

CAUSE NO. 18,005

WASTE CONTROL SPECIALISTS, LLC,	§	IN THE DISTRICT COURT OF
Plaintiff,	§	
	§	
v.	§	ANDREWS COUNTY, TEXAS
	§	
ADAM GREENWOOD, <i>et al.</i> ,	§	
Defendants.	§	109 th JUDICIAL DISTRICT

AFFIDAVIT OF PATRICIA BOBECK

STATE OF TEXAS §
COUNTY OF TRAVIS §

Before me, the undersigned notary, on this day personally appeared Patricia Bobeck, a person whose identity has been made known to me. After I administered an oath to her, and upon her oath, she declared:

Identity and Qualifications to Execute this Affidavit

1. My name is Patricia Bobeck. I am over 18 years of age. I am of sound mind, I have never been convicted of a felony or crime involving moral turpitude, and I have personal knowledge of all facts contained in this Declaration. All facts contained herein are within my personal knowledge and are true and correct.

2. **Residence.** I live in Austin, in Travis County, Texas.

3. **Education, Post-Graduate Studies, and Post-Graduate Degrees.** I studied in France and in Switzerland while completing an undergraduate degree in French at Dominican University. I later received a Master of Arts degree in Linguistics from the University of Michigan. I taught languages in South America and Hawaii before entering the University of Texas, where I received a Master of Arts degree in Geology in 1985. My studies in the University of Texas's Geology Department focused Specialization in ore deposits and igneous rocks. I am familiar with the structural geology of formations in arid parts of Texas. My Master of Arts thesis at the University of Texas concerned igneous rocks and the structural geology of Nine Point Mesa in Brewster County, Texas.

4. **Professions.** I am a professional geologist with experience in remediation of contaminated soils and groundwater for the State of Texas and I am a certified translator specializing in the translation of technical documents. For four years, from 1995 through 1999, I served as head of the Science and Technology Division of the American Translators Association.

5. **Employment.** I am now the owner of Geotechnical Translations, an Austin-based business involved in the translation and publication into English of foreign-language

papers and books about technology. I am certified as a French-to-English translator by the American Translators Association. My special translation expertise is in earth sciences:

6. **My work at the Texas Commission for Environmental Quality and other state agencies.** For fifteen years, from 1992 until 2007, I worked as a professional geologist, at the Texas Water Commission, as a project manager for the Remediation Division of the Texas Natural Resource Conservation Commission, where I oversaw hazardous waste cleanups, and for the Texas Commission for Environmental Quality ("TCEQ"). While I worked at TCEQ, my work focused on soil and groundwater remediation. I later worked as a hydrogeologist for the Bureau of Radiation Control ("BRC") in the Texas Department of State Health Services ("TDSHS"). I served as an agency staff representative of the TDSHS on the Texas Groundwater Protection Committee during its meetings on the TCEQ campus.

7. **Expertise sufficient to provide evaluations of geological conditions and risks of contamination at the site of the Waste Control Specialists, LLC's byproduct-license facility.** During my tenure at TNRCC and TCEQ, I worked closely with geologists, engineers, and scientists responsible for formulating environmental policies, investigating environmental disputes, and determining matters that affected environmental conditions in the State of Texas, including water quality. While employed by the BRC and TDSHS, I reviewed Waste Control Specialist LLC's ("Waste Control's") application for a byproduct license to construct a landfill for disposal of by-product radioactive waste, that is, waste generated as a by-product of uranium production. I conducted that review while acting within the course and scope of my employment by the State of Texas. I have the background, education, experience, and on-the-job training to evaluate the risks of radioactive contamination of underground aquifers in Texas.

8. **Familiarity with the history and principles of hydrology and publications reflecting that familiarity.** I am familiar with the history of hydrology and fluid dynamics. I translated the French book *Les Fontaines publiques de la ville de Dijon*, first published in France in 1856, into English as *The Public Fountains of the City of Dijon*; I then republished it in English in 2004 through the Kendall/Hunt Publishing Company of Dubuque, Iowa. The book, one of the most important in the history of hydrology, described the water supply system Henry Darcy built in Dijon, France, during the years 1839-1840. The book is important because of its description of the experiments that led to the formulation of Darcy's Law – a law about fluid flow that is at the heart of hydrogeology as a science. Darcy's Law, the equation that describes and measures the flow of fluid through porous media including groundwater, provides the quantitative basis for many scientific disciplines, including, *inter alia*, hydrology, hydrogeology, pipe hydraulics, petroleum engineering, chemical engineering, civil engineering, and soil science. During my translation project I had to resolve issues of old technology and terminology; provide modern terms for Old French passages; make sense of references to Roman and Greek water experts and technologies; discuss "new" pipe manufacturing methods; explain antiquated theories of artesian wells and springs; and put into context the important scientific discoveries Henry Darcy had made. In 2004, the American Foundation for Translation and Interpretation presented me with the inaugural S. Edmund Berger Prize for Excellence in Scientific and Technical Translation for my work on the book. In 2009 I translated into English the book *Geology: Basics for Engineers* by Aurèle Parriaux, the winner of the 2007 Roberval Prize.

9. Delivery of scholarly papers and presentations about geological and hydrological issues. I have delivered papers and presentations about geology, hydrology, hydrogeology, technology, my translation of Henry Darcy's book *The Public Fountains of the City of Dijon*, translations of technical papers, and linguistics at scholarly conventions, professional conferences and universities in the United States and in Europe. In recent years those conferences have included the following:

- "Henry Darcy's Public Fountains of the City of Dijon," presented at The American Water Resources Association Annual Meeting (Seattle, Washington, November 11, 2009);
- "America Meets Henry Darcy, 1959 to 2009," part of the "50 Years of Hydrogeology at GSA; Looking Back and Looking Forward" at The Geological Society of America Annual Meeting 50th Anniversary Hydrogeology Division (Portland, Oregon, October 18, 2009);
- "Henry Darcy's Public Fountains of the City of Dijon," presented at The Gulf Coast Association of Geological Societies 59th Annual Convention (Shreveport, Louisiana, September 28, 2009);
- The Geological Society of London, William Smith Meeting (Burlington House, London, September 2009);
- The University of Texas Hydrogeology Class (guest lecturer) (Austin, September 2009);
- The 2009 Technical Water Research Symposium, New Mexico Water Resources Research Institute (New Mexico Tech, August 11, 2009);
- The Capital Area Chapter of the American Water Works Association (Austin, Texas, August 2009);
- The City of Austin Watershed Protection Division (Austin, Texas, April 2009);
- The Baton Rouge Geological Society Groundwater Symposium (Baton Rouge, Louisiana, March 2009);
- "On Henry Darcy," presented at The New Mexico Tech Hydrology Seminar (Albuquerque, New Mexico, February 23, 2009);
- The Texas Railroad Commission (Austin, Texas, July 2008);
- Keynote Speaker, California EPA GeoSymposium (Sacramento, California, May 8, 2008);
- The Texas Commission on Environmental Quality (Austin, Texas, May 2008);
- The American Society of Civil Engineers, San Antonio Branch (San Antonio, Texas November 12, 2007);
- "Mardi des auteurs à l'ENPC," presented at the Ecole Nationale des Ponts et Chaussées (Paris, France, September 25, 2007);

- "Darcy's Law, Filtration and Public Health," Paper No. 2-15, presented at The Hydrogeology Division of the Geological Society of America Annual Meeting (Denver, Colorado, October 28, 2007).
- International Association of Hydrogeologists Meeting on the History of Hydrogeology (Lisbon, Portugal, September 17, 2007);
- The American Translators Association Energy Conference (Houston, Texas, May 4-6, 2007) (a seminar organized in conjunction with the Offshore Technology Conference);
- National Ground Water Association Ground Water Summit (Albuquerque, New Mexico, April 30, 2007);
- The American Society of Civil Engineers, Fort Worth Branch (Fort Worth, Texas April 16, 2007);
- "Water Works Wonder," presented to the The Texas Board of Professional Engineers, Travis Chapter (Austin, Texas, April 11, 2007);
- The University of Nevada Reno Spring 2006 Colloquium Series (2006);
- National Ground Water Association Ground Water Summit (2006);
- International Association of Hydrogeologists International Symposium AIH (Dijon, France, June 1, 2006);
- The Groundwater Resources Association of California, San Francisco Bay Chapter (June 15, 2005);
- The Austin Area Translators and Interpreters Association (January 2005);
- author, "Darcy's Fountains Flow Again!," 60 The Hydrologist 1, 8 (July 2004);
- and
- other presentations and publications.

10. **Personal familiarity with the Waste Control's Andrews County facility and license applications while working for TCEQ.** During the time that I worked at TDSHS and TCEQ, I became personally familiar with Waste Control's applications for (a) a radioactive byproduct license and (b) a low-level radioactive waste disposal license. During the course of my involvement in that license review process, I became personally familiar with the geology of the proposed Waste Control facility in Andrews County.

11. **Underground geology, hydrology, and hydrogeology are evolving scientific disciplines.** Based on the background, education, experience, study, and analysis discussed above, it is my opinion that geology, hydrology, and hydrogeology are evolving scientific disciplines. Geology and hydrology are far more evolved today than they were ten years ago, and are likely to be far better known a decade from now. Determinations of underground geological structures, including determinations about the porosity of subsurface sedimentary structures, the existence and extent of fracture lines in sedimentary and other formations, and the risks of contamination to water tables at a site, are often more akin to an art rather than a science, depending upon the extent to which a particular geological formation or site has been mapped

and drilled. And that is why more than half of all oil and gas wells are dry holes – despite the best equipment, tools, and analysis available, the specific condition of any subsurface formation often remains unknown until it is tested.

12. The purpose of waste disposal is the prevention of contamination. The purpose of disposing of radioactive waste by burial is to prevent the contamination of the surrounding environment, including water. The ideal underground storage site for radioactive material would be dry and stable (*i.e.*, a place where the risk of earthquake is low). The presence of groundwater in a proposed storage site for radioactive material is important because radionuclides can travel with the water and leak outside of their storage container. The intrusion of water greatly enhances the likelihood that radioactive isotopes will escape confinement and pose an exposure risk to the environment. A proposed disposal site is required to sequester radioactive materials with half-lives as long as 50,000 years, at a minimum.

13. Waste Control's license applications have generated a great deal of political and scientific controversy on topics of geology, hydrology, and risk-evaluation where reasonable minds could differ. Waste Control's applications for licenses to operate a facility in Andrews County have generated a large amount of public interest and controversy, including the decision by TCEQ's leadership, in 2007, to disregard the recommendations of its license-review teams to reject the proposed applications; the Sierra Club's administrative law challenge to the issuance of TCEQ's low level radioactive waste disposal license styled *In the Matter of the Application of Waste Control Specialists, LLC for License No. R04100*, before the TCEQ; and the Travis County district court's appeal of that TCEQ license-issuance decision. These continuing controversies reflect the existence of political and scientific disputes. In my opinion, reasonable minds could differ about the geology, hydrology, and porosity of subsurface conditions under and in close, lateral proximity to the Waste Control low level radioactive waste and byproduct disposal facility in Andrews County, Texas.

14. In my opinion, reasonable minds can reasonably differ about the extent of the Ogallala Aquifer in Andrews County and about related issues of whether it lies directly under or within the immediate proximity of (within 14 feet of) Waste Control's low level radioactive waste and byproduct disposal facilities in Andrews County, Texas. The physical size and porosity of the Ogallala Aquifer can change – grow larger or smaller – based on precipitation, saturation, and fracturing within sedimentary layers beneath Waste Control's property. It is a matter of professional judgment whether the Ogallala Aquifer extends directly beneath the Waste Control facility in Andrews County, as some maps show, or whether it comes within 14 feet of the Waste Control facility in Andrews County, as Glenn Lewis and other TCEQ employees concluded.

15. I do not know to what extent the Ogallala Aquifer is present at the Waste Control facility in Andrews County. It is my understanding that the Ogallala Aquifer drapes the ridge on which Waste Control plans to construct its landfill. According to the plans presented by Waste Control, Waste Control intended to remove the Ogallala Aquifer from the top of the ridge and to excavate to some depth in the underlying Dockum red clay beds. I do not know whether Waste Control has changed its construction plans or whether Waste Control still plans to excavate beneath the Ogallala Aquifer.

16. In my opinion as a professional geologist, it would be reasonable for an educated member of the public concerned about a risk of radioactive contamination to Andrews County water supplies to conclude that the Ogallala Aquifer could extend directly under all of Andrews County, based on widely available maps from reputable, scholarly sources of the kind that intelligent, educated members of the public could reasonably rely upon.

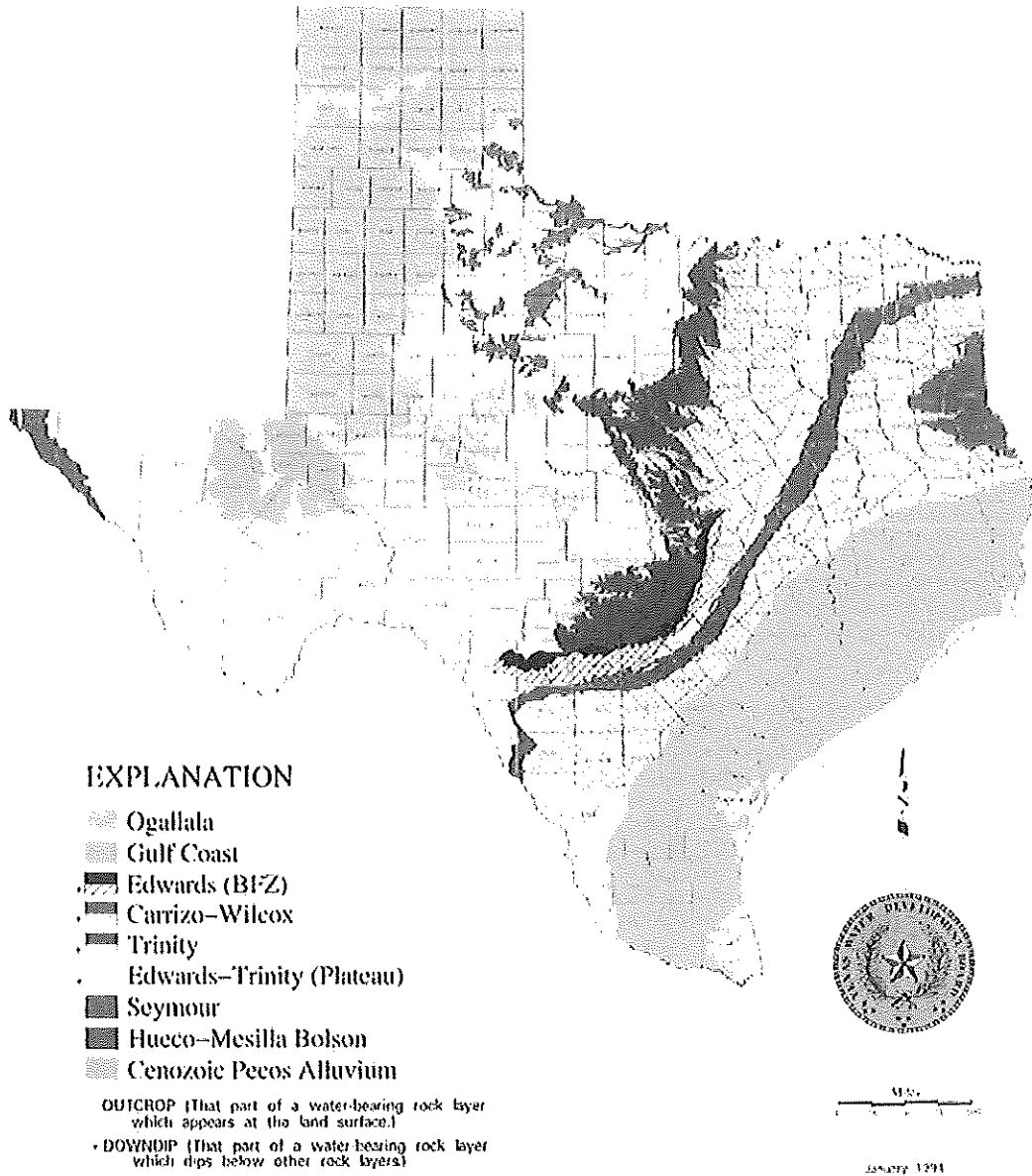
17. Maps reflecting a range of differing professional opinions about the extent of the Ogallala Aquifer are readily accessible to educated members of the public interested in geology and hydrogeology. Many maps show the Ogallala Aquifer lying under all, or nearly all, of Andrews County. Reasonable expert geologists and hydrologists can have reasonable different opinions about aquifers based upon different investigations undertaken at different times.

18. The "Major Aquifers of Texas" map can be found at the University of Texas Walter Geology Library's public domain website. It is accessible through Google at the web address: http://lib.utexas.edu/geo/aquifersoftexas/aquifers_of_texas.pdf. **Image 1** below, "Major Aquifers of Texas," is a true copy from that website of a map in a PDF copy of the Texas Water Development Board's ("TWDB's") Report 345, *Aquifers of Texas* (Austin: TWDB, Nov. 1995) written by geologists John B. Ashworth and Janie Hopkins. **Image 1** is the TWDB's map of the Ogallala Aquifer and other Texas aquifers, to scale. It is a public record map prepared and published by a public agency setting forth the results of an investigation conducted by that agency to memorialize information about water resources. It depicts the Ogallala Aquifer as covering all or nearly all of Andrews County, including the site of the proposed Waste Control low level radioactive waste and byproduct license applications I learned about while working as an employee of the State of Texas. This **Image 1** reflects one part of a spectrum of differing professional opinions about the size of the Ogallala Aquifer in Andrews County, Texas.

19. **Image 2**, two pages below, "Ogallala," is a second map from that same TWDB Report 345. It reflects the results of a TWDB study completed in November 1995. **Image 2** depicts the Ogallala Aquifer, to scale, as covering all or nearly all of Andrews County, including the site of the proposed Waste Control low level radioactive waste and byproduct license applications I learned about while working as a state employee. It is the kind of map a professional geologist would reasonably consult while formulating a professional opinion about potential risks of contamination to the water in the Ogallala Aquifer.

20. **Image 3**, three pages below, "Ogallala Aquifer," is a true copy of a TWDB map published in a book written by Teresa Howard, Gordon Wells, Linda Prospérie, Rima Petrossian, Huitang Li, and Amir Thapa, *Characterization of Playa Basins on the High Plains of Texas*, TWDB Report 357 (Austin: Texas Water Development Board, August 2003). This map is accessible on the Google search engine and other search engines at http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/Report%20357/Report357_8x11Layout.pdf. Labeled Figure 3-1 on page 3 of that public domain TWDB Report 357, it shows the Ogallala Aquifer covering almost all of Andrews County, Texas.

MAJOR AQUIFERS OF TEXAS



**Image 1 – the TWDB “Major Aquifers of Texas” in TWDB Report 345
on the University of Texas Walters Geology Library website**

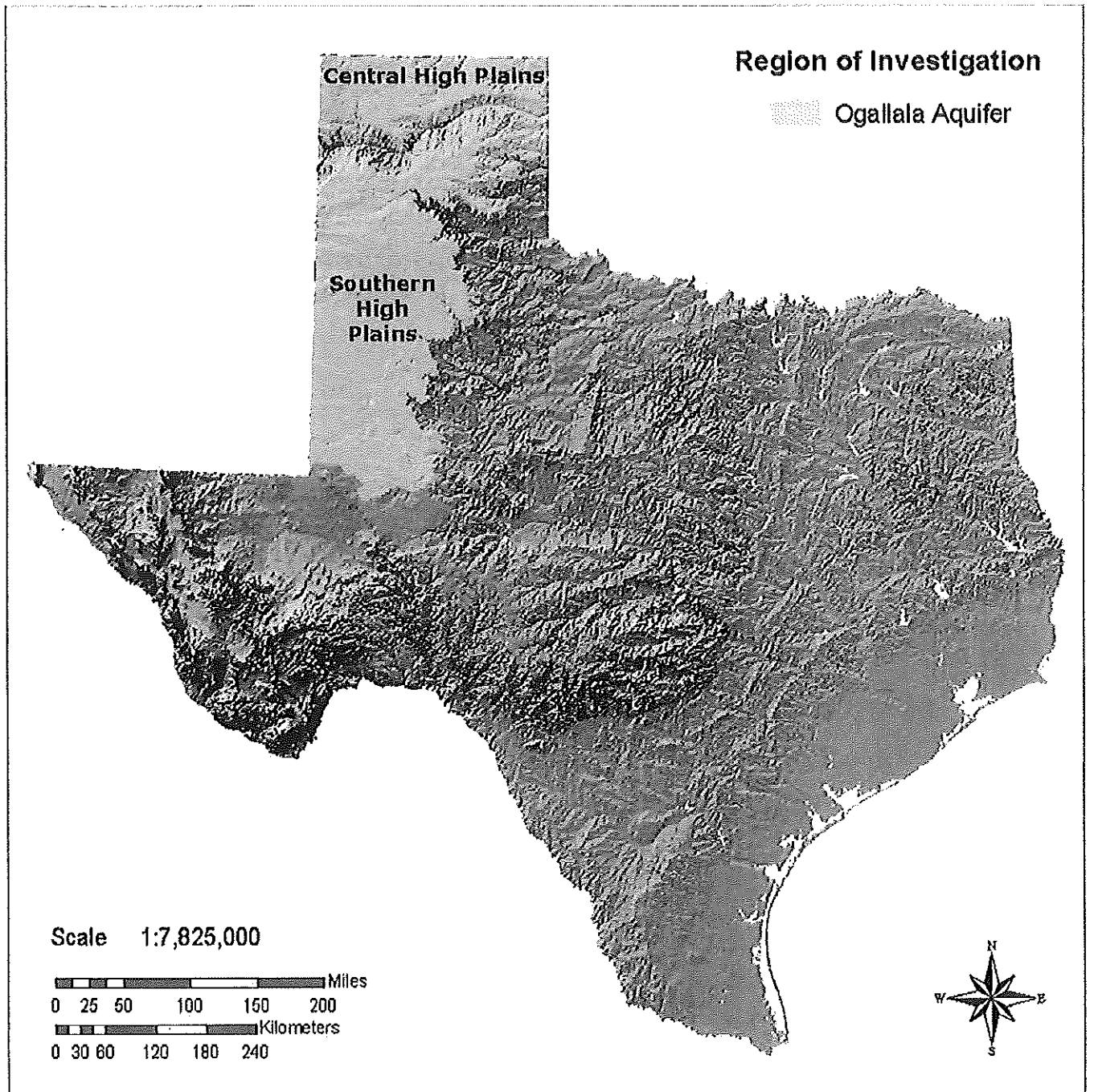


Image 3 – the TWDB 2003 map/Figure 3.1

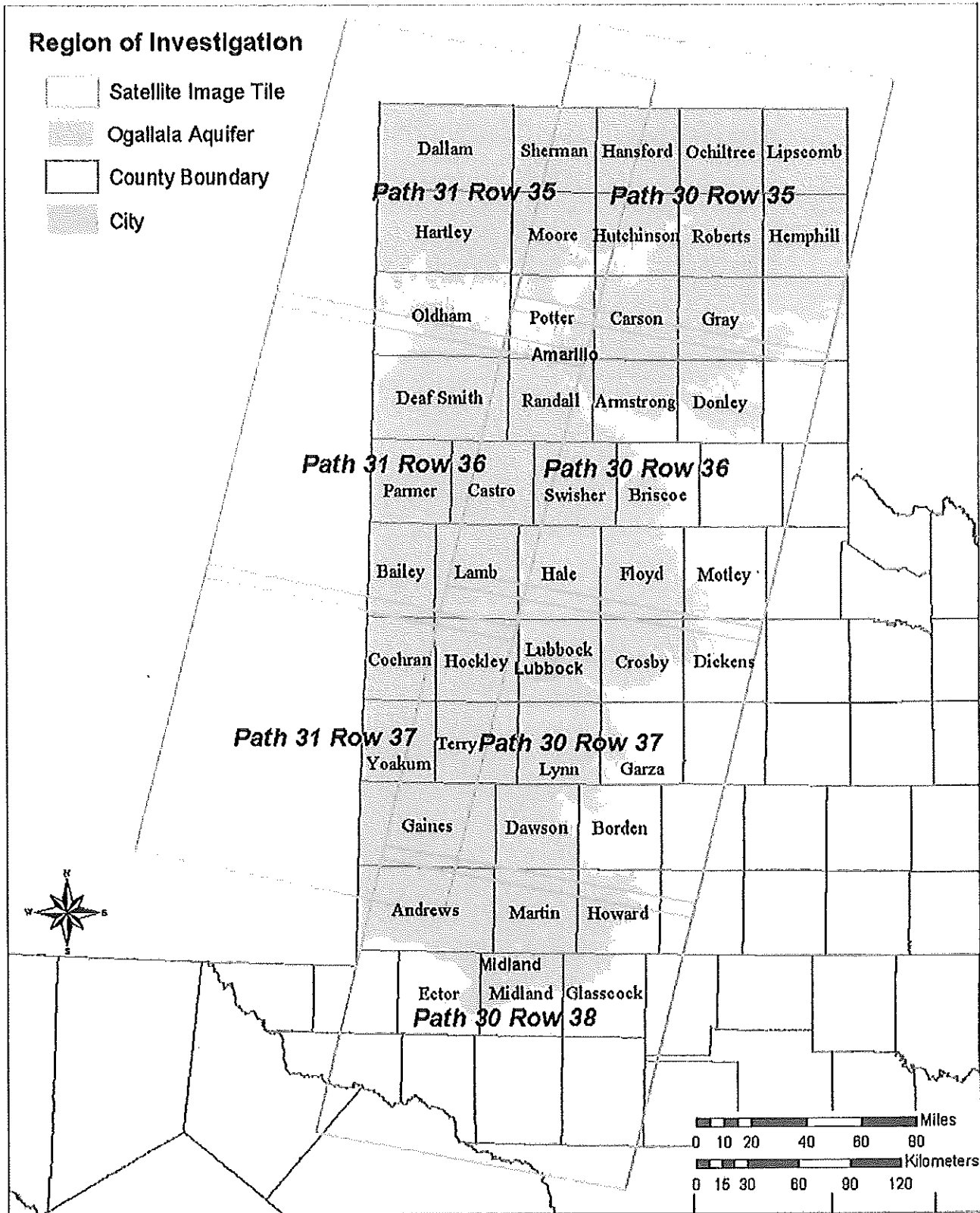


Image 4 – the TWDB 2003 map/Figure 3.2 (detail)

21. **Image 4**, as found one page above this page of this affidavit, is styled, "Region of Investigation." It is a true copy of a TWDB map published in that same book, *Characterization of Playa Basins on the High Plains of Texas*, TWDB Report 357, accessible at http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWRReports/Report%20357/Report357_8x11Layout.pdf. Labeled Figure 3-2 on page 5 of that public domain TWDB Report 357, it shows the Ogallala Aquifer covering almost all of Andrews County, Texas, including the site of the proposed Waste Control license applications I learned about while working as a state employee.

22. If Adam Greenwood and Save the Ogallala Foundation are "disparaging" Waste Control by saying, on a website or in press conferences, that the Ogallala Aquifer covers all or almost all of Andrews County, he is not the only one doing so. T. Boone Pickens' company Mesa Water, Inc. is currently using an image of the Ogallala Aquifer on a web-page marked "Ogallala Aquifer" on its website. **Image 5**, a web-page found on Mesa Water, Inc.'s website, today, appears below. It can be accessed through a Google search using the web-access:

<http://www.mesawater.com/ogallala.asp>

That webpage appears on the Mesa Water, Inc. website that can be located, via Google search, at the location below:

<http://www.mesawater.com/>

Right or wrong, a large, well-capitalized corporation in the business of providing water and water related services in Texas is using maps of the Ogallala Aquifer consistent with the statements that are supposedly the basis of Waste Control's decision to file a lawsuit against Greenwood and Save the Ogallala Aquifer Foundation. Reasonable minds and well-informed geologists can reach different reasonable conclusions about the composition, permeability, and boundaries of Texas aquifers.

Ogallala Aquifer

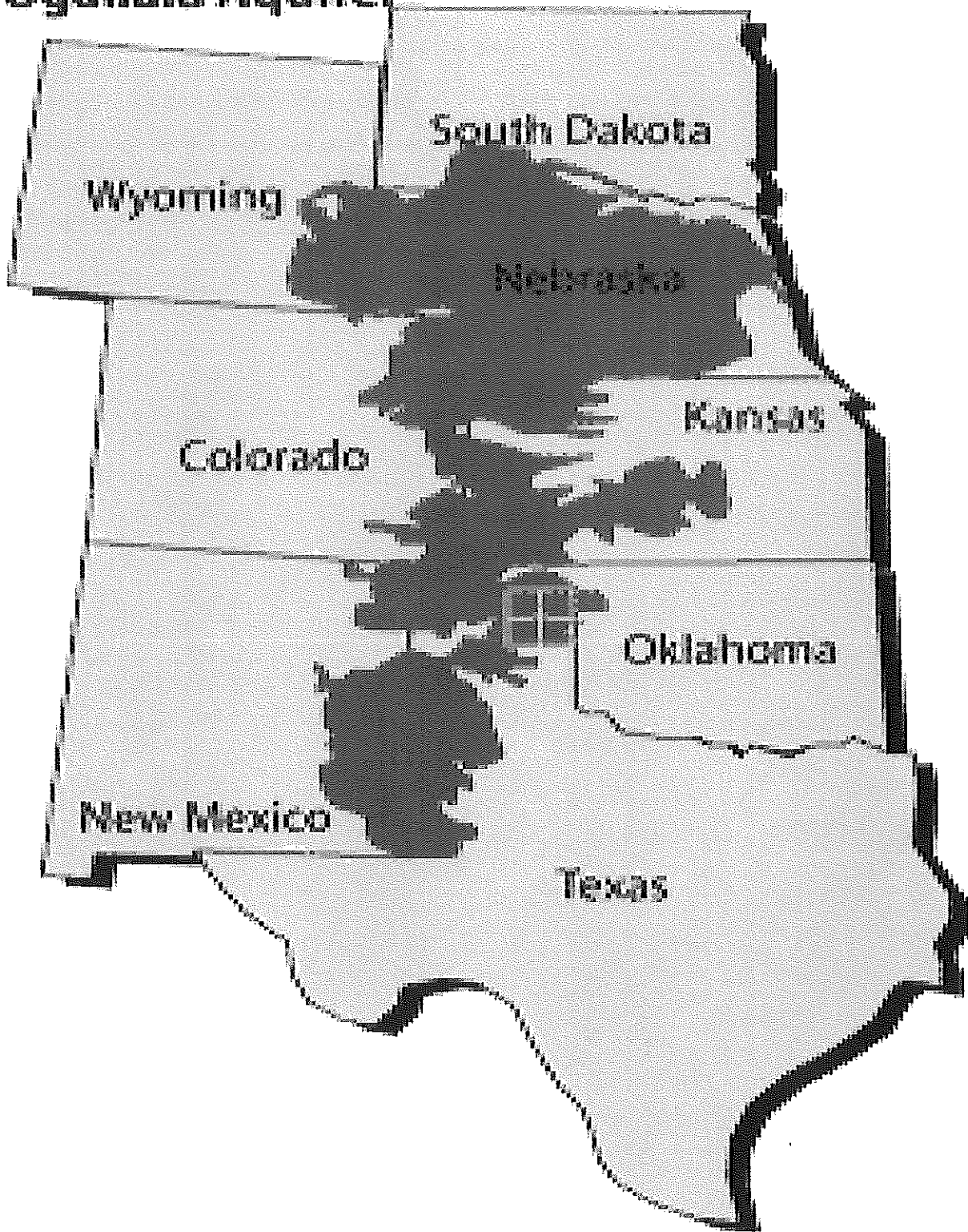


Image 5

23. In my opinion, the five images that appear on the preceding pages represent maps that an educated member of the public could easily find and reasonably rely upon while seeking out information about risks of groundwater contamination involving the Ogallala Aquifer. Those are not the only publicly available maps that depict the aquifer, however. Other recent maps of the Ogallala Aquifer prepared by TWDB do not show the Ogallala Aquifer underlying the Waste Control landfills in Andrews County.

24. At the time of the submission of the Waste Control application, the TCEQ team of which I was a member was aware, through TWDB maps and geological records on file with TCEQ and TWDB, that the Ogallala Aquifer was one of several aquifers in the immediate vicinity of, if not directly underneath, the proposed Waste Control disposal site in Andrews County. The Ogallala Aquifer is the largest aquifer in the United States. It is an important source of water for human consumption and agricultural uses. The TCEQ team headed by my fellow TCEQ employee Glenn Lewis noted throughout its review that Waste Control, as applicant, refused to reference the proximity of the Ogallala Aquifer. Instead, it referred to an aquifer called the OAG. The "O" in OAG means Ogallala.

25. On August 14, 2007, another TCEQ team evaluating a Waste Control application for a low level radioactive waste license headed by Glenn Lewis prepared a memorandum to Susan Jablonski, through Devane Clarke, Manager, RML Team. That memorandum formally advised TCEQ management of fatal flaws in the application (*i.e.*, the geology) that were deemed by the TCEQ team to be uncorrectable by special license conditions.

26. I reviewed Waste Control's application for a proposed radioactive byproduct waste facility license, License Application L-5807, immediately adjacent to the site of Waste Control's low level radioactive waste disposal facility site.

27. On August 31, 2007, I submitted my Final Technical Review report concerning Waste Control's application for a byproduct license to my superior, Susan Jablonski, Division Director, Radioactive Materials Division and to Gary Smith, Ph.D., Manager, Technical Assessments Group. A true and complete copy of that public record report, bearing my hand-drawn bracket, appears on the page below as **Image 6**.

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: WCS License L-6807 File **Date:** August 31, 2007

Thru: Susan Jablonski, P.E.
Division Director, Radioactive Materials Division

Gary Smith, Ph.D.
Manager, Technical Assessments Group

From: Patricia Bobeck, P.G.
Conrad Kuharic, P.G.

Subject: Final Technical Review: Geology/Hydrogeology Review of the Waste Control Specialists, LLC, Application for a License for a Byproduct Material Disposal Facility, Andrews County, Texas.

This final technical review (TR) was performed in accordance with the regulatory requirements of Title 25, Texas Administrative Code (TAC) §289.260; specifically the applicable portions of §289.260(c), Definitions, §289.260(f), Special requirements for a license application for uranium recovery and byproduct material disposal facilities, and §289.260(o) Technical Requirements.

The application is officially described as follows: Waste Control Specialists, 2007. Cover letter from D. Kunthro, WCS to G. Smith, TDSHS dated January 12, 2007, transmitting seven copies of Revision 13. Application was completely revised and updated, consisting of 15 binders (Volumes 1 through 12, and A, B, and C). Four minor revisions and an omission followed: Revision 14 - February 27, 2007; Revision 15 - May 4, 2007; Revision 16 - May 18, 2007; Revision 17 - June 4, 2007; a copy of omitted Table 3.1 - July 13, 2007, and a supplemental letter, dated August 23, 2007.

The Staff review of the license application as submitted and subsequently amended indicates that the application contains inconsistencies and contradictions and lack of detailed geologic data resulting in an incomplete geological characterization. In addition, hydrogeologic uncertainties and unknowns and modeling that shows water encroachment into the byproduct material landfill shows that the application lacks the requirements to demonstrate compliance with the rules of 25 TAC §289.260. Staff are unable, therefore, to state that the byproduct materials facility application complies with 25 TAC §289.252(e)(3).

The sources of most of the information in this final review include the applicant's original application and all subsequent revisions and amendments submitted in response to requests for information and clarification from the TDH/DSHS/TCEQ.

Image 6 – a true copy of my August 31, 2007 Final Technical Review

28. My August 31, 2007 Final Technical Review reflected my research and evaluation, as a professional geologist, which I performed as a part of my reporting duties as a state employee, concerning my review of a permit application where I made observations and conducted an investigation as authorized pursuant to my duty to report the truth under state law.

29. Based on my education, experience, training, and personal knowledge as a professional geologist, I believed then and I believe now that everything I wrote in that Final Technical Review was and is true, correct, and trustworthy. I recommended a denial of Waste Control's permit application because of shortcomings that could not be overcome. Whether or not the Ogallala Aquifer underlies the Waste Control landfills, it is still possible for water present in the Dockum Red Beds formation to encounter Ogallala Aquifer strata on the margins of the above-referenced ridge. If that happens, the water would flow more freely and farther in the Ogallala Aquifer than in the Dockum Red Bed.

30. When it became clear that TCEQ's management would approve Waste Control's application for a byproduct license, I resigned rather than continue working on this project.

31. I understand that Waste Control and its lawyers take the position that the site of its Andrews County ByProduct and Low Level Radioactive Waste facilities does not lie above or on top of the Ogallala Aquifer. Assuming this is true (for the purpose of this opinion I will assume it is), then the Waste Control facility is in close lateral proximity to the Ogallala Aquifer and other formations (Gatufia) that have served as aquifers. There is also a reasonable possibility that there may be vertical communication, because the above-cited Texas Water Development Board's Report 345, *Aquifers of Texas* (Austin: TWDB, Nov. 1995) states that, "Vertical hydrologic communication also occurs between the Ogallala and the underlying Cretaceous, Jurassic, and Triassic formations in many areas and between the overlying Quaternary Blackwater Draw Formation where present." *Id.*, p. 9, "Ogallala Aquifer," in the legend on the page after the Ogallala Aquifer map previously identified as **Image 1**. See <http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/R345%20Aquifers%20of%20Texas/R345Complete.pdf>, at the website PDF, p. 9.

32. The "OAG" (Ogallala, Antlers, and Gatufia Aquifer) I referred to in Paragraph 24 above involves three formations. The Antlers formation is of an age different from the Ogallala Aquifer and is part of the Trinity Group of Lower Cretaceous formations. Despite the age difference, the three formations are combined as "OAG" because all three formations are in lateral (sideways) proximity to each other and form a continuous hydrologic unit.

33. The site of the Waste Control Low-Level Radioactive Waste facility is in lateral proximity to the OAG formation. Whether any part of the OAG is saturated or unsaturated at any given time is of little importance because the OAG formation is capable of transporting fluid through rock strata (depending on rainfall and other conditions, the presence or absence of water in the OAG can change). If water can travel through the OAG formation, at any time and under any circumstances, then there is a danger that the water will carry radioactive contamination through the formation and into the water supply.

34. The eastern wall of Waste Control's Triassic red clay beds is highly faulted. These faults have the appearance of thrust faults because of the orientation of the fault planes as

they intersect the exposed wall of the landfill. These faults feature both Southwest and Northeast orientations and suggest that this ridge was under compression at least at the end of Triassic time. In short, the Triassic red clay beds that Waste Control claims to be stable, impermeable and continuous may not be.

35. A minor earthquake could cause earth movement along fault lines at the site of Waste Control's Andrews County low-level radioactive waste disposal facility. That could result in the movement of radioactively-contaminated water from the Waste Control site to the surrounding water tables.

36. Even Waste Control's application for a low-level radioactive waste license, as filed at TCEQ, reflects that the Triassic red clay beds beneath the Andrews County low-level radioactive waste facility resulted from geologic subsidence in the area beneath Waste Control's low-level radioactive waste facility. A true copy of Waste Control's "Attachment 2-2, Geology of WCS Facility, Andrews County, Texas 1996" exhibit to its Application to its license application, is attached as **Bobeck Exhibit 1**. It is a true copy of the original document found at the TCEQ "Waste Control Specialists LLC License Application for Low-Level Radioactive Waste Disposal" website, available at <http://www.urs-slc.com/wcs/>, at Volume 12, under "Attachment 2-2: Geology of WCS Facility, Andrews County, Texas 1996."

37. As reflected in the underlined portion of Attachment 2-2, the Waste Control document identified as "Geology of WCS Facility, Andrews County, Texas 1996" and now marked as **Bobeck Exhibit 1**, on page 2, states that,

"The ridge is at least in part a product of structural deformation, as underlying Triassic strata have subsided in response to dissolution of Permian salt beds to the south and west of the ridge, underlying the Monument Draw Trough, San Simon Swale, and Pecos River Valley [citations to scientific sources omitted]...In contrast, to the south and west of the ridge, dissolution of underlying Permian salt beds have resulted in deformation of the Triassic and Tertiary strata, and the High Plains surface has been locally disrupted by subsidence."

These statements reflect instances of geologic subsidence and disruption in the past. They could recur in the future. That subsidence and disruption may account for structural faulting of the kind observable to this day in the eastern wall of Waste Control's Triassic red clay beds.

38. This Attachment 2-2, Waste Control document identified as "Geology of WCS Facility, Andrews County, Texas 1996," now marked as **Bobeck Exhibit 1**, reflects a real risk of "hydraulic continuity," that is, transmission of water, between the formations of the Triassic Red Clay Bed and the Ogallala Aquifer formation, even if the Ogallala Aquifer does not extend directly beneath the Waste Control low-level radioactive waste facility:

"The usual identity of strata overlying the Triassic Red Bed Ridge, whether part of the Ogallala Formation, or Cretaceous strata (as at the WCS facility) probably has little bearing on the groundwater hydrology, because the Cretaceous strata are likely in hydraulic continuity with the overlying Ogallala Formation, and are together part of the High Plains Aquifer (e.g., Knowles et

al., 1984) [T. Knowles, P. Nordstrom, and W. B. Klemm, 1984, *Evaluating the ground-water resources of the High Plains of Texas*, Texas Dept. of Water Resources Report 288, vol. 4]....”

Bobeck Exhibit 1, at 8. If this Waste Control statement is correct and the “Cretaceous strata” beneath Waste Control’s low-level radioactive waste facility “are likely in hydraulic continuity” with the Ogallala Formation and the High Plains Aquifer, then radioactive contamination of water beneath or near the Waste Control facility could pass through that hydraulic continuity and contaminate groundwater outside of Waste Control’s facility. And that is one of the issues raised by Adam Greenwood and Save the Ogallala Aquifer Foundation.

39. As further reflected in the underlined portion of Attachment 2-2, the Waste Control document identified as “Geology of WCS Facility, Andrews County, Texas 1996,” now marked as **Bobeck Affidavit Exhibit 1**, geologists have had recent differences of opinion about the composition and extent of the Ogallala Aquifer at the site of Waste Control’s low-level radioactive waste facility in Andrews County. These differences in opinion reflect the difficulty of placing an accurate geological label on certain strata, as well as shifts of opinion reflecting evolving opinions and re-interpretations of geological data. That “Geology of WCS Facility, Andrews County, Texas 1996” report states as follows:

“Determining exactly where the Ogallala Formation ends by erosional truncation or pinching out is problematic. Water well driller’s logs in the area are not very useful in discriminating whether or not the Ogallala Formation is actually present, because in well cuttings the hard caliche layers (such as the “caprock caliche”) are difficult to distinguish from Cretaceous limestone beds (such as the Comanche Peak and Edwards Limestone), and the sand and gravel in the Ogallala Foundation are difficult to distinguish from basal Cretaceous deposits (Antlers Sandstone or “Trinity” sands).”

Bobeck Exhibit 1, p. 4 (emphasis supplied). If a determination of “exactly where the Ogallala Formation ends” is “problematic” and these two formations are “difficult to distinguish,” then reasonable minds can differ about the precise location of its boundary. On the next page, that report states that,

*“To the southwest of the ‘Red Bed Ridge,’ deposits in part equivalent in age to the Ogallala Formation are present, but these have been typically identified as ‘Cenozoic Basin Fill’ or Gatuna Formation...[citations to underlying sources omitted]. Some of these deposits have been mapped as Ogallala Formation (Nicholson & Clebsch, 1961 [A. Nicholson, Jr. & A. Clebsch, Jr., *Geology and ground-water conditions in southern Lea County, New Mexico* (New Mexico Bureau of Mines and Mineral Resources, Ground-Water Report 6, 123 pages, 1961).], shown as “To” on the Geologic Atlas of Texas, Hobbs Sheet, 1976), but may more logically be included with the Gatuna Formation, as suggested by Hawley (1993)....”*

Bobeck Exhibit 1, p. 5 (emphasis supplied). If “some of these deposits have been mapped as Ogallala Formation” by geologists, it seems unreasonable to insist that a non-geologist layman

would have to reject, out of hand, the idea that these same deposits might be a part of the Ogallala Formation. The authors' use of "may" reflects uncertainty about the characterization of these formations. On the next page, this same report states that,

"Overlying the red mudstone of the Dockum Group is 3 to 10 m. [meters] of friable sandy pebble conglomerate. *This unit was previously identified as the Ogallala Formation in the RCRA permit application* (AM Environmental, 1993) [AM Environmental, 1993. RCRA permit application for a hazardous waste storage, treatment, and disposal facility. Submitted to the Texas Natural Resource Conservation Commission]. ..."

Bobeck Exhibit 1, p. 6 (emphasis supplied).

40. Four years after the preparation of **Bobeck Exhibit 1**, Thomas H. Lehman, Ph.D. and Ken Rainwater, Ph.D, P.E. prepared another report, which Waste Control submitted as "Attachment 2-1, Geology of WCS – Flying 'W' Ranch, Andrews County, Texas, November 2000," to Waste Control's TCEQ low level radioactive waste disposal license application.

41. A true copy of that Waste Control Attachment 2-1, as found at the TCEQ "Waste Control Specialists LLC License Application for Low-Level Radioactive Waste Disposal" website, is attached as **Bobeck Exhibit 2**. It is available at <http://www.urs-slc.com/wcs/>, at Volume 12, under "Attachment 2-1: Geology of WCS – Flying 'W' Ranch, Andrews County, Texas, November 2000."

42. That "Attachment 2-1, Geology of WCS – Flying 'W' Ranch, Andrews County, Texas, November 2000," report states as follows:

"Determining exactly where the Ogallala Formation pinches out in Andrews County is problematic. Existing compilations of water well driller's logs in the area are not very useful in discriminating whether or not the Ogallala Formation is actually present, because in well cuttings the hard caliche layers (such as the "Caprock Caliche") are difficult to distinguish from Cretaceous limestone beds (such as the Comanche Peak and Edwards Limestone), and the sand and gravel in the Ogallala Foundation are difficult to distinguish from basal Cretaceous deposits (Antlers Sandstone or "Trinity" sands)."

Bobeck Exhibit 2, p. 19 (emphasis supplied). If a determination of "exactly where the Ogallala Formation pinches out" was still "problematic" when Waste Control filed its application, reasonable minds can differ about the precise location of the Ogallala Aquifer's boundary in Andrews County, Texas.

43. That same "Attachment 2-1, Geology of WCS – Flying 'W' Ranch, Andrews County, Texas, November 2000" report submitted by Waste Control to TCEQ contains statements that give rise to reasonable concerns about lateral hydraulic continuity on or in close interaction with Waste Control's low-level radioactive waste disposal facility. Such "hydraulic continuity" presents a risk of water-borne transmission of radioactive contamination. Under part "4.2 WCS – Flying 'W' Ranch," that Waste Control report states that:

"Similarly, it is not clear why the two areas where local groundwater occurs are not connected. The basal sand interval of the Antlers Formation is present continuously between the two areas (Figure 9), and elevations on the land surface, water table, and "red bed" surface suggest that lateral southeastward flow of ground-water could occur between the two areas (Figure 7). No barrier to lateral flow is apparent. Groundwater flowing southeastward from the northwestern area may be intercepted in the subsurface by a southwesterly-directed drainage (Section 16, Block A-29) to discharge at the land surface at Baker Spring (Figure 3)..."

Bobeck Exhibit 2, p. 18 (emphasis supplied).

44. Again, geology and hydrology are evolving sciences. A geologist's or hydrologist's reasonable, professional opinion about the identification of a geologic unit may change as additional information becomes available. When radioactive materials must be kept isolated from groundwater for tens of thousands of years, uncertainties should be resolved against risk-taking of the kind Waste Control has taken in its application for facilities permits in Andrews County, Texas.

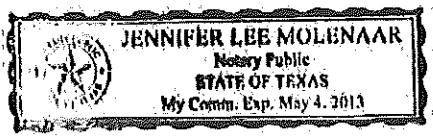
45. In my opinion as a geologist and a hydrologist, Adam Greenwood has legitimate scientific reasons to be concerned about (a) potential contamination of the Ogallala Aquifer from the disposal of byproduct material and low level radioactive waste at Waste Control's Andrews County facilities; (b) the extent of the Ogallala Aquifer and other water tables in Andrews County, whether they lie under or immediately adjacent to Waste Control's Andrews County byproduct and low level radioactive waste facilities, and the issue of lateral communication of water-borne radioactive contamination through them; and (c) the risk that the public, meaning the taxpayers of Andrews County and the State of Texas, could become financially responsible for closing, cleanup, and remediation costs resulting from operations of Waste Control's TCEQ-licensed facilities in Andrews County.

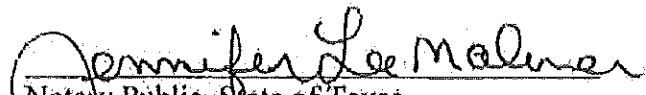
46. I have neither requested nor received an expert witness's fee or compensation of any kind for my work on this affidavit or for the time I devoted to discussing the facts of this case with Defendants' counsel David A. Furlow. Nor do I expect to receive any such compensation. I view myself as a witness with technical information and academic opinions, and not as a hired expert.



Patricia Bobeck

Subscribed and sworn to before me, the undersigned notary, on this 27th day of March, 2010





Notary Public, State of Texas