SLR Property I, LP
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October 2, 2022

Mr. Michael Redman
Regulatory Compliance Specialist
Post Oak Savannah Groundwater Conservation District
310 East Avenue C
Milano, Texas 76556

RE: SLR Property I, LP - 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]*

Dear Mr. Redman:

Thank you for your September 2, 2022 letter requesting additional information regarding the application of SLR Property I, LP ("SLR") for a new 15,000 af/yr Simsboro Operating Permit (the "Application"). I repeat each of your request below by copying and pasting the request from your letter, followed by our response to that request in ***bolded italics***:

Application deficiencies:

1. An updated list of wells, (and their locations) that will be used to produce groundwater. During a recent site visit, POSGCD staff discovered that some of the wells were plugged and could not be found at their reported location

   Enclosed is an updated Table 1-1 to be substituted for Table 1-1 previously submitted as part of the Application. This updated Table 1-1 is explained in detail in SLR's response to your Request No. 2, below.

2. Provide the District with an explanation of which wells are to be replaced and which wells are still left to be constructed,

   The Historic Use Permit currently authorizes production from wells at 61 authorized well sites defined on updated Table 1-1. As indicated on the updated Table and as discussed below, all but 9 of those 61 authorized wells currently exist.

   Each of the 9 authorized wells that do not currently exist at one point in time did exist at the defined well site and was used to produce water for industrial

use within SLR's Milam County Property. Subsequently, each of the 9 authorized wells that do not currently exist was plugged; a replacement well has not yet been drilled at any of those sites.

The 9 authorized wells that do not currently exist fall into two categories:

First, five of the authorized wells that do not currently exist have already been approved by the POSGCD Board as replacement wells. Those five wells are identified on the updated Table 1-1 by a single asterisk next to the defined location of the authorized well site. When the Historic Use Permit was initially issued in 2007, a total of 60 wells were listed as authorized wells. In 2011, the POSGCD Board approved Alcoa's application to amend the permit to add one existing well to the list of authorized wells, remove from the list six wells that were proposed to be plugged; and add to the list six new wells as replacement wells for the plugged wells. Since then, one of those six authorized replacement wells – identified on Table 1-1 as E-1 has been drilled. Enclosed is a copy of Alcoa's July 18, 2011 letter requesting such amendments of the Historic Use Permit. Also enclosed is a copy of the minutes of the September 13, 2011 POSGCD Board of Directors Meeting reflecting the Board's granting of Alcoa's requests and confirming the Board's and its legal counsel's understanding that the Board was authorized to take such action pursuant to the terms of the Historic Use Permit.

Second, in the second category, four of the authorized wells that do not currently exist have not yet been approved by the POSGCD Board as replacement wells. Those 4 wells are identified on the updated Table 1-1 by a double asterisk next to the defined location of the authorized well site. SLR is in the process of developing a Development Plan for its Milam County property. SLR intends to apply to POSGCD after completion of its Development Plan for approval of replacement wells at the authorized well sites for which such approvals have not yet been obtained, as well as for additional wells at other locations, all consistent with SLR's Development Plan. SLR believes seeking approvals for all these wells at the same time, after completion of its Development Plan, would be most efficient for both it and the District.

It is important to note that the Historic Use Permit authorizes the addition of wells to produce water authorized to be produced under the Historic Use Permit anywhere within SLR's Milam County property, regardless of whether there was ever a well in existence at that site that produced water for industrial use within such property. Enclosed for convenience is a copy of the Historic Use Permit as it was reissued in 2021 in SLR's name.

3. Provide the GIS files outlining the Boundary of the SLR property,

   The requested GIS files are submitted with this response; the files are on the enclosed thumb drive.

4. Provide the GIS files outlining the groundwater owned and the groundwater leased (figure 2-1),

   All groundwater is owned by SLR; none is leased. The requested GIS files are submitted with this response; the files are on the enclosed thumb drive.

5. Camera runs on C4052A, C4440A, C-9-15, C-9-17, C-9-23, F3 Sims, F5 Sims, F5222A, F5222B, NFD-02 Sims, and the Wash Rack well to determine accurate location of the well screen (the application did not include acceptable documentation for the well screen location) , and

   The requested camera runs are submitted with this response; the files are on the enclosed thumb drive.

6. Any other information outlined in the attached request from July 15, 2022.

   In Attachment A to Steve Young's June 29, 2002 letter to Gary Westbrook regarding this Application for a new 15,000 af/yr Simsboro Operating Permit, Paragraph 2 under the heading "Application Deficiencies" provides as follows:

   2. Among the deliverables that POSGCD requested to be included in the application are concerns that SLR has with the GAM's representation of the Carrizo-Wilcox Aquifer and specifically the Hooper Aquifer. Relevant issues of concern are the top and bottom surfaces and the hydraulic properties (including transmissivity, faults, storativity) assigned to the Hooper and the Simsboro aquifers in Milam and Lee Counties and across the SLR property.

      Recommended Modification: Provide an addendum to the application that describes SLR concerns with the GAM representation of the Carrizo-Wilcox Aquifer structured and hydraulic properties.

   In response to these requests by Steve Young relating to this Application and the same requests relating to SLR's other application, Bob Harden has included a section in his Aquifer Impact Study for each of the two applications that

responds to the requests. The section in each application is entitled "POSGCD Request for Comment on New GAM" and is found on page 12 of Mr. Harden's Aquifer Impact Study for this Application.

With the above response and other responses provided by this letter, SLR believes it has provided appropriate responses to all requests by the District.

Items that will need to be addressed during the application review:

1. The digital files for the Geophysical logs listed in Appendix A,

   The requested digital files are submitted with this response; the files are on the enclosed thumb drive.

2. The downhole camera runs, that were completed by WellScope, for wells DP-S-A-3, DP-S-A-4, DP-S-A-5, DP-S-A-6, DP-S-A-7, F15 Sims, F2 Sims, F4 Sims, F9 Sims, and P-5,

   The requested downhole camera runs were completed as of EOB today and a thumb drive with these files will be submitted to the district by EOB Friday when received from the vendor.

5. The proposed screen elevation for AT-2,

   The proposed screen elevation for AT-2 will be determined based on the results of the test hole and consultation with the district at the time of drilling.

6. SLR should make it clear whether all the production from the HUP 330 permit is to supply all the water to industry that is owned by SLR or whether SLR will sell some of the water to industry or other users located on property leased from SLR,

   SLR understands that the applicable limitations of use of water under SLR's Historic Use Permit relate to purpose of use of the water authorized to be produced (it must be industrial use) and place of use of the water (it must be used within SLR's Milam County property), but not to who owns facilities or businesses that use water for industrial purposes, or the type of real estate and/or water supply agreement between SLR and the end user of the water. Thus, SLR has and intends to have agreements with customers, tenants, and others that are end users of the water to supply them water under SLR's Historic Use Permit so long as the place and purpose of use meet the requirements under SLR's Historic Use Permit. This is no different from what occurred in the past with respect to commercial arrangements between Alcoa

and Texas Utilities and its successor, Luminant, although historic commercial arrangements are irrelevant so long as the purpose and place of use requirements are satisfied.

7. Does well DP-S-A-6 need to be plugged due to the obstruction in the well, as outlined in the application, and

   The obstruction in DP-S-A-6 will be attempted to be fished out and new equipment placed in the well. If this effort is unsuccessful the well will be plugged.

8. Under response to Rule 7.4, the application, under item 4.e., states that after 90 days, SLR will produce to the District:
   i. TDLR State Well Report
   ii. Geophysical Log
   iii. Results of Water Quality Testing
   iv. Results of Pumping Test

   According to Rule 7.15.9.2, this should be done in 60 days. Please provide district with and updated page that confirms that change.

   Enclosed is a copy of the updated page that confirms the requested change.

Respectfully,

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

Enclosures

cc: Mr. Gary Westbrook
General Manager

TABLE 1-1. Approved Historic Use Permit Wells

Site Designation		Latitude	Longitude	Location of Well - Milam County Appraisal District Property ID	Approved Maximum Pumping Rate (GPM)
58-32-502	**	30.33340°N	97.04030°W	10354	500
58-32-503	**	30.33230°N	97.04180°W	10354	500
58-32-504		30.56083°N	97.06778°W	10354	500
58-32-505		30.55942°N	97.06879°W	10354	500
A-9-2		30.55511°N	97.04182°W	10354	540
A-9-3		30.55482°N	97.04309°W	10354	540
AT-1	*	30.54091°N	97.05737°W	20520844	500
AT-2	*	30.56416°N	97.02223°W	20519037	500
C4052A		30.57223°N	97.02831°W	20519037	300
C4245		30.57988°N	97.02349°W	20519037	240
C4246		30.57911°N	97.02407°W	20519037	250
C4247		30.57784°N	97.02452°W	20519037	240
C4248A		30.57674°N	97.02479°W	20519037	230
C4250A		30.57393°N	97.02559°W	20519037	290
C4440A		30.58688°N	97.02000°W	20519037	440
C5245B		30.57941°N	97.00878°W	10354	410
C-9-12		30.56138°N	97.02401°W	20519037	440
C-9-13		30.56657°N	97.01864°W	20519037	320
C-9-14		30.56227°N	97.02189°W	20519037	420
C-9-15		30.57191°N	97.00947°W	10354	250
C-9-16		30.57370°N	97.00835°W	10354	420
C-9-17		30.57550°N	97.00838°W	10354	260
C-9-18		30.57744°N	97.00833°W	10354	510
C-9-19		30.58184°N	97.00811°W	10354	460
C-9-20		30.56734°N	97.01604°W	20519037	450
C-9-23		30.56489°N	97.02366°W	20519037	420
C-9-26		30.58430°N	97.01025°W	10354	620
C-9-27		30.58484°N	97.01057°W	10354	500
C-9-29		30.57276°N	97.00874°W	10354	370
C-9-30		30.57448°N	97.00817°W	10354	420
C-9-31		30.58076°N	97.00835°W	10354	450
DP-S-A-3		30.57033°N	97.03935°W	20519037	250
DP-S-A-4		30.56881°N	97.04432°W	20519037	250
DP-S-A-5		30.564578°N	97.047136°W	13054	250
DP-S-A-6		30.56225°N	97.04861°W	10354	250
DP-S-A-7		30.55998°N	97.05018°W	10354	250
E-1		30.58835°N	97.01944°W	20519037	1000
E-2	*	30.54073°N	97.06448°W	20520844	1000
E-3	*	30.53970°N	97.06348°W	20520844	1000
E-4	*	30.53892°N	97.06204°W	20520844	1000
F1 Sims	**	30.51378°N	97.07286°W	20519037	560
F10 Sims		30.52283°N	97.06630°W	20519037	250
F11 Sims		30.52264°N	97.06762°W	20519037	250
F12 Sims		30.51527°N	97.07801°W	20519037	250
F13 Sims		30.51867°N	97.07272°W	20519037	250
F14 Sims		30.51614°N	97.07222°W	20519037	250
F15 Sims		30.51738°N	97.07004°W	20519037	250
F2 Sims		30.51536°N	97.07445°W	20519037	250
F3 Sims		30.51442°N	97.07441°W	20519037	250
F4 Sims		30.51329°N	97.07452°W	20519037	250
F5 Sims		30.51402°N	97.07085°W	20519037	250
F5222A		30.50352°N	97.10667°W	11598	500
F5222B		30.50301°N	97.10691°W	11598	200
F6 Sims		30.51804°N	97.06758°W	20519037	250
F8 Sims		30.51959°N	97.06777°W	20519037	250
F9 Sims		30.52120°N	97.06688°W	20519037	250
NFD-02 Sims		30.51388°N	97.07195°W	20519037	250
P-5		30.58484°N	97.01220°W	10354	500
South Crusher		30.52158°N	97.10150°W	11598	500
Storm Shelter	**	30.50569°N	97.10631°W	11598	500
Wash Rack		30.55158°N	97.07546°W	10354	500

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

October 2, 2022

STATE OF TEXAS
ROBERT HARDEN
79290
LICENSED
PROFESSIONAL ENGINEER

Bob Harden

The seal appearing on this document was authorized
by Robert Harden, P.E. 79290
on October 2, 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.

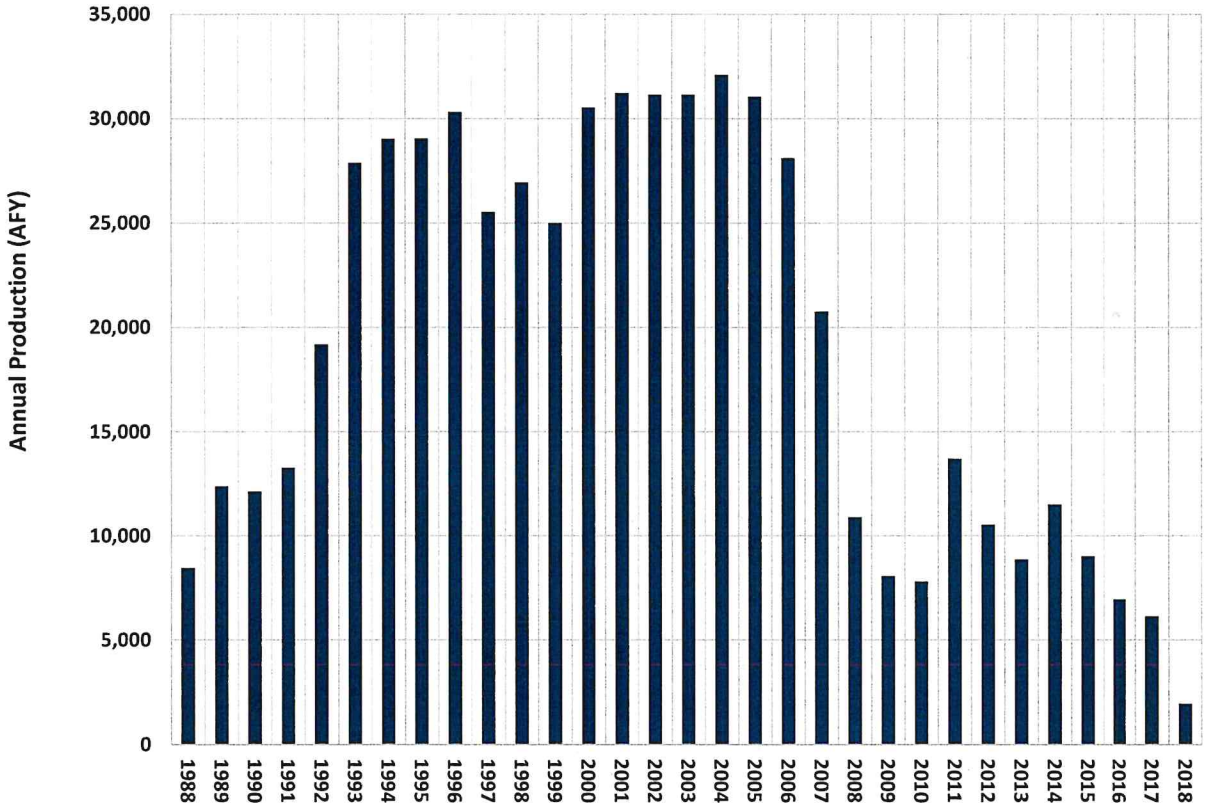
The historic use permit currently has a term that extends through December 31, 2038. SLR is not at this time requesting an extension of the term of its historic use permit.

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.

Item	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-1and 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)	(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)

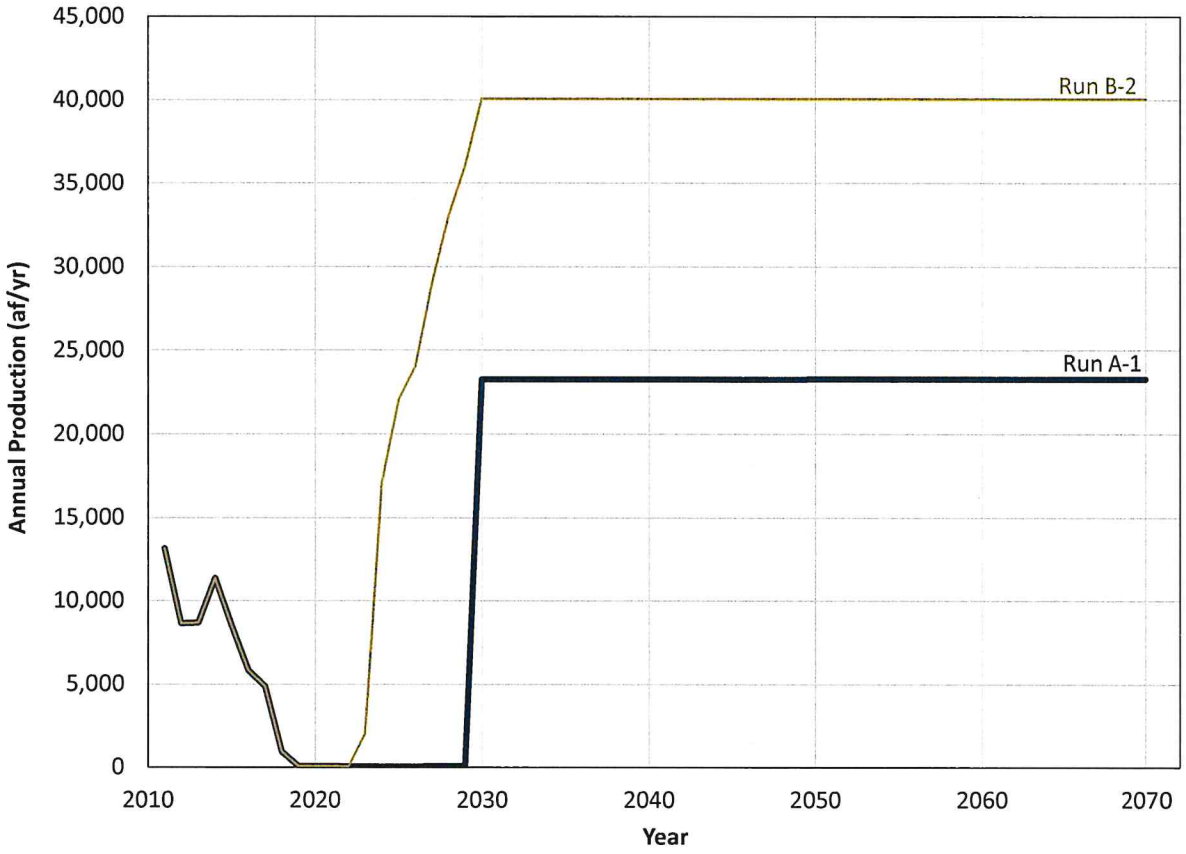
Well Designation	Approved Permit	Model Node	Approved Production Capacity (GPM)	Assumed Rate for Model Run B-2 (gpm)	(ft3/day)
F11 Sims	Dual HUP - OP	157598	250	222	42,665.94
F12 Sims	Dual HUP - OP	156892	250	222	42,665.94
F13 Sims	Dual HUP - OP	157597	250	222	42,665.94
F14 Sims	Dual HUP - OP	157597	250	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 Savanah, 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 Savanah, 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.

POSGCD Request for Comment on New GAM

At the request of the POSGCD, the following comments on the new GAM's representation of the Carrizo-Wilcox Aquifer are provided as part of each of SLR's applications. POSGCD requested comments on the Hooper Aquifer, and issues related to the structure delineation of the top and bottom surface and hydraulic properties assigned to the Hooper and Simsboro aquifers in Lee and

Milam Counties and across the SLR property. Due to the large number of model parameter inputs, no attempt was made to identify and comment on all of the model input. This evaluation is not intended to be either comprehensive or detailed. It consists of various comments that may be of interest to POSGCD.

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 Hooper 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, the boundary between the base of the Simsboro and top of the Hooper cannot always be defined simply. As a general approach, however, it is suggested that at the sites where the lower massive sands exist, the elevation of the base of the more massive sands be used as structural delineation of the base of the Simsboro, and then this elevation be interpolated to include the thinner and less productive sands at the locations where the more massive sands are not present.

Estimates of transmissivity of Hooper sand layers 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 for the Hooper aquifer. The SLR testholes, completed in 2022, do not penetrate the full thickness of the Hooper as represented in the GAM. Based on review of a few scattered oil and gas logs, it is currently believed the most productive sands occur in the upper 200 feet of the Hooper.

The vertical conductivity assigned in the model is sometimes less than the previous GAM. Model inspection at a few of the model cells in the most downdip, and unmined portions of SLR property indicates the vertical conductivity of the Simsboro is less than the more clay rich Calvert Bluff. Throughout the SLR property, the base of unmined Calvert Bluff sands, and the base of reclaimed Calvert Bluff materials, are separated from the top of the Simsboro sands by a low permeability clay layer. These clays have been characterized as "practically impermeable" with hydraulic conductivity of 5×10^{-9} cm/sec or less (Mathewson, 1979). More recently, Alcoa conducted core sampling of clay zones in conjunction with site characterization for the Three Oaks Mine. These efforts documented the vertical conductivity of these clays with laboratory test results in the 2×10^{-8} cm/sec to 5×10^{-10} cm/sec (Alcoa, 2000). Experience is these clays provide an effective seal, and the sealing quality was the reason mine depressurization of the Simsboro was required to prevent heave of the clays in the separation zone.

In the Central portion of the Carrizo-Wilcox Aquifer, faulting is challenging to simulate with groundwater models. Typically, in the Carrizo-Wilcox model layers are a composite of multiple sand, silt and clay layers. The fault displacement can disconnect the individual sand layers across the fault location, and my experience is even when the major sand layers are only partially displaced there can be important effects on the hydraulics of lateral flow. Additionally, the large displacements associated with the Mexia-Talco fault zone can completely offset the full thickness of sand zones or the thickness of a model layer.

Faulting in the GAM model is implemented using the Horizontal Flow Barrier (HFB) package. The HFB package assumes lateral connection of a model layer across a fault and the HFB package does not operate between different model layers. Thus, faulting can only be approximated within typical MODFLOW models.

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 periodically undergo modification as additional data and experience 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

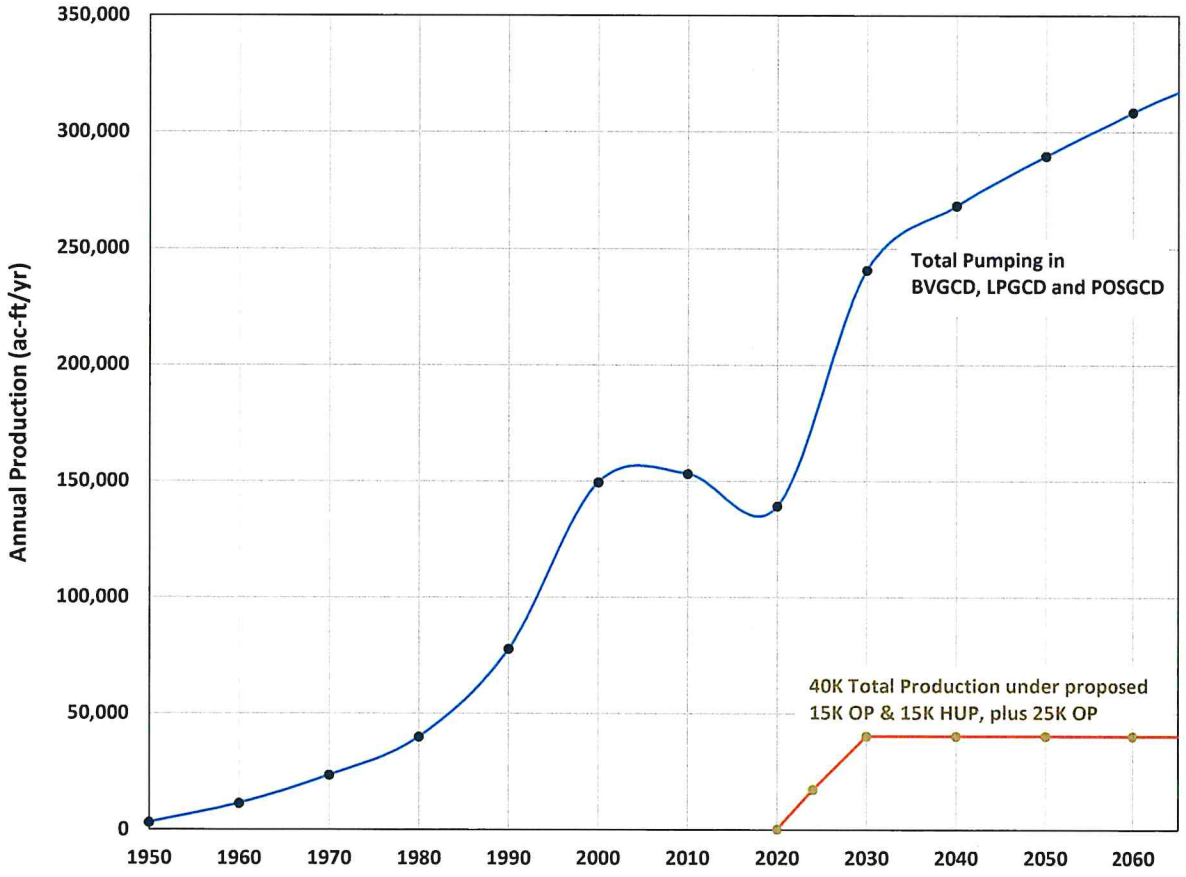
Discussion of Modeling Results

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 Savanah 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.

References

ALCOA, (2000), Three Oaks Mine Permit Application Section .127, Railroad Commission of Texas.

Chi, S. and Reilinger, R., (1984) Geodetic evidence for subsidence due to groundwater withdrawal in many parts of the United States of America; Journal of Hydrology, 67, 155-182.

D.B. Stephens, Groundwater Consultants, LLC, Intera Inc., (2020) GAM Update to the Groundwater Availability Model for the Central Portion of the Sparta, Queen City, and Carrizo-Wilcox Aquifers; Texas Water Development Board.

Donnelly, A, Harding, J., Seifert, W., Uliana, M., Young S., (2017), Desired Future Condition Explanatory Report for Groundwater Management Area 12.

Donnelly, A, Seifert, W., Uliana, M., Young S., (2022), Desired Future Condition Explanatory Report for Groundwater Management Area 12.

Ewing, T., Jigmond, M., Jones, T., Young, S., (2018) Final Report: Groundwater Availability Model for the Central Portion of the Sparta, Queen City, and Carrizo-Wilcox Aquifers; Texas Water Development Board.

Follet, C. (1970), Report No. 109 Ground-Water Resources of Bastrop County, Texas; Texas Water Development Board (reprinted 1972).

Gabrysch, R., (1984), Ground-water withdrawals and land-surface subsidence in the Houston-Galveston region, Texas, 1906-80; Texas Department of Water Resources Report 287.

Kasmarek, M.C., (2012), Hydrogeology and simulation of groundwater flow and land-surface subsidence in the northern part of the Gulf Coast aquifer system, Texas, 1891–2009 (ver. 1.1, November 2013): U.S. Geological Survey Scientific Investigations Report 2012–5154, http://pubs.usgs.gov/sir/2012/5154/.

Klempt, W.B., Duffin, G.L., Elder, G.R., Report 210 Groundwater Resources of the Carrizo Aquifer in the Winter Garden Area of Texas, Volume 1, Texas Water Development Board.

Land, L.F, and Armstrong, C.A. (1985), A Preliminary Assessment of Land-Surface Subsidence in the El Paso Area, Texas, U.S. Geological Survey Water-Resources Investigations Report 85-4155.

Mathewson, (1979). The Impact of Surface Mining on Surface and Groundwater Quality, Texas A&M University, Project N. L-2-3.

References (con't)

Price, R., Thorkildsen, D. (1991), Report No. 332 Groundwater Resources of the Carrizo-Wilcox Aquifer in the Central Texas Region; Texas Water Development Board.

Shafer, G. (1965, Reprinted 1978), Report 4 Ground-Water Resources of Gonzales County, Texas; Texas Water Development Board (2020), http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp

Theis, C.V. (1940), The Source of Water Derived from Wells, American Society of Civil Engineers.

Thompson, G. (1972, Reprinted 1987), Report No. 160 Groundwater Resources of Navarro County; Texas Water Development Board.

William F. Guyton & Associates, (1970), Report No. 150 Ground-Water Conditions in Anderson, Cherokee, Freestone, and Henderson Counties, Texas; Texas Water Development Board.

William F. Guyton & Associates, (1970), Report No. 110 Ground-Water Conditions in Angelina and Nacogdoches Counties, Texas; Texas Water Development Board.

HISTORIC USE PRODUCTION PERMIT
ISSUED BY DIRECTION OF THE BOARD OF DIRECTORS OF THE POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Phone: 512-455-9900 Fax: 512-455-9909

Historic Certificate #:	*POS – HUP- 0330*	*Effective Date*	*12/11/2007*
Permittee:	*SLR Property I, LP*	*Max. Capacity (GPM):*	*NA*
Address:	*P.O. Box 191577* *Dallas, TX 75219*		
Well Locations:	*Attachment A*	*Max. Aggregate Annual Production from all Wells under this Permit—for Industrial Use On Site (Attachment B)*	*15,000 AFY*

This Historic Use Production Permit is granted to SLR Property I, LP ("Permittee"), the assignee of the interests of Alcoa, Inc., to authorize the Permittee to operate multiple water wells or other aquifer penetrations at the locations specified in Attachment A, which is incorporated herein and made a part hereof for all purposes, within the Post Oak Savannah Groundwater Conservation District ("District") for the non-wasteful purpose of producing water for industrial purposes based on reasonable claim of, and application for, Historic Use of said production under the Rules of the District ("Rules"). This Permit is conditioned upon and subject to the Permittee complying with the Rules, orders of the Board and the Management Plan of the District, as amended, and the laws, rules, and regulations of the State of Texas, as amended, applicable to operating and maintaining water wells within the District. This Permit confers only the right to use the Permit under the provisions of the Rules and according to the terms of this Permit. The Permit terms may be modified or amended pursuant to the Rules.

The Wells are registered with the District and the State of Texas. 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 Rules are incorporated herein in their entirety by reference, as if set forth herein verbatim. The Permittee shall comply with the Rules and each requirement thereof in operating, maintaining, repairing, drilling, and altering the Wells. The applications pursuant to which this Permit has been issued are incorporated into the Permit, and the Permit is granted on the basis of, and contingent upon, the accuracy of the information supplied in the applications. A finding that false information has been supplied to the District in the permitting process for the Wells is grounds for revocation of the Permit.

The issuance of this Permit does not grant the Permittee the right to use any private property, or any public property, for the production or conveyance of water. Neither does this Permit authorize the invasion of any personal rights nor the violation of any federal, state, or local laws, rules or regulations. Further, the District makes no representation and shall have no responsibility with respect to the availability or quality of water authorized to be produced under this Permit.

The term of this Historic Use Production Permit is through December 31, 2038. This Permit is subject to review at any time upon notice and hearing. The Permit may be modified during any such review to conform the Permit with intervening changes in the Management Plan, the Rules, or state law. The Board may waive any review if no material change has been made to the Management Plan, or if the changes made do not require modifications of such permits.

Post Oak Savannah
Groundwater Conservation District

By: *Gary Westbrook, General Manager*

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT
Board of Directors Meeting
POSGCD District Office
310 East Avenue C
Milano, Texas 76556
September 13, 2011 – 5:30 p.m.

MINUTES

Members Present	Entity
Andy Hovorak	POSGCD
Kerry Starnes	POSGCD
Jay Tumlinson	POSGCD
Lee Alford	POSGCD
Jim Hodson	POSGCD
Nathan Ausley	POSGCD
Robert Ware	POSGCD
Dwayne Jekel	POSGCD
Jay Wilder	POSGCD
Gary Westbrook	POSGCD
Drew Gholson	POSGCD

Board Members Absent	
Carroll Glaser	POSGCD

Others Present	Entity
Michael J. Simmany	Lost Pines GCD
Travis McPhaul	Lost Pines GCD
Billy Sherrill	Lost Pines GCD
Keith Hansberger	Lost Pines GCD
Fred Russell	22 Hills
Dan Fischer	22 Hills
Dick Burns	ALCOA
Terrill Tomecek	ALCOA
Jackie Scott	BRA
Dave Barkemeyer	Milam County
Steve Box	Environmental Stewardship
Bill Graham	Land Owner
Curtis Chubb	Self
Ken Daughter	Lost Pines GCD
Ted Hubert	Milano

BOARD MEETING

1.) Call to Order and establish quorum

Nathan Ausley, Board President called the meeting to order and established a quorum at 5:30 p.m.

2.) Public Comment

Board President, Nathan Ausley asked for public comment. Public comment was heard from Steve Box with Environmental Stewardship concerning Item # 6, ALCOA, Inc. Historic Use Permit # POS-HUP-0330 with concern for the impacts on the Colorado River. He stated that Mr. Westbrook had been helpful in answering questions on Item # 6 prior to the meeting, but that Environmental Stewardship had questions about the ALCOA's Historic Use permit and their requested amendments. He then presented a letter to the District listing these concerns and some questions.

3.) Minutes of July 12, 2011 Meeting

A motion was made by Director, Jay Tumlinson to approve the minutes of the July 12, 2011 Meeting as presented. The motion was 2nd by Director, Jim Hodson. The motion carried unanimously.

4.) Blue Water Systems, L.P., Emergency Interconnect with Manville Water Supply Corp.

General Manger, Gary Westbrook reported that Blue Water Systems (BWS) had completed an agreement for emergency interconnect with Manville WSC (MWSC), and that BWS had complied with all requirements of the District for a procedure of this kind. He also stated that their agreement included language to require MWSC to maintain other water resources for supply in the event that the District were to curtail permits issued to BWS for this water, and that the BWS export permit allows this. No action was required.

5.) Grant of variance and license to ALCOA, Inc., and Milam County, authorizing ALCOA, Inc., to provide water to County for emergency supplies to citizens for drought relief

President Nathan Ausley announced that Director Hodson would be abstaining from discussion on agenda items 5 and 6 due to possible conflicts of interest. Discussion was held on this item between General Manager, Gary Westbrook and the Board of Directors. Comment was heard from the Milam County Judge Dave Barkemeyer stating that this will be brought back to the Commissioners Court for discussion. The Board was unanimously in favor of working with these entities to provide assistance in this effort as identified and discussed. A motion was made by Director, Nathan Ausley to grant a waiver to ALCOA, Inc., or any other permittee of the District, as applied for, to provide water to Milam County for emergency supplies to citizens for drought relief as discussed and to grant authority to General Manager Gary Westbrook to work with the District's attorney to issue waivers as long as Milam and Burleson Counties are listed as being in Exceptional Drought status according to the Texas Water Development Board's definitions. The motion was 2nd by Director, Jay Tumlinson. The motion carried 8 to 0 with Director, Jim Hodson abstaining from voting.

6.) ALCOA, Inc. Historic Use Permit # POS-HUP-0330

President Nathan Ausley reminded the meeting that Director Hodson would be abstaining from discussion on agenda item 6 due to possible conflicts of interest. General Manager, Gary Westbrook presented a request from ALCOA, Inc., to amend their Historic Use Permit # POS-HUP-0330, including the addition of one of ALCOA's registered wells, and six wells to be added to the permit, with six wells to be plugged and replaced. GM Westbrook explained that the permit as issued to ALCOA by the District included the ability for ALCOA to proceed with this action by application, and that they had done so. He further stated that the District's attorney, Mr. Barney Knight, was in agreement that ALCOA had been given this ability in the permit as issued. GM Westbrook further reiterated that the permit terms and limits would not be changed in that ALCOA could only put the new wells and use the water within the footprint of ALCOA property as included in the original permit, and that the use for the water could only be for industrial purposes

on site as listed in the permit, spacing of the new wells would be governed by the District's Rules, and that there was no increase in the amount of water allowed to be produced. A motion was made by Director Robert Ware to approve the application by ALCOA, Inc. to amend ALCOA's Historic Use Permit # POS-HUP-0330. The motion was 2nd by Director, Dwayne Jekel. The motion carried 8 to 0 with Director, Jim Hodson abstaining from vote.

7.) Management Plan and Rules

A report of the Rules Committee Meeting of September 7, 2011 was given by Director, Nathan Ausley, and he stated that the amended drafts of the Rules and the Ground Water Management Plan would be posted to the POSGCD website soon for review.

8.) Minutes of September 7, 2011 Rules Committee Meeting

A motion was made by Director Jim Hodson to approve the Minutes of September 7, 2011 Rules Committee Meeting. The motion was 2nd by Director, Kerry Starnes. The motion carried unanimously.

9.) Board Policies

General Manager, Gary Westbrook presented recommended changes to the Board Policies, written by Barney Knight of Knight and Partners and included in the Board Packets, which reflects the recent changes in statute. A motion was made by Director Nathan Ausley to approve the Board Policies as presented. The motion was 2nd by Director, Jay Tumlinson. The motion carried unanimously.

10.) Direction to General Manager concerning violations of District Rules by Roy Crush, Centerville, Texas

A brief summary of the violations of District Rules by Roy Crush, of Centerville was given by General Manager, Gary Westbrook. A motion was made by Director Lee Alford to proceed with actions against Mr. Crush concerning these violations if Mr. Crush did not respond to the District's notices. The motion was 2nd by Director Robert Ware. The motion carried unanimously.

11.) Monitoring Well Network and report on results of recent monitoring work

A summary report of recent amendments in assignments of wells within the monitoring network, along with maps, was given by Drew Gholson, Water Resource Manager of the District. Following this, a report was given by GM Westbrook on recent monitoring of water levels in wells in the District. A list of these wells, along with a map of locations accompanied the report. Discussion ensued concerning possible locations, as reported by staff, on monitoring wells to be drilled by the District in the very near future. A motion was made by Director, Kerry Starnes to grant a variance from spacing requirements and drill monitoring wells on the District's property at the District Office location for monitoring and educational purposes. The motion was 2nd by Director Jim Hodson. The motion carried unanimously.

12.) Receive report from District Manager on recent District activities and take appropriate actions

A. Permit applications filed with the District and Hearing Dates; Emergency Permits Granted

There was no Emergency Permits Granted, and no hearings scheduled at this time.

B. Well recordings and registrations, New well applications and completions, Wells plugged

There were 58 wells registered, 29 new well applications, 10 new wells completed, and 0 wells plugged

C. Recent and future District presentations and activities

1. Education Program

a. Water Wise

General Manger, Gary Westbrook presented the annual report on the Water Wise Education Program and presented letters from students that were received.

b. Local Water Utility Workshops of September 20 and 22, 2011

General Manger, Gary Westbrook advised that the Workshops will be on September 20th in Milano and September 22nd in Caldwell. We will discuss Grants, POSGCD Rules and Regional Water Planning

c. Other

General Manger, Gary Westbrook advised that we will again begin conducting our educational program in the schools in our District, beginning next month.

2. Director Terms and Appointments

General Manger, Gary Westbrook reported on the Director's terms that will expire this year. Positions for Milam County are Carroll Glaser- At Large, and Dwayne Jekel- Rural Water Supply For Burleson County, Andy Hovorak – Municipal, and Robert Ware-rural Water Supply. GM Westbrook reported that letters had been sent out to the Commissioner's Courts of both counties to advise of these positions and needed appointments on August 1, 2011, in accordance with the District's policies.

3. District Logo and website

General Manger, Gary Westbrook presented 4 draft logos to be considered. The logo with the more conventional Texas and the conventional star will be the new logo for the District.

4. Texas Alliance of Groundwater Districts meetings of August 30-31, 2011

General Manger, Gary Westbrook stated that he attended the Texas Alliance of Groundwater Districts meetings of August 30-31, 2011 and gave a brief summary of the meeting.

13.) Bills received and current financial status.

A motion was made by Director Nathan Ausley to approve the bills. The motion was 2nd by Director Dwayne Jekel. The motion carried unanimously.

14.) Dates, locations, and times of future meetings.

President Nathan Ausley announced that the next regularly scheduled meeting would be October 11, 2011 at the POSGCD District Offices at 5:30 p.m.

15.) Adjourn Board Meeting

President Nathan Ausley adjourned the meeting at 6:33 p.m.

THE ABOVE MINUTES OF THE MEETING OF THE BOARD OF DIRECTORS OF THE POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT HELD ON SEPTEMBER 13, 2011 WERE APPROVED AND ADOPTED BY THAT BOARD ON OCTOBER 11, 2011.

Nathan Ausley, President

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 location of each of the 30 well sites referred to in the Summary of Application, above, unique property description, and total combined maximum pumping rate for all wells located at each of the 30 well sites that are screened into the same formation. See Figure 5-1 in Section 5 for a map of the location of each of the 30 well sites and SLR property utilized in support of this application. 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 total combined maximum pumping rate defined for production from that formation at that well site.

The following information is common to all wells:

For each of the 30 well sites, no part of the water rights has been leased, sold, or transferred. SLR owns all rights to the surface estate and groundwater rights for each of the 30 well sites.

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

Upon drilling, completing and testing of any well, within 60 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;

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.

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 60 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;

Alcoa Primary Metals

Energy Division-Sandow Mine
3990 John D. Harper Road
PO Box 1491
Rockdale, TX 76567-1491 USA

July 18, 2011

Mr. Gary Westbrook
Post Oak Savannah Groundwater Conservation District
P. O. Box 92
Milano, Texas 76556

RE: Amendment to Alcoa Inc. Historic Use Permit # POS-HUP-0330

Dear Mr. Westbrook,

Pursuant to our discussion of July 13, 2011, Alcoa Inc. is requesting an amendment to its Historic Use Permit # POS-HUP-0330 (copy enclosed) as follows:

A. Alcoa well number DP-S-A-5 was originally registered with the district, however this well was inadvertently omitted from Appendix A which lists the wells covered under Historic Use Permit # POS-HUP-0330. Alcoa requests that well number DP-S-A-5 be added to Appendix A and covered under Historic Use Permit # POS-HUP-0330.

Attachment A
ALCOA'S WELLS

Count	Well ID	Latitude	Longitude	Comments
61	DP-S-A-5	30.56478°N	97.04740°W	Inadvertently Omitted

B. Alcoa plans to plug and abandon the following six wells currently included in Appendix A and covered under Historic Use Permit # POS-HUP-0330. Alcoa proposes that these six wells be removed from Appendix A. These six wells are:

Attachment A
ALCOA'S WELLS

Count	Well ID	Latitude	Longitude	Comments
7	~~A-9-4~~	~~30.56120°N~~	~~97.04058°W~~	To be Plugged & Abandoned
8	~~AX(9)1~~	~~30.50493°N~~	~~97.06474°W~~	To be Plugged & Abandoned
9	~~AX(9)2~~	~~30.53000°N~~	~~97.06375°W~~	To be Plugged & Abandoned
10	~~AX(9)3~~	~~30.53012°N~~	~~97.06231°W~~	To be Plugged & Abandoned
11	~~AX(10)5~~	~~30.54111°N~~	~~97.05764°W~~	To be Plugged & Abandoned
30	~~C-9-24~~	~~30.56436°N~~	~~97.02256°W~~	To be Plugged & Abandoned

Alcoa will notify the district by mail to confirm when the plugging operation for each of these six wells has been completed.

C. Alcoa proposes to designate six new wells as replacements for the six wells to be plugged and abandoned described in B. above. The new wells are designated as:

Attachment A
ALCOA'S WELLS

Count	Well ID	Latitude	Longitude	Comments
7	E-1	TBD	TBD	New Replacement Well
8	E-2	TBD	TBD	New Replacement Well
9	E-3	TBD	TBD	New Replacement Well
10	E-4	TBD	TBD	New Replacement Well
11	AT-1	TBD	TBD	New Replacement Well
30	AT-2	TBD	TBD	New Replacement Well

Alcoa will notify the district by mail to confirm when each of the new replacement wells has been completed and confirm the exact coordinates for each well.

Enclosed is a mark-up of Attachment A that reflects the addition of the one inadvertently omitted well, the removal of the six wells to be plugged and abandoned, and the addition of the six new replacement wells. After all six wells are plugged and abandoned and all six replacement wells are completed and the coordinates of each confirmed, Alcoa will submit an updated Attachment A showing only the 61 wells that are then currently-active, without comments or annotations.

Please call me at 512-760-8999 if you have any questions or need any additional information.

Respectfully,

Tommy E Hodges

Tommy E. Hodges, P.E.
Energy Manager
Alcoa Inc.
Rockdale Energy

Enclosures

Attachment A
ALCOA'S WELLS

Count	Well ID	Latitude	Longitude	Comments
1	DP-S-A-3	30.57033°N	97.03935°W	
2	DP-S-A-4	30.56881°N	97.04432°W	
3	DP-S-A-6	30.56225°N	97.04861°W	
4	DP-S-A-7	30.55998°N	97.05018°W	
5	A-9-2	30.55511°N	97.04182°W	
6	A-9-3	30.55482°N	97.04309°W	
7	~~A-9-4~~	~~30.56420°N~~	~~97.04058°W~~	To be Plugged & Abandoned
7 (replacement)	E-1	TBD	TBD	New Replacement Well
8	~~AX(9)1~~	~~30.50493°N~~	~~97.06474°W~~	To be Plugged & Abandoned
8 (replacement)	E-2	TBD	TBD	New Replacement Well
9	~~AX(9)2~~	~~30.53000°N~~	~~97.06375°W~~	To be Plugged & Abandoned
9 (replacement)	E-3	TBD	TBD	New Replacement Well
10	~~AX(9)3~~	~~30.53912°N~~	~~97.06251°W~~	To be Plugged & Abandoned
10 (replacement)	E-4	TBD	TBD	New Replacement Well
11	~~AX(10)5~~	~~30.54111°N~~	~~97.05764°W~~	To be Plugged & Abandoned
11 (replacement)	AT-1	TBD	TBD	New Replacement Well
12	C4248A	30.57674°N	97.02479°W	
13	C4247	30.57784°N	97.02452°W	
14	C4246	30.57911°N	97.02407°W	
15	C4245	30.57988°N	97.02349°W	
16	C4250A	30.57393°N	97.02559°W	
17	C4052A	30.57223°N	97.02831°W	
18	C4440A	30.58688°N	97.02000°W	
19	C5245B	30.57941°N	97.00878°W	
20	C-9-12	30.56138°N	97.02401°W	
21	C-9-13	30.56657°N	97.01864°W	
22	C-9-14	30.56227°N	97.02189°W	
23	C-9-15	30.57191°N	97.00947°W	
24	C-9-16	30.57370°N	97.00835°W	
25	C-9-17	30.57550°N	97.00838°W	
26	C-9-18	30.57744°N	97.00833°W	
27	C-9-19	30.58184°N	97.00811°W	
28	C-9-20	30.56734°N	97.01604°W	
29	C-9-23	30.56489°N	97.02366°W	
30	~~C-9-24~~	~~30.56436°N~~	~~97.02259°W~~	To be Plugged & Abandoned
30 (replacement)	AT-2	TBD	TBD	New Replacement Well
31	C-9-25	30.58430°N	97.01025°W	
32	C-9-27	30.58484°N	97.01057°W	
33	C-9-29	30.57276°N	97.00874°W	
34	C-9-30	30.57448°N	97.00817°W	
35	C-9-31	30.58076°N	97.00835°W	
36	F1 Sims	30.51378°N	97.07286°W	
37	F2 Sims	30.51536°N	97.07445°W	
38	F3 Sims	30.51442°N	97.07441°W	
39	F4 Sims	30.51329°N	97.07452°W	
40	F5 Sims	30.51402°N	97.07085°W	
41	F6 Sims	30.51804°N	97.06758°W	
42	F8 Sims	30.51959°N	97.06777°W	
43	F9 Sims	30.52120°N	97.06688°W	
44	F10 Sims	30.52283°N	97.06630°W	
45	F11Sims	30.52264°N	97.06762°W	
46	F12 Sims	30.51527°N	97.07801°W	
47	F13 Sims	30.51867°N	97.07272°W	
48	F14 Sims	30.51614°N	97.07222°W	
49	F15 Sims	30.51738°N	97.07004°W	
50	NFD-02-Sims	30.51388°N	97.07195°W	
51	P-5	30.58484°N	97.01220°W	
52	58-32-502	30.33340°N	97.04030°W	
53	58-32-503	30.33230°N	97.04180°W	
54	58-32-504	30.56083°N	97.06778°W	
55	58-32-505	30.55942°N	97.06879°W	
56	F5222A	30.50352°N	97.10667°W	
57	F5222B	30.50301°N	97.10691°W	
58	South Crusher	30.52158°N	97.10150°W	
59	Storm Shelter	30.50569°N	97.10631°W	
60	WashRack	30.55158°N	97.07546°W	
61	DP-S-A-5	30.56478°N	97.04740°W	Inadvertently Omitted

HISTORIC USE PRODUCTION PERMIT
ISSUED BY DIRECTION OF THE BOARD OF DIRECTORS OF THE POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT

Phone: 512-455-9900 Fax: 512-455-9909

Historic Certificate #:	*POS-HUP- 0330*	*Effective Date*	*12/11/2007*
Permittee:	*Alcoa Inc.*	*Max. Capacity (GPM):*	*NA*
Address:	*P.O. Box 1491* *Rockdale, TX 76567*		
Well Locations:	*Attachment A*	*Max. Aggregate Annual Production from all Wells under this Permit—for Industrial Use On Site (Attachment B)*	*15,000 AFY*

This Historic Use Production Permit is granted to Alcoa Inc. ("Permittee") to authorize the Permittee to operate multiple water wells or other aquifer penetrations at the locations specified in Attachment A, which is incorporated herein and made a part hereof for all purposes, within the Post Oak Savannah Groundwater Conservation District ("District") for the non-wasteful purpose of producing water for industrial purposes based on reasonable claim of, and application for, Historic Use of said production under the Rules of the District ("Rules"). This Permit is conditioned upon and subject to the Permittee complying with the Rules, orders of the Board and the Management Plan of the District, as amended, and the laws, rules, and regulations of the State of Texas, as amended, applicable to operating and maintaining water wells within the District. This Permit confers only the right to use the Permit under the provisions of the Rules and according to the terms of this Permit. The Permit terms may be modified or amended pursuant to the Rules.

The Wells are registered with the District and the State of Texas. 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 Rules are incorporated herein in their entirety by reference, as if set forth herein verbatim. The Permittee shall comply with the Rules and each requirement thereof in operating, maintaining, repairing, drilling, and altering the Wells. The applications pursuant to which this Permit has been issued are incorporated into the Permit, and the Permit is granted on the basis of, and contingent upon, the accuracy of the information supplied in the applications. A finding that false information has been supplied to the District in the permitting process for the Wells is grounds for revocation of the Permit.

The issuance of this Permit does not grant the Permittee the right to use any private property, or any public property, for the production or conveyance of water. Neither does this Permit authorize the invasion of any personal rights nor the violation of any federal, state, or local laws, rules or regulations. Further, the District makes no representation and shall have no responsibility with respect to the availability or quality of water authorized to be produced under this Permit.

The term of this Historic Use Production Permit is through December 31, 2038. This Permit is subject to review at any time upon notice and hearing. The Permit may be modified during any such review to conform the Permit with intervening changes in the Management Plan, the Rules, or state law. The Board may waive any review if no material change has been made to the Management Plan, or if the changes made do not require modifications of such permits.

Post Oak Savannah
Groundwater Conservation District

By: _____
Gary Westbrook, General Manager

Attachment A
ALCOA'S WELLS

Count	Well ID	Latitude	Longitude
1	DP-S-A-3	30.57033°N	97.03935°W
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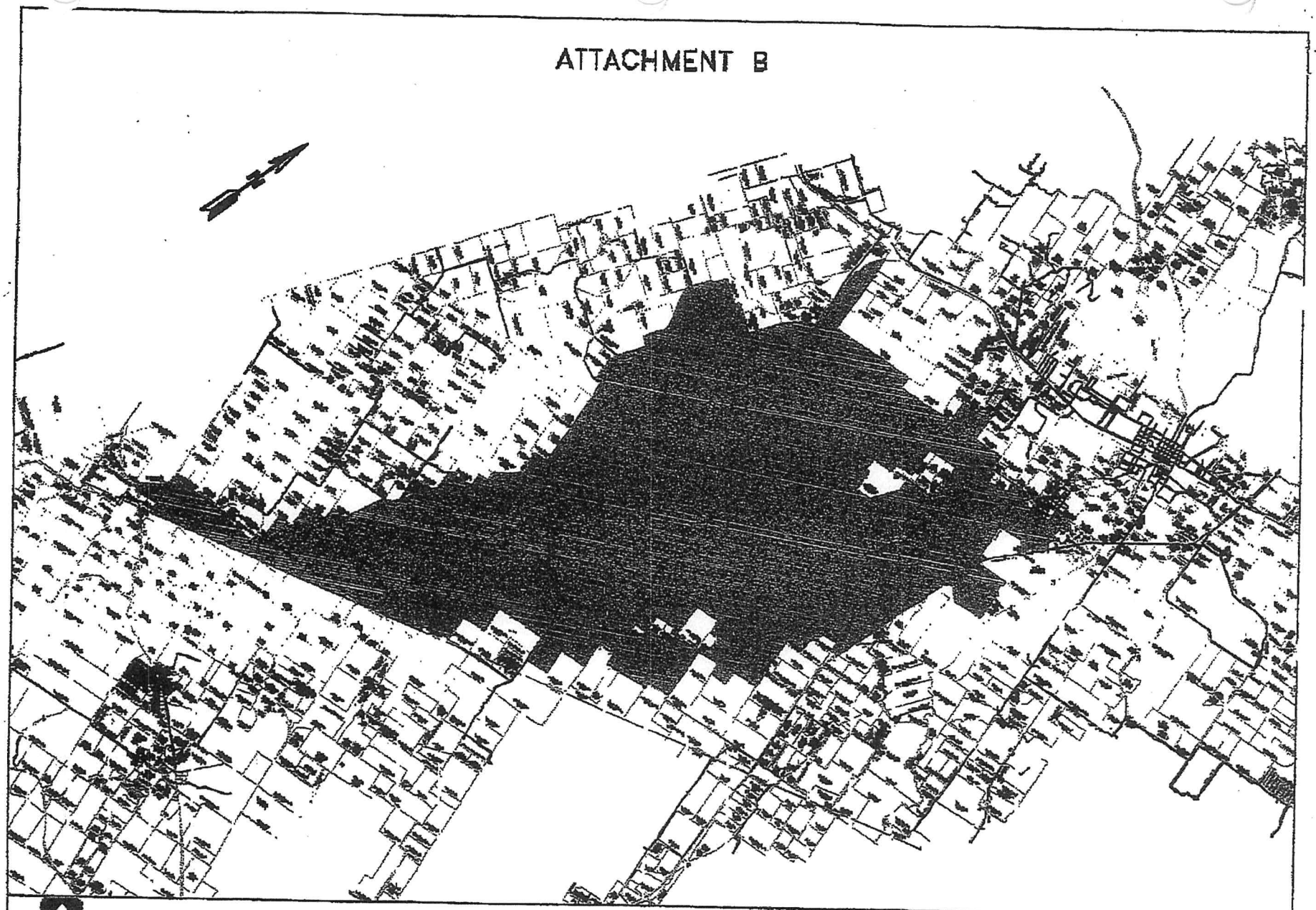
59	Storm Shelter	30.50569°N	97.10631°W
60	WashRack	30.55158°N	97.07546°W

ATTACHMENT B



ALCOA

SCALE: 1" = 10,000'

ALCOA INC.

ALCOA NILAM COUNTY AREA