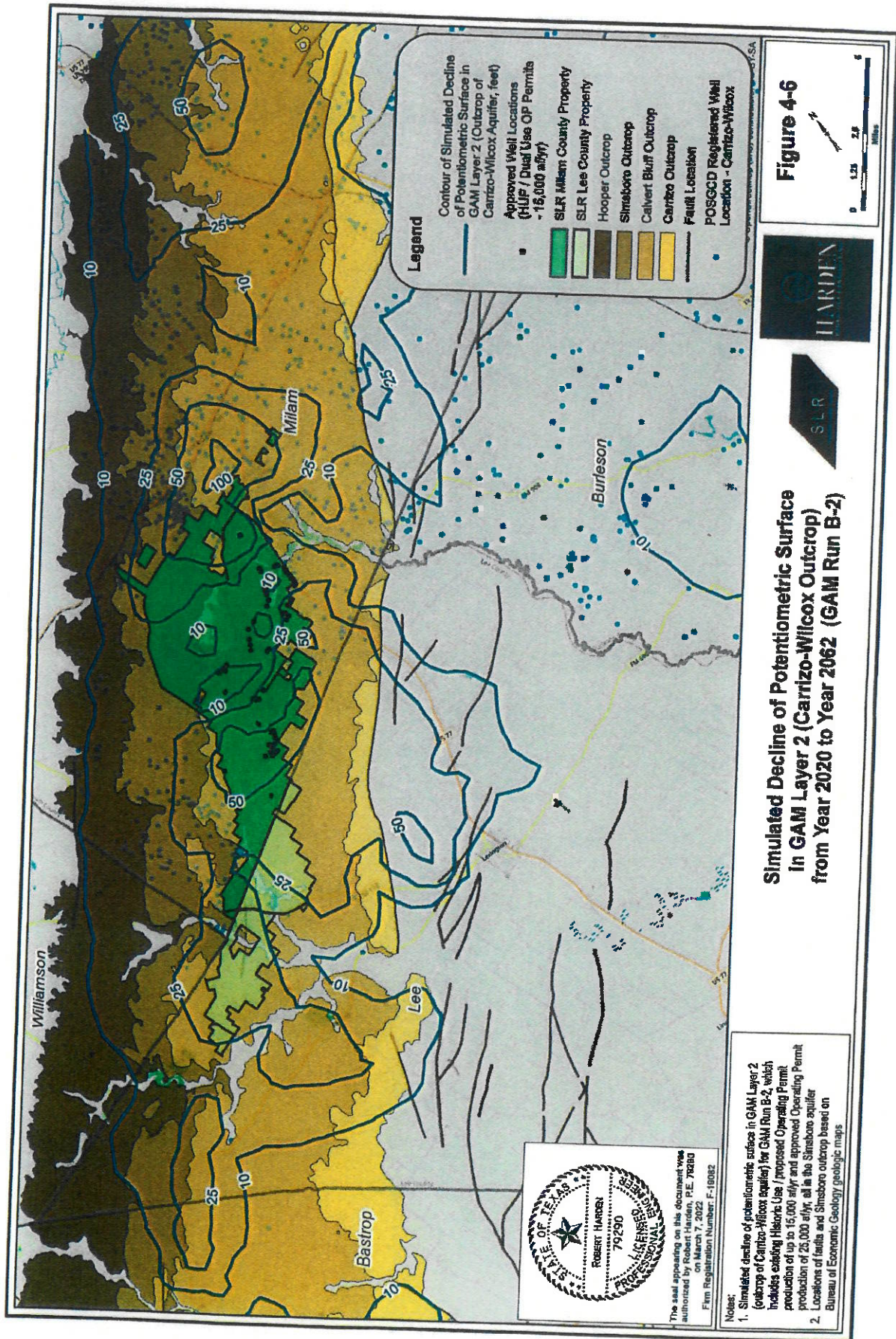
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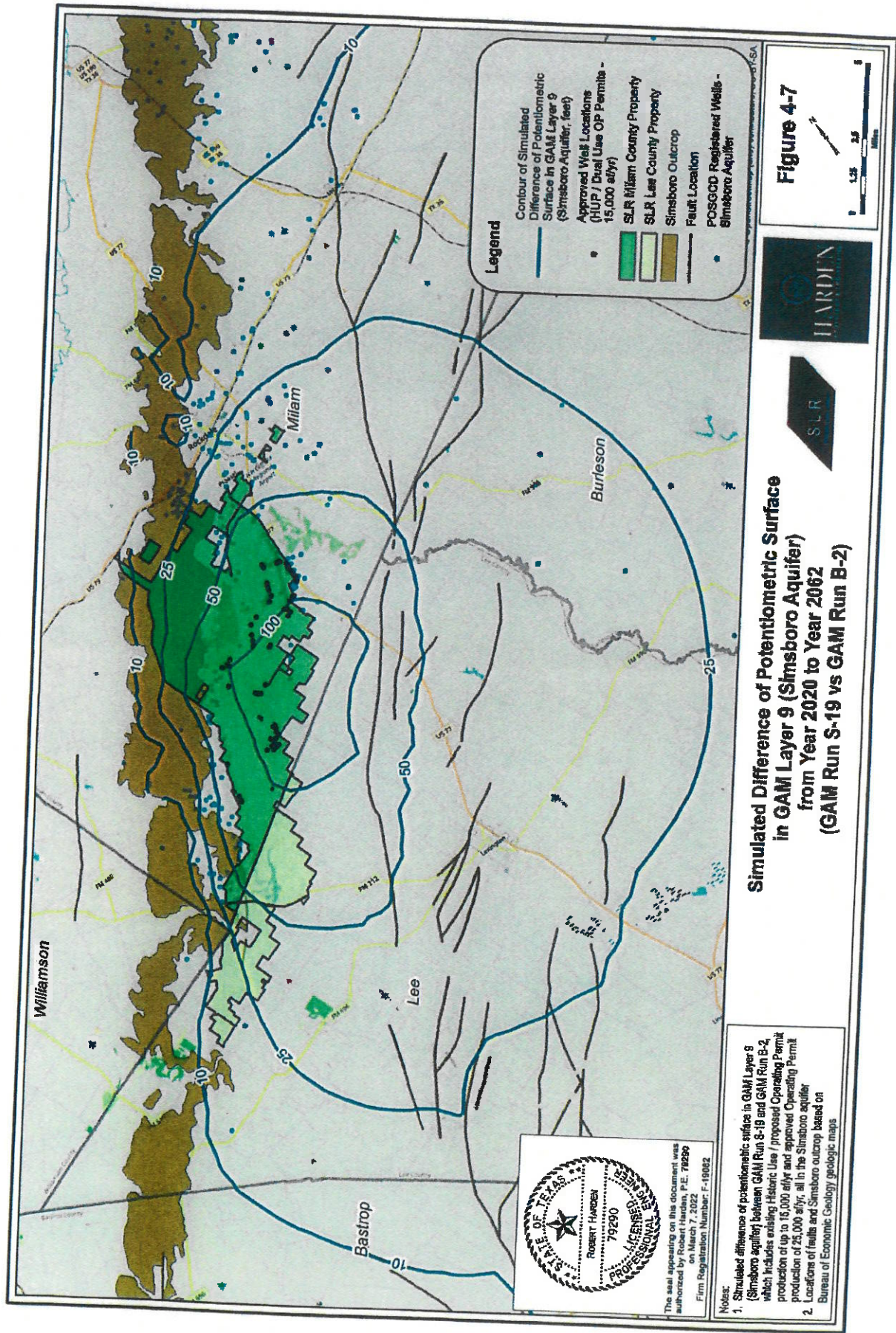
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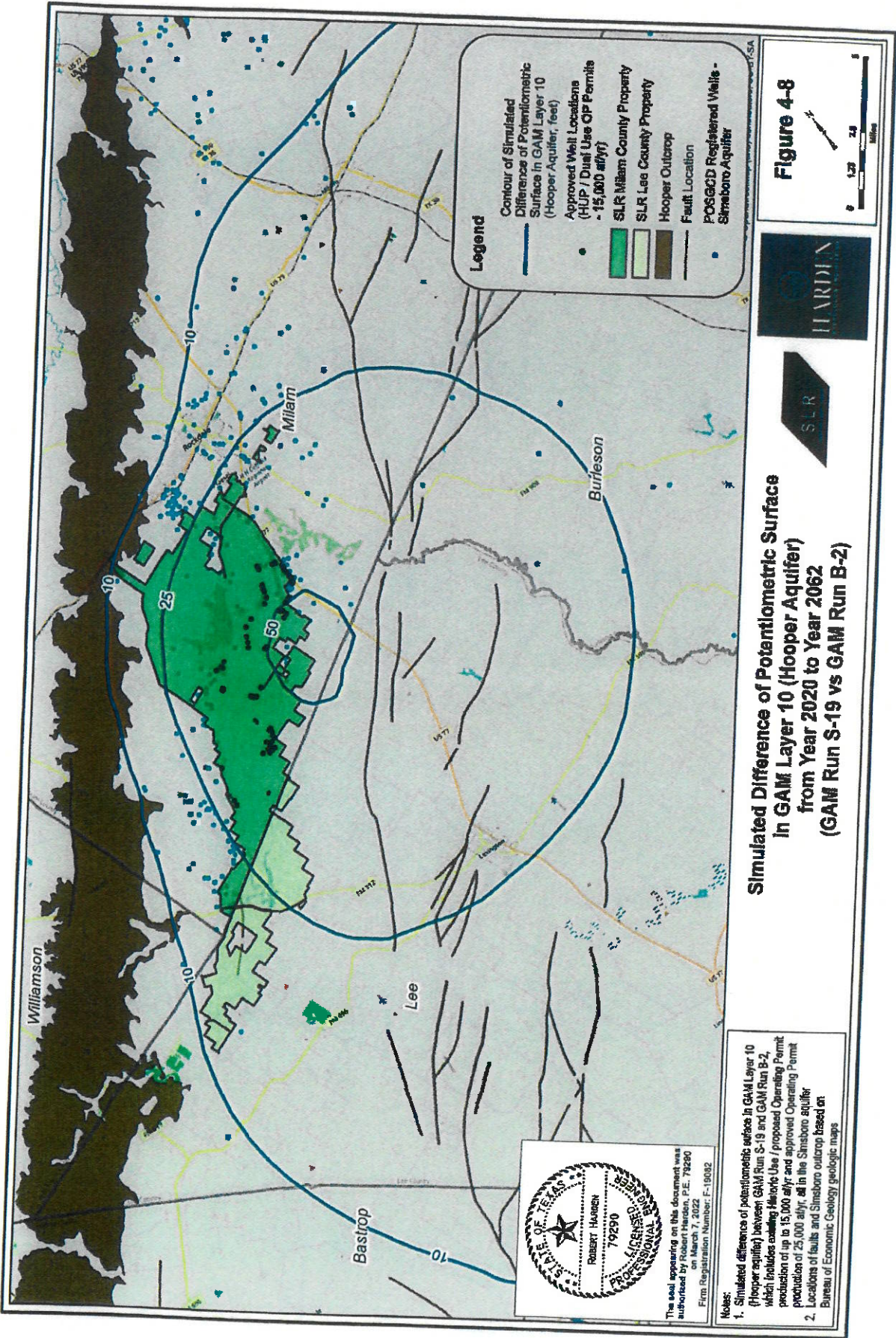












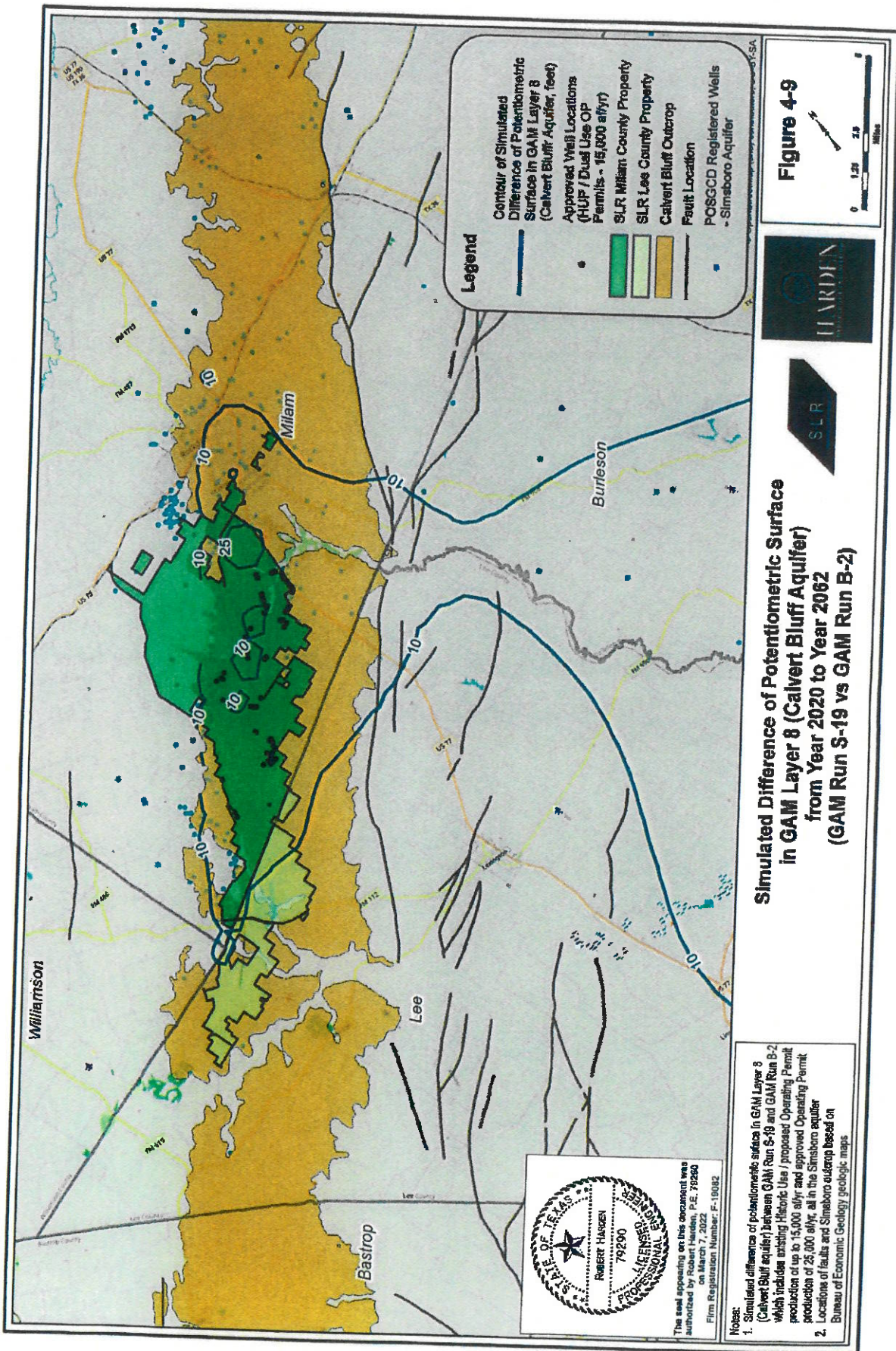


Figure 4-9

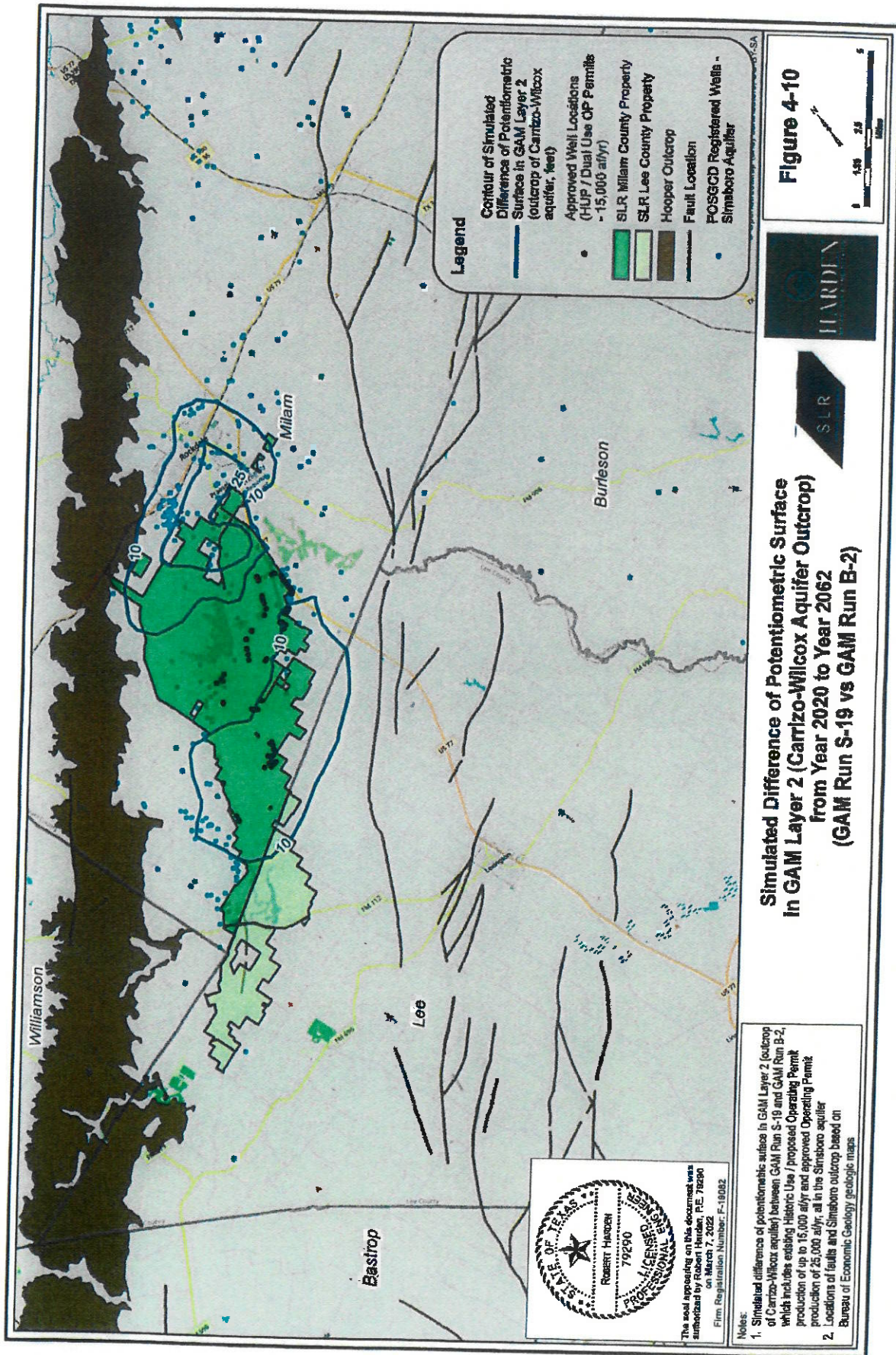
**Simulated Difference of Potentiometric Surface
in GAM Layer 8 (Calvert Bluff Aquifer)
from Year 2020 to Year 2062
(GAM Run S-19 vs GAM Run B-2)**



The seal appearing on this document was
authorized by Robert Harden, P.E. 79290
on March 7, 2023
Firm Registration Number: F-19082

Notes:

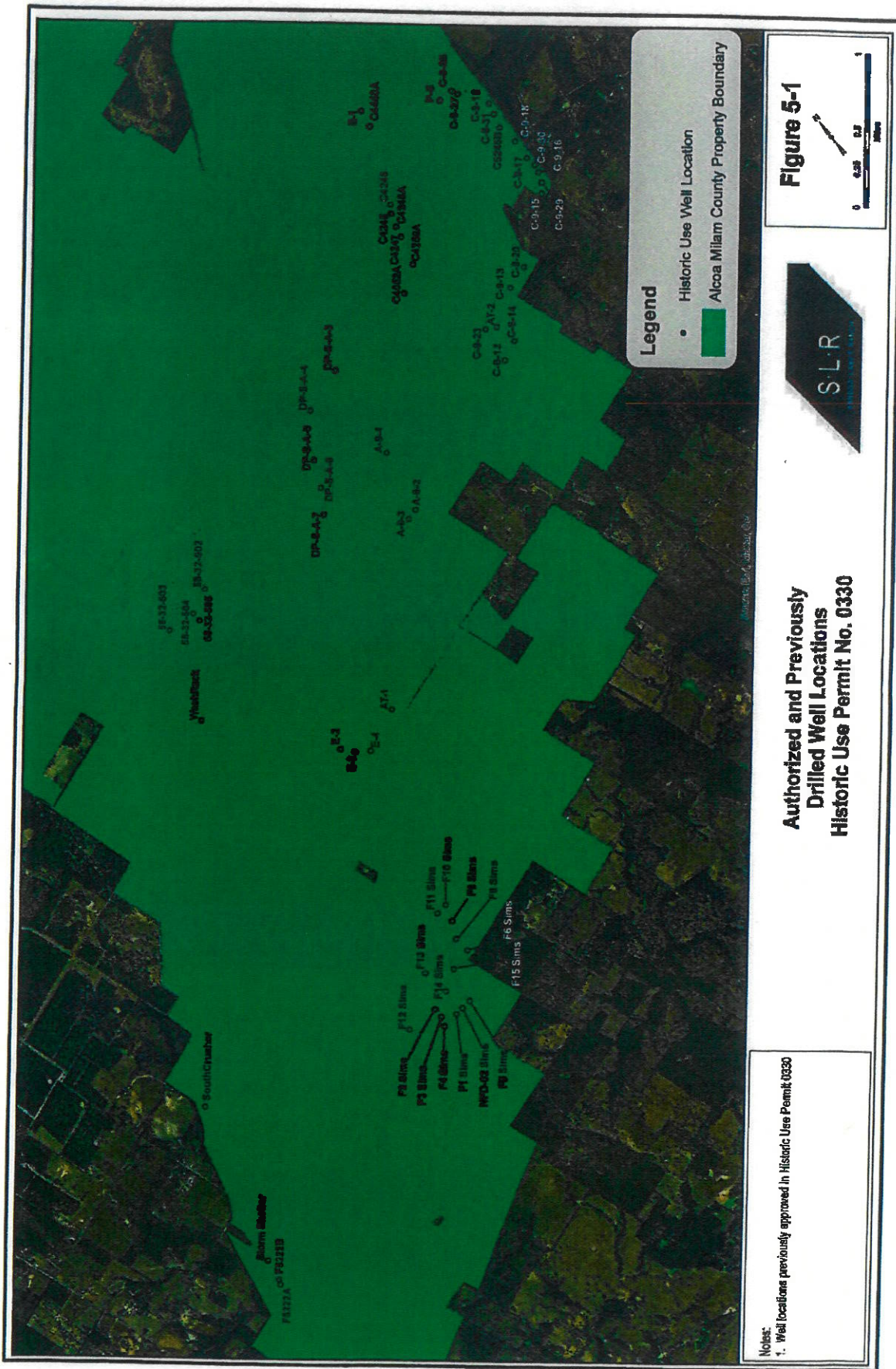
1. Simulated difference of potentiometric surface in GAM Layer 8 (Calvert Bluff aquifer) between GAM Run S-19 and GAM Run B-2 which includes existing historic use / proposed Operating Permit production of up to 15,000 a/y and approved Operating Permit production of 25,000 a/y, all in the Simsboro aquifer
2. Locations of faults and Simsboro outcrop based on Bureau of Economic Geology geologic maps

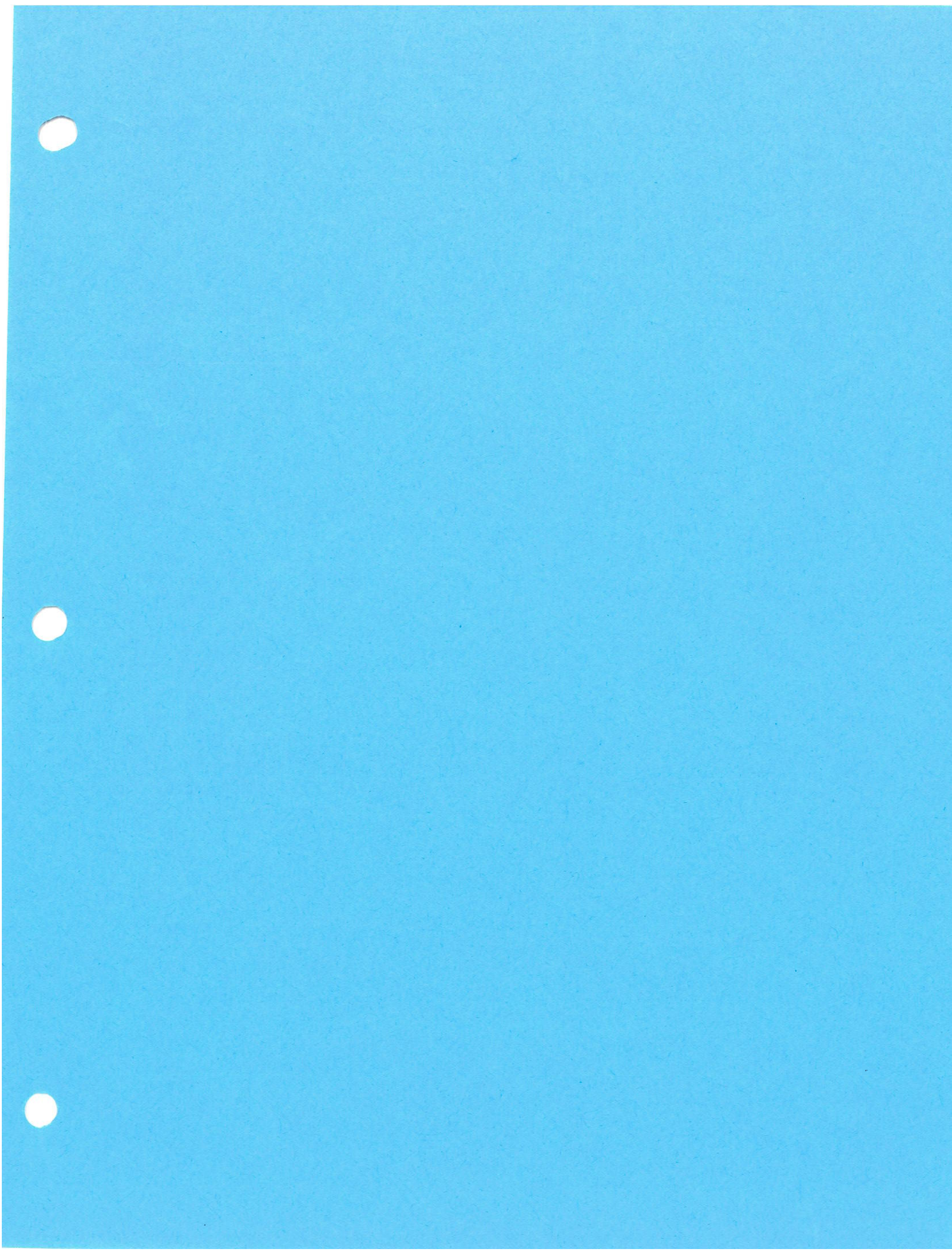


Production Well Information

Section 5







APPENDIX A

Historic Use Permit Authorized Wells

Available Construction Information

Footnote: Any wells for which there is incomplete information regarding screens will be made available for a downhole survey, if necessary