



Control Number: 48625



Item Number: 165

Addendum StartPage: 0

BEFORE THE
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SOAH DOCKET NO. 473-19-1445

2019 FEB 15 AM 9:07

PUC DOCKET NO. 48625

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JOINT APPLICATION OF SHARYLAND UTILITIES, L.P.
AND CITY OF LUBBOCK, ACTING BY AND THROUGH LUBBOCK POWER &
LIGHT, FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE
PROPOSED OGALLALA TO ABERNATHY 345-kV TRANSMISSION LINE IN
CASTRO, HALE, AND SWISHER COUNTIES, TEXAS

DIRECT TESTIMONY OF MARK TURNBOUGH, PhD

ON BEHALF OF:

David Pinkerton, Rhonda Pinkerton, The W E & L J Reeves Revocable Trust, Fred
Kanady III, and the Douglas & Glenda Goen Living Trust
(collectively referred to as the "Pinkerton Group");

Donald C. Ebeling, Jr., Donald C. Ebeling,
and Cynthia B. Ebeling (collectively referred to as "Ebeling");

Myrick Land & Cattle, LLC, JD Myrick, Freddie Sue Myrick, Coy Myrick, Gayla Myrick,
Triangle Cattle Co., Ltd., Cody Myrick, Cody Myrick Trust, Jerrod Hon, and Corrie Hon
(collectively referred to as "The Myrick Group");

Steven Higgins and MCH, Inc. (collectively referred to as "Higgins"); and

Legacy Dairy Farms, LLC, Heifer Ranch at Arroyo Seco, Ltd., and LDT Lands, LLC

AND

Route 19 Proponents

FEBRUARY 14, 2019

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ATTACHMENT

Attachment MT-1 Resume

1 **I. INTRODUCTION**

2
3 **Q. PLEASE STATE YOUR NAME.**

4 A. My name is Mark Turnbough.

5
6 **Q. WHAT IS YOUR OCCUPATION?**

7 A. I am an environmental / land use and regulatory consultant.

8
9 **Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS**
10 **PROCEEDING?**

11 A. I am testifying on behalf of David Pinkerton, Rhonda Pinkerton, The W E & L J
12 Reeves Revocable Trust, Fred Kanady III, the Douglas & Glenda Goen Living Trust,
13 Donald C. Ebeling, Jr., Donald C. Ebeling, and Cynthia B. Ebeling, Myrick Land & Cattle,
14 LLC, JD Myrick, Freddie Sue Myrick, Coy Myrick, Gayla Myrick, Triangle Cattle Co.,
15 Ltd., Cody Myrick, Cody Myrick Trust, Jerrod Hon, Corrie Hon, Steven Higgins, MCH,
16 Inc., Legacy Dairy Farms, LLC, Heifer Ranch at Arroyo Seco, Ltd., and LDT Lands, LLC.
17 I am also testifying on behalf of the aligned group: Route 19 Proponents.

18
19 **Q. PLEASE DESCRIBE THE DISCIPLINARY AREAS IN WHICH YOU PROVIDE**
20 **CONSULTING SERVICES.**

21 A. A significant amount of my work deals with site suitability analysis and regulatory
22 permitting. Most of that work is related to land use analysis, facility permitting and
23 compliance, environmental assessment, statistical analysis, regulatory impact assessment,

1 policy analysis, water resource protection and multi-disciplinary project management.
2 Attachment MT-1 contains my resume.

3
4 **Q. HOW LONG HAVE YOU WORKED AS AN ENVIRONMENTAL**
5 **CONSULTANT?**

6 A. Thirty-six years.

7
8 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
9 **QUALIFICATIONS AS WELL AS YOUR CONSULTING EXPERIENCE.**

10 A. I received a PhD from Texas Tech University in 1985 in Systems Theory and
11 Environmental Policy. My dissertation focused on environmental resources management.
12 I have undergraduate and masters degrees from Texas Tech in Anthropology/Sociology
13 with a specialization in the statistical analysis of quantitative indicators.

14 I have had significant participation in well over 150 projects. During the past 36
15 years, I have participated in the preparation of over 100 technical papers and reports for
16 clients in the public and private sectors. I am a regulatory and systems consultant to
17 Nuclear Waste Partnership, LLC (NWP) which manages the DOE's Waste Isolation Pilot
18 Plant located in southeastern New Mexico. From 2007 until October 2014, I was also a
19 regulatory consultant to the operator of Los Alamos National Laboratory, Los Alamos
20 National Security, LLC.

21 In the mid-1980's I participated in several transmission line projects as an employee
22 of Espey, Huston & Associates in Austin, Texas. I worked with a multi-disciplinary team,
23 including Rob Reed, Charles Jasper, Tom VanZandt, Sandy Hicks, George Vaught, and

1 Wayne Glander, which developed a set of criteria that could be applied to the evaluation
2 of potential impacts that would result from placement of an electric transmission line in
3 any given location. These criteria included land use impact variables, environmental
4 impact variables, archaeological/historical impact variables, competing electrical
5 infrastructure variables, and esthetics considerations. These criteria were adapted from
6 environmental impact assessments conducted by Espey Huston teams for various projects.
7 They pre-date the establishment of statutory requirements in PURA and the current P.U.C.
8 Substantive Rule for siting electric transmission lines. However, variations of these
9 original criteria are widely used today as a means for evaluating compliance with PURA
10 and the P.U.C. Substantive Rule. Some of the individuals on that original team have
11 continued to do work in this area.

12 From 2004 to the present, I have been retained to evaluate proposed transmission
13 line projects in 20 PUC cases including the one pending in this matter. (PUC Docket
14 Numbers 29684, 37448, 38140, 38230, 38324, 38597, 38877, 40319, 40728, 41756, 41718,
15 42087, 42729, 43599, 43878, 44837, 46234, 48358, and 48785) In a relatively recent case,
16 PUC Docket No. 44837, which involved an AEP application to route a 345-KV electric
17 transmission line in south central Texas across remnants of the Coastal Prairie, the ALJs
18 and the PUC cited my testimony as a basis for selecting an alternative route other than the
19 one proposed by AEP and Power Engineers.

20 I continue to be very active in site selection, site suitability analysis and related land
21 use analyses for complex non-linear siting efforts. For example, in 2006 I was selected by
22 the French nuclear power company AREVA and the Washington Group International (now
23 known as AECOM URS) to manage the characterization of and selection of a site for the

1 U.S. Department of Energy’s Global Nuclear Energy Partnership (GNEP) that would be
2 suitable for a Consolidated Interim Storage Facility for High Level Radioactive Waste, a
3 Spent Fuel Reprocessing Facility and a Next Generation Nuclear Reactor. A suitable
4 “greenfield” site was selected and fully characterized for the GNEP in southeastern New
5 Mexico. It received the highest level of DOE funding for any of the alternatives under
6 consideration.

7 Beginning in March of 2011, I was heavily involved as the senior regulatory adviser
8 in the re-permitting of the DOE Waste Isolation Pilot Plant (WIPP), the only deep geologic
9 repository for Defense Related Transuranic Waste in the world.

10 In January of 2012, I was retained by the New Mexico State Land Commission as
11 an expert witness for the Commission in a contamination remediation and ranch land
12 restoration case (Ray Powell, Commissioner of Public Lands of the State of New Mexico
13 vs. Equity Investments Corp, et al (No. D-101-CV-2011-01285, First Judicial District
14 Court, State of New Mexico)).

15 In April of 2014, I was selected by AECOM URS, Babcock & Wilcox and AREVA
16 to be on a six-person team to review and provide guidance on the Recovery Plan of the
17 DOE WIPP. The facility was shut down in February of 2014 by a radiation leak caused by
18 a drum sent by Los Alamos National Laboratory for disposal. The WIPP was officially re-
19 opened for disposal operations in January of 2017.

20 From 1991 to the present, I have managed or participated in the permitting of over
21 70 percent of the total disposal capacity of Sub-Title D facilities for solid waste in the state
22 of New Mexico. In that context, my work consists of assisting applicants in locating

1 suitable sites, securing regulatory approval of those projects, and then maintaining
2 compliance with applicable regulatory frameworks.

3 I managed the application process for the first “Rule 36” facility permitted by the
4 New Mexico Oil Conservation Division (OCD) for the processing and disposal of waste
5 generated by the exploration for and production (E&P) of oil and gas. The permit was
6 issued in December of 2014, and it is the first full service facility permitted under the
7 Division’s “new” rule which was promulgated in 2008. Presently, I am managing the
8 application processes for several other OCD Rule 36 E&P disposal facilities and several
9 water rights acquisition projects in southeastern New Mexico.

10 In April of this year, I was retained by the Edwards Aquifer Authority (EAA) to
11 provide technical and regulatory expertise in the development of an extensive land use and
12 socioeconomic data base for Bexar, Medina and Uvalde Counties.

13 Currently I am managing the site suitability analysis and permitting of a large
14 multipurpose recycling and industrial solid waste disposal facility for Envirolands, LLC in
15 Albuquerque, New Mexico.

17 **II. PURPOSE OF TESTIMONY**

19 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

20 A. The purpose of my testimony is to provide an evaluation of the methodology,
21 findings, and recommendations of Sharyland Utilities, LP (Sharyland) and City of Lubbock
22 through Lubbock Power and Light (LP&L) based on the Environmental Assessment and
23 Alternative Route Analysis (EA) conducted by Power Engineers (Power) for a 345-KV

1 Transmission Line Project (Ogallala to Abernathy) in Castro, Hale, and Swisher Counties,
2 Texas. The purpose of the project is to connect a portion of the LP&L system with the
3 Electric Reliability Council of Texas (ERCOT) for the integration of LP&L into the
4 ERCOT system. Sharyland and LP&L have agreed that Sharyland will construct and
5 operate the transmission line proposed in this application, however due to the nature of the
6 project, Sharyland and LP&L are filing jointly. The proposed line would connect the
7 Ogallala Station in southeastern Castro County to the Abernathy Station in southcentral
8 Hale County. In general, my scope of work in this case focuses on an evaluation of
9 alternative routes identified by Power for consideration under PURA and the PUC
10 Substantive Rule.

11 In large part my analysis is based on data provided in the Sharyland / LP&L
12 Application and Power's EA supporting development of a proposed transmission line and
13 the qualities of each alternative route as they relate to criteria established by statute and
14 Public Utility Commission (PUC or Commission) rules. Typically, I evaluate alternative
15 routes in terms of the relevant statutory and regulatory parameters and in terms of how well
16 each route would serve the established need supporting development of the transmission
17 line. My background in systems engineering, regulatory consulting, and other multi-
18 disciplinary fields supporting the analysis of specific land uses is applicable to much of the
19 work that goes into these kinds of projects.

20
21 **Q. WAS YOUR TESTIMONY AND SUPPORTING DOCUMENTATION PREPARED**
22 **BY YOU OR UNDER YOUR SUPERVISION?**

23 A. Yes.

1 **Q. IS THE INFORMATION CONTAINED IN YOUR TESTIMONY AND THE**
2 **SUPPORTING DOCUMENTATION TRUE AND CORRECT TO THE BEST OF**
3 **YOUR KNOWLEDGE AND BELIEF?**

4 A. Yes.

5

6 **Q. WHY DID YOU PREPARE AN EVALUATION OF THE POWER EA AND**
7 **SHARYLAND / LP&L SELECTION OF ROUTE 4 AS THE ROUTE THAT THEY**
8 **BELIEVE BEST ADDRESSES THE REQUIREMENTS OF PURA AND THE PUC**
9 **SUBSTANTIVE RULE FOR THIS PROJECT?**

10 A. Zach Brady, an attorney with the firm Brady & Hamilton, LLP, retained me on
11 behalf of the twenty clients identified initially in this submission to evaluate the methods
12 and the results of the EA used by Sharyland / LP&L to select Route 4 as the route that was
13 thought to best meet the requirements of PURA and the PUB Substantive Rule. In addition,
14 I was asked to evaluate the potential land use and environmental impacts of the remaining
15 primary alternative routes in order to determine if a potentially more suitable alternative
16 route could be identified. I was also asked to evaluate the application of Power's criteria
17 in the generation of 24 alternative routes.

18

19 **Q. PLEASE DESCRIBE THE STEPS TAKEN TO PREPARE YOUR EVALUATION.**

20 A. I took the following steps:

- 21 • The first task was to review applicable statutory and regulatory requirements for
22 development of suitable routes.
- 23 • The second task was to review Sharyland / LP&L's CCN Application in this

1 proceeding, including the EA prepared by Power.

- 2 • The third task was to review Sharyland / LP&L / Power testimony in support of the
3 CCN that would help me understand Sharyland / LP&L's decision to select Route 4.
- 4 • The fourth task involved the evaluation of the validity of selected aspects including
5 scoping issues for the EA, the analysis that was reported in the EA, and Sharyland /
6 LP&L's responses to requests for information from other parties.
- 7 • The fifth task involved review of testimony and comments provided by interested
8 parties regarding the decision by Sharyland / LP&L to select Route 4, including Texas
9 Parks & Wildlife comment dated November 9, 2018.
- 10 • Given the information I gathered from the preceding steps, I evaluated the potential
11 impact (in terms of requirements contained in PURA and the PUC Substantive Rule)
12 on the area affected by the proposed placement of Route 4.
- 13 • Finally, I conducted a reconnaissance of the Ogallala to Abernathy Study Area and of
14 the alternative routes proposed for consideration by Power in their EA. I conducted
15 the reconnaissance on December 11 and 12, 2018.

16
17 **III. FINDINGS REGARDING SHARYLAND / LP&L / POWER EA**

18
19 **Q. PLEASE DESCRIBE THE BASIS OF AND METHODOLOGY DEVELOPED FOR**
20 **CONDUCTING THE EVALUATION OF THE EA.**

21 A. The primary basis for evaluating the EA was to review the aerial photography,
22 mapping, and data collected, and compared to the 44 siting criteria depicted in Power's
23 Table 4-1, Environmental Data for Route Evaluation (Routes) and Table 4-2,

1 Environmental Data for Route Evaluation (Segments). I also reviewed estimated costs of
2 alternative routes prepared by Sharyland / LP&L. In addition, I reviewed documentation
3 (Mapping and Tabular Descriptions) of Habitable Structures within 500 feet of the
4 centerline of proposed alternative routes. Further, I reviewed verbal descriptions of
5 segments generated by Power.

6 Using those data, I compared the land use environmental and aesthetic data for
7 Route 4 and the remaining alternative routes.

8
9 **Q. WHAT CRITERIA DID THE POWER STUDY USE TO DETERMINE THE**
10 **ROUTE THAT BEST MEETS THE REQUIREMENTS OF PURA AND THE PUC**
11 **SUBSTANTIVE RULE?**

12 A. As indicated above, Power used 44 criteria in order to provide comparisons of the
13 alternative routes. In many respects, these criteria systematically “operationalize” the
14 broader requirements of the PUC Substantive Rule and PURA. For example, they estimate
15 total length of the proposed alternative routes which roughly correlates to cost, if
16 topographic changes along the proposed alignment are not significant and other
17 geotechnical issues are unremarkable. Depending on the fact pattern in a given study area,
18 it is not unreasonable to assume that arguments for the protection of environmentally
19 sensitive areas and, in this case, specifically delineated irrigated farming tracts can be
20 compatible with objectives expressed by utilities for selecting routes that may be shorter
21 and less expensive than some of the alternatives. In this instance, however, it can be argued
22 that protecting the land use (irrigation intensive agriculture) / environmental resources /
23 esthetics / and cultural resources that characterize the overall Study Area correspond with

1 a reasoned argument for not simply selecting one of the shortest and least expensive routes,
2 but perhaps one of the other relatively short routes from among the 24 alternatives that best
3 meets the requirements of PURA and the PUC Substantive Rule.
4

5 **Q. PLEASE DESCRIBE THE GENERAL CHARACTERISTICS OF THE**
6 **OGALLALA TO ABERNATHY STUDY AREA.**

7 A. The Study Area for the proposed Ogallala to Abernathy Project is an approximately
8 1,002 square mile roughly rectangular polygon located in southeastern Castro County,
9 southwestern Swisher County, and western Hale County, Texas. The Study Area is
10 approximately 50.2 miles long (along the north / south axis) and approximately 21.4 miles
11 wide (along the east / west axis). The Study Area is large enough to accommodate the
12 identification of geographically diverse routes proposed to connect the existing project end
13 points. The Study Area appears to have been defined in order to utilize existing
14 transmission line, highways, county roads, and apparent property lines as well as existing
15 land uses and cultural features in order to provide for an adequate number and distribution
16 of primary alternative routes. The analysis conducted by Power provides for the
17 delineation of 24 alternative routes consisting of 65 primary segments. The analysis
18 provides adequate geographic distribution of segments / routes along meaningful land use
19 boundaries and features in the area.

20 According to information reported in the Power EA, the Study Area is located in
21 the southern High Plains area of the High Plains Physiographic Region of Texas.
22 Generally, the region is described as relatively flat with playa lakes and isolated sand dune
23 fields. Typically, elevations in the southern High Plains Region range from approximately

1 2,200 feet to approximately 3,900 feet above sea level. With regard to the Study Area,
2 itself, elevations range between 3,200 feet in the breaks and canyons located in the northern
3 portion of the Study Area to slightly more than 3,900 feet in the western portion.

4 According to data reported in the EA, surficial units in the area are essentially
5 comprised of Quaternary-aged Black Water Draw Formation, and windblown silts, and
6 shallow sand strata. The region is typically underlain by Tertiary-aged Ogallala Formation
7 and Quaternary-aged Playa Deposits. The Ogallala Formation is part of an extensive fresh
8 water aquifer system that extends from the southern High Plains of Texas to the Dakotas.
9 It is the primary source of water for intensive irrigation practices in the Study Area.

10 Land use in the Study Area consists primarily of irrigated agriculture, animal
11 agriculture, and related agribusiness activities. According to data reported in the EA, the
12 total market value for agriculture products in the Castro, Swisher, and Hale County area
13 was approximately \$2.3 billion in 2012. Livestock sales continued to account for a
14 majority of the agriculture income in the Study Area. However, the predominant land use
15 in the Study Area is irrigated farming. A large percentage of crops grown in the area are
16 utilized as feed for the livestock operations.

17 Communities located completely or partially inside the Study Area are identified
18 here from north to south. The community of Tulia, population 4,771, is situated in the
19 northeast corner of the Study Area in Swisher County. Also, in the north half of the Study
20 Area, in Castro County, the community of Hart, population 1,114, is located inside and
21 adjacent to the western edge of the Study Area boundary just north of State Highway 51.
22 The eastern boundary of the Study Area runs through the western one-third of the
23 community of Kress, population 703, located in Swisher County. The far western edge of

1 Plainview, population 21,305, in Hale County is inside the eastern boundary of the Study
2 Area. Hale Center, population 2,156, is situated in the southeastern portion of the Study
3 Area in central Hale County. None of the communities identified are directly affected by
4 potential alternative routes identified in the Power EA. Interstate 27 runs through the
5 eastern portion of the Study Area subparallel to the eastern boundary of the area.
6

7 **IV. FINDINGS REGARDING ALTERNATIVE ROUTES**
8

9 **Q. IN YOUR ANALYSIS DID YOU COMPARE OTHER ALTERNATIVE ROUTES**
10 **TO ROUTE 4 IDENTIFIED BY SHARYLAND / LP&L / POWER?**

11 A. Yes.
12

13 **Q. WOULD YOU PLEASE DESCRIBE THAT COMPARISON?**

14 A. In a general sense, as previously indicated, I compared all 24 alternative routes
15 using the 44 criteria applied by Power, and using considerations unique to the Sharyland /
16 LP&L analysis. The results of my analysis concur with the applicants' and their
17 contractor's assessment that all 24 alternative routes meet the requirements of PURA and
18 the PUC Substantive Rule.
19

20 **Q. PLEASE EXPLAIN THE RELEVANT LAND USE, ENVIRONMENTAL AND**
21 **COMMUNITY VALUES CONSIDERATIONS.**

22 A. Based on my analysis, however, Route 4 is not the route that best meets the
23 requirements of PURA and the PUC Substantive Rule. One of the primary reasons for that

1 determination is based on an apparent disregard for the primary land use consideration in
2 the Study Area. Inspection of Power Figure 3-2, Primary Alternative Segments with
3 Environmental and Land Use Constraints Sheets 1 and 2, indicates that the vast majority
4 of the land use, with the exception of the communities identified, is dedicated to intensive
5 irrigated agriculture. Farms developed with traveling irrigation equipment require
6 extensive and strategic development of the water delivery infrastructure in order to
7 maximize irrigated acreage for cultivated crop land. Although Power cites the length Route
8 4 crosses non-irrigated crop land as a positive attribute, inspection of Power Table 4-1
9 indicates that Route 4 ranks at the bottom of the list (for negative impact) of alternative
10 routes (23rd of 24) for the greatest length of ROW through land irrigated by traveling
11 systems (criteria No. 13). Placement of transmission line structures across irrigated farm
12 land is disruptive and very difficult to accommodate with center pivot irrigation systems.
13 Moreover, with regard to the negative impact on water well locations by the placement of
14 a route (criteria No. 26 on Table 4-1), Route 4 is tied for the second highest number of
15 existing water wells within 200 feet of the route centerline.

16 In addition, with regard to a related issue, Route 4 utilizes one of the shortest total
17 length configurations along apparent property lines. In fact, only two routes, alternative
18 Routes 9 and 11, utilize less distance along property lines in the Study Area. Utilization
19 of property lines for potential transmission line ROW in an area characterized by intense
20 irrigated agricultural practices tends to assure a limited impact on existing center pivot
21 irrigation systems that are placed within existing property boundaries. To reiterate the
22 point, with regard to irrigated farms, recognition of property boundaries is essential to the
23 protection of expensive irrigation infrastructure placed within those boundaries.

1 It is important to place this discussion of paralleling apparent property lines in the
2 context of the hierarchy evident in the screening process used by Power with regard to
3 placement of routes (segments) parallel to existing compatible ROW. The framework in
4 PURA and the PUC Substantive Rule is roughly the basis of the following hierarchy:

- 5 1. Length of route utilizing existing electric transmission line ROW
- 6 2. Length of route parallel to existing transmission line ROW
- 7 3. Length of route parallel to other existing compatible ROW (highways,
8 roads, railways, etc)
- 9 4. Length of route parallel to apparent property lines
- 10 5. Length of route parallel to pipeline ROW (Note that this criterion is viewed
11 less favorably than the first four criteria, but it has not yet been characterized
12 as a uniformly negative factor.)

13 With regard to the first criterion, none of the alternative routes utilize existing
14 transmission line ROW.

15 With regard to the second criterion, Route 4 runs parallel to existing transmission
16 line ROW for only approximately 1.4 miles, whereas Route 19 runs parallel to existing
17 transmission line ROW for approximately 6.5 miles

18 With regard to the third criterion, Route 4 runs parallel to other existing compatible
19 ROW for approximately 47.3 miles, whereas Route 19 runs parallel to compatible ROW
20 for approximately 28.2 miles

21 The difference between Route 4 and Route 19 in the third criterion is more than
22 offset (given the uniformity of land use constraints in the Study Area-center pivot irrigation
23 of crop land) in the fourth criterion where Route 4 runs parallel to only approximately 5.2

1 miles of apparent property lines, as opposed to Route 19 which runs parallel to property
2 lines for approximately 20.1 miles

3 • POWER's analysis, as stated in footnote 3 on Table 4-1 in the EA states
4 that "Apparent property lines created by existing roads, highways, or railroad
5 ROWs are not "double counted" in the length of ROW parallel to apparent property
6 lines criterion."

7 • The premise of the footnote is incorrect in this respect; for the most part,
8 roads, highways and railroad ROWs do not create apparent property lines. They
9 tend to reflect apparent property lines.

10 • The upshot to these observations is that it is important to note that all of the
11 alternative routes in the Study Area were subjected to the same analytic hierarchy
12 as was Route 4. However, significant differences in the length of apparent property
13 lines used in the various route configurations resulted from decisions made by
14 POWER's technical staff to discount one of the most important land use criterion
15 of the Table 4-1 data set (length of route through land irrigated by traveling
16 irrigation systems (rolling or pivot type)) For example, Route 4 runs across
17 approximately 12.4 miles of land in this category, whereas Route 19 crosses only 7
18 miles of land irrigated by traveling systems.

19 • Consequently, if Route 4 had been structured to avoid crossing 12.4 miles
20 of land irrigated by center pivot irrigation systems by using apparent property lines,
21 then its length paralleling property lines would have increased to at least 17.6 miles,
22 and probably more.

23 • In this context, decisions to parallel other compatible ROW need to be

1 conditioned by the rationale for protecting ubiquitous and expensive infrastructure
2 associated with the predominant land use in the Study area.

3 With regard to other criteria, according to data in Power Table 4-1, Route 4 is tied
4 with six other routes for the greatest distance (most negative impact) estimated for the
5 length of ROW within the foreground visual zone of parks and/or recreational areas
6 (criteria No. 30). In the summary of attributes for Route 4 on page 138 of the Power EA,
7 it states incorrectly that it has no estimated length of ROW within foreground visual zone
8 of parks and/or recreational areas. The error is repeated in Gary McClanahan's Direct
9 Testimony on page 14, lines 26-30. In an area characterized by intensive irrigated
10 agriculture and related agricultural enterprises e.g., concentrated animal feeding
11 operations, the existence of parks and/or recreation areas is typically in short supply.
12 Consequently, in terms of generic notions of respecting community values, it would seem
13 to be prudent to minimize potential impacts to scarce resources.

14
15 **Q. IN YOUR EVALUATION DID YOU REVIEW THE LETTER DATED**
16 **NOVEMBER 9, 2018, FROM THE TEXAS PARKS' AND WILDLIFE**
17 **DEPARTMENT (TPWD) TO KAREN HUBBARD, PUC STAFF, RE: FINDINGS**
18 **AND RECOMMENDATIONS FOR THIS PUC DOCKET NO.?**

19 A. Yes.

20
21 **Q. PLEASE SUMMARIZE YOUR REACTION TO THE TPWD POSITION RE:**
22 **ROUTE SELECTION IN THIS CASE.**

23 A. I concur with the decision of TPWD not to recommend Route 4 as having the least potential

1 impact to fish and wildlife resources.

2
3 **Q. IN YOUR OPINION, WHICH OF THE 24 PRIMARY ALTERNATIVE ROUTES**
4 **BEST MEET THE REQUIREMENTS OF PURA AND THE PUC SUBSTANTIVE**
5 **RULES?**

6 A. Based on my review of the Sharyland / LP&L CCN Application, the Power EA,
7 and Testimony regarding characteristics of the alternative routes, I believe that Route 19
8 best meets the requirements of PURA and the PUC Substantive Rule. Although Route 19
9 is not the shortest of the 24 alternative routes with a total estimated ROW length of 60.3
10 miles, it is my opinion that total length, given the land use context in this Study Area, does
11 not materially affect its ranking among the alternative routes. It is only 2.4 miles longer
12 than Route 4. (Route 4 is 57.9 miles vs. Route 19 which is 60.3 miles.) The average length
13 of the 24 alternative routes is 59.23 miles. The shortest route of the set is 55.8 miles and
14 the longest route is 65.6 miles. The standard deviation for the average length of the 24
15 alternative routes is 2.21 miles. Route 4 and Route 19 are both inside that range.

16 With regard to Prudent Avoidance issues, Route 4 has thirteen habitable structures
17 within 500 feet of the centerline of its ROW, whereas Route 19 has fourteen habitable
18 structures within 500 feet of its centerline. It is worth noting here that both routes have the
19 same number of single-family residences (thirteen). Also, if one assumes that the
20 magnitude of an electromagnetic field decreases with an increase in distance from the
21 source, then Route 19 is nominally better with regard to compliance with the policy of
22 Prudent Avoidance than Route 4. The average distance of the thirteen Habitable Structures
23 (all single-family residences) from the centerline for Route 4 is 258.4 feet, and the median

1 distance is 203 feet. For Route 19, the average distance of the fourteen Habitable Structures
2 (thirteen single family residences and one commercial structure) is 264 feet, and the median
3 distance is 241 feet.

4 The point worth making here is that over the length of the respective two routes,
5 virtually the same level of Prudent Avoidance is achieved.

6 As indicated above, with regard to lengths parallel to compatible features, Route 19
7 has approximately 20.1 miles of length parallel to apparent property lines, whereas Route
8 4 has only 5.2 miles of length paralleling apparent property lines. The point made on pages
9 17,18 and 19 of my testimony regarding the need to use apparent property lines for ROW
10 alignment in areas characterized by intensive irrigated agriculture is reiterated here.
11 Consequently, it follows that Route 19 is inherently less disruptive of existing and future
12 irrigated agriculture (using traveling systems) than Route 4.

13 Again, with regard to length parallel to existing electric transmission line ROW,
14 Route 19 has 6.5 miles, whereas Route 4 only has 1.2 miles of length running parallel to
15 existing electric transmission line ROW.

16 In terms of total length parallel to compatible linear features, Route 4 has
17 approximately 53.7 miles which is 92.75 percent of its total length, whereas Route 19 has
18 54.8 miles of length parallel to compatible linear features which represents 91 percent of
19 its total length. Given the relative importance of utilizing apparent property boundaries in
20 this type of land use setting and the large disparity between Route 4 and Route 19 in
21 paralleling existing transmission line ROW, the minor difference in total length of all
22 paralleling features combined is not a very precise discriminator for identifying the route
23 that best meets the requirements of PURA and the PUC Substantive Rule.

1 With regard to placement of other facilities in proximity to the two routes, Route
2 19 has no electronic installations within 2000 feet of the route centerline (criteria No. 25),
3 whereas Route 4 4 has one installation within 2000 feet.

4 Other considerations include:

- 5 • Route 19 is tied with Route 4 and several other routes for the number of
6 interstate highway, U.S. highway, or state highway crossings at seven.
- 7 • Route 19 has seven crossings of ranch to market and farm to market road
8 crossings, whereas Route 4 has six.
- 9 • Route 19 is tied with Route 4 for length of ROW through upland or
10 bottomland and/or riparian woodlands at zero miles.
- 11 • Route 19 is tied with Route 4 and twenty other routes with having zero miles
12 across open water (lakes and ponds).
- 13 • Route 19 is tied with Route 4 with zero recorded historic or prehistoric sites
14 crossed by or within 1,000 feet of the route.
- 15 • Neither Route 19 nor any of the other alternative routes, including Route 4
16 crosses or run within 1,000 feet of any parks and/or recreational areas.
- 17 • Neither Route 19 nor any of the other alternative routes, including Route 4
18 has an FAA registered airport within 10,000 of the route centerline.
- 19 • Neither Route 19 nor any of the other alternative routes, including Route 4
20 has any heliports within 5,000 feet of the route centerline.
- 21 • Neither Route 19 nor any of the other alternative routes, including Route 4
22 has any commercial AM radio transmitters within 10,000 of the route centerline.
- 23 • Neither Route 19 nor any of the other alternative routes, including Route 4

1 has any existing oil and gas wells within 200 feet of the route centerline.

2 • Neither Route 19 nor any of the other alternative routes, including Route 4
3 has any length of ROW across any known habitat of federally listed endangered or
4 threatened species.

5 • Neither Route 19 nor any other alternative route, including Route 4 has any
6 NRHP-listed or determined eligible sites crossed by or within 1,000 feet of the route
7 centerline.

8 • As indicated above, unlike Route 4, Route 19 has zero length of ROW
9 within the foreground visual zone of parks and/or recreational areas. According to
10 Power Table 4-1, Route 4 is tied with six other routes for the greatest estimated
11 length within the foreground visual zone or parks or recreational areas.

12 Although Gary McClanahan (Power) indicates in his Direct Testimony (page 18,
13 lines 11-16) that land owner specific concerns do not have more relative weight regarding
14 the proximity to an alternative route than any other expressed concerns of land owners
15 potentially affected by other alignments, I think it is relevant to include a statement of
16 concern by Coy Myrick whose residence and agricultural operations are directly affected
17 by the decision of Sharyland / LP&L to select Route 4. In part, he states the following:

18 “County Road 528 in Castro County, Texas is one of the heaviest travelled
19 roads in the County from FM 928 to Highway 194. Both my residence and
20 headquarters for my farming and cattle operation are located on that road
21 which is the proposed route for the electricity line. Construction of that line
22 beside my home and headquarters will force me to travel, work and live by
23 that line 24 hours a day, seven days a week. It concerns me that my 23

1 employees and I will be forced to travel and work near the line on a daily
2 basis. Because County Road 528 is the only improved road providing
3 access to the headquarters and feed yard, it is the route by which I receive
4 commodities, cattle, and other deliveries via semi-trucks on a daily basis,
5 with an average of 90 loads per week. Construction of the electricity line
6 along County Road 528 will impact seven residences located in close
7 proximity to the road, a large feed yard, and a private airport and aerial
8 spraying location along a short, 5½ mile portion of the line.”
9

10 Mr. Myrick’s narrative essentially describes a fact pattern in which there is
11 evidence of a disproportionate negative impact registered on individuals who live and work
12 adjacent to a 5½ mile section (part of Segment 28, all of Segment 39, and part of Segment
13 51) of Route 4.
14

15 V. CONCLUSIONS

16

17 Q. WHAT CONCLUSIONS HAVE YOU DRAWN FROM YOUR ANALYSIS?

18 A. Based on my review of the Sharyland / LP&L Application for a CCN and the
19 supporting documents provided by Power in the EA, there is adequate information to reach
20 an informed conclusion regarding the suitability of the primary alternative segments and
21 the primary alternative routes. The Study Area is sufficiently large to accommodate the
22 delineation of a geographically reasonable distribution of alternative routes for connecting
23 the Ogallala and the Abernathy Stations. There are systematic comparisons of the 24

1 primary alternative routes across 44 environmental, land use, aesthetic, and cultural
2 resource variables. These comparisons indicate that all 24 alternative routes meet the
3 requirements of PURA and the PUC Substantive Rule.

4 However, consideration of those variables (including the considerable importance of
5 land use constraints in the Study Area) makes it possible to identify Route 19 as relatively
6 more likely than Route 4 to best meet the requirements of PURA and the PUC Substantive
7 Rule.

8 9 **VI. RECOMMENDATION**

10 11 **Q. WHAT IS YOUR RECOMMENDATION WITH REGARD TO ROUTE 19?**

12 A. It is my recommendation that the ALJ and the PUC Commissioners in this case
13 adopt Route 19 as opposed to Route 4 as the route that best meets the requirements of
14 PURA and the PUC Substantive Rule.

RESUMÉ

MARK W. TURNBOUGH, PhD

February, 2019

General Background: Includes advanced multi-disciplinary education, training and experience in the analysis and synthesis of complex systems, environmental policy, technology assessment, statistical research, land-use analysis/socio-economics/demography, legislative analysis/bill drafting, drafting of regulatory language and preparation of complex permit applications for critical facilities.

Consulting Experience: Primary areas of activity include regulatory permitting/compliance monitoring, systems analysis, management of technical negotiations for legal/regulatory settlements, environmental impact assessment, site suitability analysis, site selection, site characterization, analysis of land uses, site remediation/restoration analysis, statistical research and computer applications, including Geographic Information Systems and Inductive Statistical Models.

Synopsis of Selected Consulting Activity (1984-2019):

(For complete project/work history, see Page 11, **Experience** section).

In December of 2018 was retained by the law firm of Spivey Valenciano, PLLC on behalf of MM Smithfield Family Limited Partnership, LTD. and Pettus Czar, LTD. to evaluate the environmental and land use impacts of a proposed ONCOR Electric Delivery Company, LLC, AEP Texas Inc, and LCRA Transmission Services Corporation 345-kV electric transmission line in Pecos, Reeves, and Ward Counties, Texas (Sand Lake to Solstice and Bakersfield to Solstice Project). PUC Consolidated Docket No. 48785.

In October of 2018 was retained by the law firm of Burdett Morgan Williamson & Boykin on behalf of The Eastern Coalition to evaluate the environmental and land use impacts of a proposed LCRA Transmission Services Corporation 138-KV electric transmission line in Burleson County, Texas (Cooks Point Project). PUC Docket No. 48358.

In March of 2018 was retained by Kemp Smith Law Firm to provide technical expertise in support of Edwards Aquifer Authority litigation (Uvalde County Underground Water Conservation District, Uvalde County, City of Uvalde, et al. v. Edwards Aquifer Authority) re: complex water rights re-distribution policy.

In January of 2018 was retained by Lea Land Industrial Landfill (located at Halfway, New Mexico) to recruit and manage a multi-disciplinary team to develop an application for a major modification

to the New Mexico Oil Conservation Division in order to triple the solid waste disposal capacity for Oil and Gas Exploration and Production wastes and to develop a state of the art large volume liquids recycling facility.

In May of 2017 was retained by Envirolands, LLC to identify and characterize a suitable site west of the City of Albuquerque, NM that could be permitted as a full service solid waste recycling and disposal facility under the Solid Waste Management Regulations of the New Mexico Environment Department.

In January of 2017 was retained by Straten Realty. L.L.C. (Joe Will Ross Attorney at Law) to evaluate the environmental and land use impacts of a Joint Application of AEP Texas North Company and Electric Transmission Texas, L.L.C. for the proposed AEP TNC Heartland to ETT Yellow-Jacket 138-kV Transmission Line in McColloch and Menard Counties, Texas (PUC Docket No. 46234).

In November of 2016 was retained by Synergy Medwaste, L.L.C. to provide systems and regulatory support for EPA Region 6 authorization to test and operate a high temperature pyrolysis system to treat medical waste at a location on the Nambe Pueblo near Santa Fe, New Mexico.

In September of 2016 was retained by VJ Technologies, L.L.C. to provide systems and regulatory support for the development of an integrated real time radiography inspection, remediation and re-packaging unit for managing containers of mixed Transuranic Waste that have the potential for hazardous waste incompatibility problems. **This project was initiated in order to address the Los Alamos National Laboratory (LANL) Trans-Uranic Waste shipped to WCS which was subsequently isolated in concrete modular cannisters and re-located to the federal disposal cell for safe keeping until it could be further characterized and treated on-site.**

In January 2016 was retained by Pitchfork Landfarm, L.L.C. to coordinate an assessment of potential contamination, and the development of a final closure plan for the facility located in south east Lea County, New Mexico under New Mexico Oil Conservation Rule 36.

In August of 2015 was retained by Braun and Gresham Attorneys at Law to evaluate the environmental and land use impacts of an AEP Texas Central Company Proposed Tuleta to Euler to Coletto Creek 138-kV Double Circuit Electric Transmission Line in Bee and Goliad Counties, Texas (PUC Docket No. 44837). Both the SOAH Administrative Law Judges and the PUC cited my testimony as a basis for requiring the Utility to adopt an alternative route recommended in my testimony.

In May of 2015 was retained by TVG Texas 1, LLC (Windsong Ranch Development) to evaluate the environmental and land use impacts of a proposed Brazos Electric Power Cooperative Parvin Substation and 138-kV Double Circuit Transmission Line in Collin and Denton Counties, Texas (PUC Docket No. 43878).

In May of 2015 was retained by Ewell, Brown and Blanke on behalf of Chuck Norris to evaluate

the environmental and land use impacts of a proposed Centerpoint Energy 345-KV Transmission Line in Grimes, Harris and Waller Counties, Texas (PUC Docket 44547).

In February of 2015 was retained by CK Oilfield Services to conduct site suitability- site selection studies to identify land in south east New Mexico that is suitable for permitting under NMOCD Rule 36 a surface disposal facility for the treatment and disposal of oil and gas exploration waste.

In November of 2014 was retained by Brady & Hamilton to evaluate the environmental and land use impacts of a proposed Southwestern Public Service Company 240-KV Transmission Line from Wolfforth to Carlisle in Lubbock County, Texas (PUC Docket No. 42727).

In July 2014 was retained by the FFPTHCA Alliance to evaluate the environmental and land use impacts of a set of routes for a 138kV electric transmission line proposed by the Lower Colorado River Authority (LCRA TSC) in, Blanco, Gillespie, and Kendall Counties, Texas (PUC Docket No. 43599) Case was not heard on the SOAH Docket until May 2015.

In April 2014 was selected by URS, Inc., B & W, Inc., and AREVA to be on a six person executive team to review and provide technical and regulatory guidance for the development of the Recovery Plan for the U.S. Department of Energy Waste Isolation Pilot Plant. The facility was shut down in February of 2014 by a radiation leak in the underground repository.

In March of 2014 was retained by the City of Haslet, Texas and the Blue Mound Alliance to evaluate the environmental and land use impacts of a set of routes for a 138kv electric transmission line proposed by ONCOR Electric Delivery Company in Denton, Tarrant and Wise Counties, Texas, PUC Docket No. 42087.

In February of 2014, was retained by Braun & Gresham, PLLC on behalf of Ray Audas, et al., Four S Investments, Henry Bethea and Jeff and Peggy Fye to evaluate an electric transmission line proposed by Entergy Texas, Inc. in Grimes and Montgomery Counties, Texas, PUC Docket No. 41718.

In January of 2014 was retained by the firm of Braun & Gresham, PLLC on behalf of Wayne "Skip" Hill, et al., Michael Bradley Nevil, and Brunhild Investments, Inc. to evaluate the TNMP CCN and route study that was used to select a route for the proposed Westminster 138 kV transmission line in Collin County, Texas, PUC Docket No.41756.

In May of 2013 was retained by Bechtel National, Inc. to provide consulting expertise on the development of a water infrastructure business unit that would serve national and international water development needs.

In November of 2012 was retained by the law firm of Ewell, Bickham and Brown, LLP on behalf of The East Wildlife Foundation in re: The San Antonio Viejo Ranch to evaluate the Recommended Route advanced by Electric Transmission Texas, LLC in its application for a 345kV double circuit

Transmission Line from Rio Lobo to Rio Bravo to North Edinburg in Webb, Zapata, Jim Hogg, Brooks, Starr, and Hidalgo Counties, Texas. Was also tasked to file Cross Rebuttal Testimony in the case, PUC Docket No. 40728. Case settled on February 19, 2013 with adoption of alternate route advanced by East Wildlife Foundation and the Alliance of South Texas Ranches.

In October of 2012 was retained by Herrera & Boyle, PLLC on behalf of Bryan Herr, Tom Trial, Anthony Jennings, and John Morvant to evaluate the Application of Brazos Electric Power Cooperative, Inc. to Amend a CCN for construction of a 138kV single circuit transmission line in Grimes, Walker, and Montgomery Counties, Texas-SOAH Docket No.473-12-7019, PUC Docket No. 40319, Public Utility Commission of Texas.

From June of 2012 to October of 2016 was retained by Boston Government Services, to provide consulting services directly to the Environmental Management Division of the U.S. Department of Energy on regulatory and cross-cutting issues in the management of legacy waste at sites throughout the DOE Complex. The program is designed to provide nationally recognized expertise to the EM Division.

In January of 2012, was retained by the New Mexico State Land Office to provide technical and regulatory expertise on two unrelated tasks: (1) To evaluate the nature, extent, remediation and reclamation of surface resources affected by large scale tire dumping on State lease land, and to testify as an expert in re: New Mexico Commissioner of Public Lands v. Daniels, et al (2) To assist the Commissioner of Public Lands in evaluating the potential impact on state owned lands of proposed changes to New Mexico Oil Conservation Commission ("OCC") Rules regarding the disposition of Oil and Gas Exploration and Production wastes, and preparing a formal comment to the OCC.

In November of 2011, was retained by Gordon Environmental, Inc., Albuquerque, New Mexico, to provide site selection-site suitability expertise re: the selection of land in Sandoval County suitable for the development of a new Regional Subtitle D Landfill.

In July of 2011, was retained by the Law Firms of Lafont, Tunnel, Formby, Lafont & Hamilton, Plainview, Texas and Zach Brady & Co. on behalf of the Cogdell Ranches Trust to evaluate and prepare direct testimony as an expert before the Texas PUC re: the Application of Southwestern Public Service Company to Amend a Certificate of Convenience and Necessity for a Proposed 345kV Electric Transmission Line within Hale, Floyd, Motley, Cottle, Briscoe, Hall, Childress, Donley, Collingsworth, and Wheeler Counties, Texas (SOAH Docket No. 473-11-5978, PUC Docket No. 38877 Public Utility Commission of Texas) that would cross nine of the Cogdell ranches in the Panhandle of Texas.

In June of 2011, was retained by Robert Hall, Oklahoma City, Oklahoma to oversee resolution of compliance issues between Lea Land Industrial Landfill and the New Mexico Environment Department.

In March of 2011, was retained by the Lea County, New Mexico Economic Development

Corporation to prepare an application to the New Mexico Environment Department for a “Voluntary Remediation Program/Covenant Not To Sue” on behalf of International Isotopes, Inc.

In January of 2011, was retained by the Law Firm of Stubbeman, McRae, Sealy, Laughlin & Browder on behalf of John B. Phillips, Skipper Driver, and Dane Driver to evaluate selected links in the Wind Energy Transmission Texas, LLC proposed Long Draw to Sand Bluff to Divide and Sand Bluff to Bearkat 345 kV CREZ Transmission Lines in Borden, Coke, Glasscock, Howard, Mitchell, & Sterling Counties (SOAH Docket No. 473-11-1266, PUC Docket No. 38825).

In November of 2010, was retained by Big Bear Disposal, Lovington, New Mexico to evaluate the suitability of sites in southeastern New Mexico for the development of proposed Oil and Gas Waste Disposal Facilities.

In October of 2010, was retained by the Lea County, New Mexico Economic Development Corporation to validate site suitability for two tracts of land west of Hobbs, New Mexico for the location of two facilities: one (640 acres) that would De-convert Depleted Uranium Hexafluoride, and the other (1000 acres) for a facility that would utilize a patented recombinant organism, brine-water and carbon dioxide in a large array of photosensitive panels to produce diesel products and related molecular chains.

In August of 2010, was retained by Law Firm of Herrera & Boyle on behalf of Group of Allied Landowners to evaluate selected links in the amended ONCOR Willow Creek-Hicks 345-kV CCN for a CREZ Transmission Line in Denton, Parker, Tarrant and Wise Counties (SOAH Docket No. 473-10-4789, PUC Docket No. 38324).

In July of 2010, was retained by Law Firm of Herrera & Boyle on behalf of the Ioni Creek Conservation Group to evaluate selected links in the Lone Star Central A to Central B to Sam Switch to Navarro 345-kV CCN Route Analysis (SOAH Docket No.473-10-4398, PUC Docket No. 38230).

In May of 2010, was retained by Law Firm of Herrera & Boyle on behalf of Clear Creek Preservation Coalition to evaluate selected links in the ONCOR Riley-Krum 345-kV CCN Route Study and Environmental Assessment (SOAH Docket No.473-10-4109, PUC Docket No. 38140).

In December of 2009, was retained by Law Firm of Locke, Lord, Bissell and Lydell on behalf of CJ Ranch, Garrett Ranch, Point Peak Resort and Jean Mueller to evaluate alternatives to LCRA’s proposed 345-kV transmission line from Gillespie –Newton (PUC Docket No. 37448)

In July of 2009, was retained by Hicks & Co. to evaluate the environmental impacts of alternative routes for a Lower Colorado River Authority (LCRA) electric transmission line that would run from Dallas to Kendall County, Texas.

In August of 2008, was retained by Waste Connections, Inc. to characterize and acquire land from

the New Mexico Commissioner of Public Lands that would be suitable for permitting under 20.9.1 NMAC for a Subtitle D solid waste disposal facility in Otero County, New Mexico.

In August of 2008, was retained by The Urlacher Group (Big Bear Disposal, Inc.) to site, characterize, permit and oversee construction of an Oilfield disposal system under Rule 36 of the Oil Conservation Commission Regulations.

From February of 2008 to October 2011, was retained by Project Enhancement Corporation (PEC) to provide regulatory expertise to the Environmental Management Division of DOE re: Cross-cutting issues with the potential to affect multiple sites in the complex.

From January 2008 to October 2014, was retained by Los Alamos National Security (LANS) to provide regulatory guidance to LANS and NNSA re: implementation of the Los Alamos RCRA Order on Consent signed by the state of New Mexico, DOE and LANS.

In December 2007, coordinated the legal/technical case and testified for the applicant in the New Mexico Environment Department's adjudicatory permit hearing for Camino Real Landfill in Sunland Park, New Mexico.

In August 2007, was retained by the Lea County Energy Committee / Lea County Economic Development Corporation to characterize the suitability of several selected sites for construction and operation of a Uranium Enrichment Facility. A separate entity, International Isotopes has selected one of those sites for a de-conversion plant.

In January 2007, was retained by the Eddy-Lea Energy Alliance, LLC (ELEA), The Washington Group and AREVA as Principal Site Investigator for the proposed ELEA Global Nuclear Energy Partnership (GNEP) Site Characterization effort for a Consolidated Fuel Reprocessing Facility and an Advanced Burner Reactor.

In December 2007, was retained by Sundance Oilfield Services, LLC to develop an application under new Oil Conservation Division regulations (Rule 36) for solid waste disposal facilities near Eunice, New Mexico.

In October 2006, was retained by Ben Barnes & Associates to evaluate RCRA compliance issues for the Lea Land Industrial Waste Disposal Facility in Lea County, New Mexico.

In May 2006, was retained by the City of Clayton, New Mexico to locate, characterize, acquire and permit a suitable site for a regional landfill for northeast New Mexico and northwest Texas.

In April 2006, was retained by Gordon Environmental, Inc. for Southwest Landfill to evaluate the relationship between the existing facility and land uses in the surrounding area.

In April 2006, was retained by a private consortium representing Lea and Eddy Counties (ELEA),

New Mexico to manage the preparation of a site proposal to the DOE (Global Nuclear Energy Partnership-GNEP) request for proposals to identify a suitable site for a proposed spent nuclear fuel recycling facility. After GNEP the ELEA has purchased the proposed site for other economic development purposes.

From January 2006 to the present, has been retained as a consultant by Las Uvas Dairies, Hatch, New Mexico (one of the largest family owned dairy operations in the United States) to provide regulatory assistance to its facility engineers regarding the renewal and compliance maintenance of its consolidated discharge permits issued by the state of New Mexico.

From March 2005 to March 2006, drafted sections for the Camino Real Solid Waste permit application and provided quality assurance review of the entire submission. The application package was submitted to the New Mexico Environment Department Solid Waste Bureau on March 6, 2006.

From October 2005 to March 2006, coordinated independent third party preparation of Community Impact Assessments (CIA) for Camino Real Landfill (Sunland Park, N.M.) and the proposed Rhino Landfill (Chaparral, N.M.). The studies were prepared as part of the permitting process for both facilities.

As consultant to Camino Real Landfill in Sunland Park, New Mexico, participated in the preparation and submission of the Title V Operating Permit renewal application. The application was submitted to the New Mexico Environment Department (NMED) on April 29, 2005 and was subsequently approved and the permit was re-issued.

As consultant to Sandoval County (New Mexico), participated in the preparation of a RCRA Subtitle D Application for a major expansion of regional landfill and recycling facility. (April 2004-June 2005). Facility permitted on July 17, 2005.

As consultant to Controlled Recovery, Inc. (CRI), provided regulatory expertise to large scale oil recycling operation in Lea County New Mexico (April, 2005-January 2007).

As consultant to WCI, Inc., negotiated settlement of NMED Administrative Order against El Paso Disposal, Inc. (a subsidiary of WCI, Inc.) (October-December, 2004).

As consultant to Carroll, Gross, Reeder & Drews, LLP provided expertise on behalf of Lawrence and Carolyn Biedenharn in re: a 138kV electric transmission line proposed by the Lower Colorado River Authority ("LCRA") Transmission Services in Kendall and Bexar Counties (SOAH Docket No. 473-04-7609, PUC Docket No. 29684, Public Utility Commission of Texas) July, 2004-July, 2005.

As consultant to CH2M HILL, provided specialized regulatory and project development expertise

(January 2004-December 2009).

As consultant to Advanced Technologies and Laboratories International, Inc. (ATL) provided regulatory expertise to U. S. Department of Energy Headquarters Environmental Management Division (EM3) for the definition and resolution of major regulatory problems for DOE facilities, e.g. LANL Consent Order, Hanford TRU Tank Waste and Fernald Silos Waste (April 2004-2009).

As consultant to Nuclear Waste Partners (Formerly the Washington Group International) provides specialized regulatory consulting for the Washington Group at the U.S. Department of Energy WIPP facility in the state of New Mexico (January 2004-present).

As consultant to the LES/URENCO National Enrichment Facility (NEF), provided specialized regulatory consulting for the acquisition of environmental permits from the state of New Mexico (January 2002-July 2009).

As consultant to Aquila / Canberra, Inc. provided specialized regulatory and policy analyses for ongoing North American projects (July 2003-2006).

As consultant to the New Mexico State Land Office drafted policy guidance for enhancing the protection of surface resources on land owned by the State of New Mexico (June 2003-July 2004).

As consultant to Cogema (AREVA), Inc. conducted regulatory and technical feasibility studies for a range of potential North American projects (September 2002-2003).

As consultant to American 3CI, provided regulatory expertise on the preparation of permits for infectious waste management facilities (February 2002-March 2006).

As consultant to CTAC, provided regulatory expertise on the modification of the U.S. Department of Energy (DOE) /WIPP hazardous waste permit issued by the State of New Mexico (January 2002-January, 2004).

As consultant to Moncrief Oil Company, provided specialized regulatory guidance on the disposition of sulfur and related by-products of natural gas processing facilities in the Wind River Basin of central Wyoming (August 2001-August 2002).

As consultant to Westinghouse/TRU Solutions and Westinghouse Safety Management Solutions, provided regulatory expertise on the modification of the U.S. DOE/WIPP hazardous waste permit issued by the state of New Mexico (September 2000-December 2001).

As consultant to the Edwards Aquifer Authority (contracted through Kemp Smith, P.C. and Hicks and Co.) provided regulatory analysis for the development of and impact assessment for new aquifer management rules (June 2000-December 2009).

As environmental consultant to CRI, Inc. provided regulatory expertise; client was in opposition to

a proposal by the state of New Mexico to co-mingle oilfield wastes with solid waste (sub-title D) in disposal cells permitted for sub-title D wastes (Jan.-Nov., 2000). NMED hearing officer adopted Mr. Turnbough's interpretation of the regulatory framework. It was the first time an NMED hearing officer had ever ruled against an established NMED policy.

As consultant to the Washington Group assisted in the development of a community interface plan to improve the company's relationship with Lea County, New Mexico (July-September, 2000).

As consultant to the Washington Group, provided permit and license data regarding WCS capabilities to store and characterize TRU waste in support of the WIPP project (February- April, 2000).

As environmental consultant to Lea County, New Mexico provided interface with U.S. Department of Energy (DOE) in preliminary discussions regarding economic development associated with the operation of the DOE Waste Isolation Pilot Plant (WIPP) (1999-2000).

As environmental consultant to Raymond G. Sanchez and Robert Desiderio, attorneys at law, provided project management and coordination for site assessments on Maloof properties in New Mexico (January 2000-December 2001).

As environmental consultant to the El Paso, Texas based law firm of Kemp Smith, provided expertise for the selection and development of water resources for use by the City of El Paso (2000-2005).

As environmental consultant to Spivey & Ainsworth and Chandler and Associates, provided expertise on the assessment of a large and complex oilfield contamination case (Cantrell v. Ashland Oil Co.) in Johnson and Lawrence Counties, Kentucky (1999-2009).

As lead consultant on the Lea County Landfill project managed site selection studies and permit document preparation for submission to the New Mexico Environment Department (Permit granted 1999).

As environmental consultant to WCS, LLC provided regulatory guidance for the development of permits and licenses for additional radioactive and hazardous waste streams for the facility. Provided systems support and compliance monitoring at facility permitted and licensed in Texas. Also, managed compliance issues with regulatory agencies in New Mexico re: potential discharges from WCS to "a downstream receiving state." (WCS is located adjacent to the Texas/New Mexico state line). (June 1995-2016).

As environmental consultant to Harlan Richey (President of Richey Oil Co.), provided expertise and expert testimony; client was in opposition to a proposed 27,000 acre sludge application project adjacent to the historic Eagle Mountain Ranch in Hudspeth County, Texas. The Texas Natural Resources Conservation Commission (TNRCC) subsequently withdrew its prior approval of the project (1997-1998).

As environmental consultant to Phillips Petroleum, Inc., provided expertise and expert witness testimony (deposition only—case was settled in favor of Phillips) on a complex land use/groundwater contamination case (1997-1998).

As environmental consultant/project manager to Camino Real Environmental Center (CREC), managed the development of three solid waste permit applications for boundary modification, recycling center and landfill permit renewal for the solid waste facility at Sunland Park, (Doña Ana County) New Mexico. (Permits granted 1997). Coordinated Title V and NSPS permitting and related compliance issues at the all of the subsidiary facilities in New Mexico (1990-2006). Provided regulatory guidance for early phases of solid waste permit application preparation for 2007 hearing. Compliance monitoring (2004-2012).

As environmental consultant/project manager for USA/UNITED WASTE, coordinated the rehabilitation of a permit (solid waste) application for Tri-Sect Landfill in Valencia County, New Mexico. (1998)

As environmental consultant/project manager for CREC, managed the acquisition of a discharge permit for a sludge land application site at the CREC Sunland Park, New Mexico site. (1994)

As environmental consultant/project manager for CREC, managed the site selection and development of a permit application for the Eddy County, New Mexico regional landfill (Sand Point Regional Landfill). (Permit granted 1994)

As environmental consultant/project manager for Med-Compliance Services (MCS), managed the development of a permit application for a bio-medical waste transfer and processing facility in Albuquerque (Bernalillo County) New Mexico. (Permit granted 1994).

Project required the development of a new processing technology that could meet new state standards.

As environmental consultant to Lower Valley Water District (El Paso County), prepared environmental assessments for Las Azaleas constructed wetlands project. (1993).

As permit consultant to R.R.I., acquired landfill and recycling permits for R.R.I. (NUMEX Landfill) facilities at Sunland Park, New Mexico. (1991).

As project manager for El Paso County, (El Paso County v. State of Texas), coordinated 4 year review of Ft. Hancock site suitability for radioactive waste disposal. Developed technical case for plaintiffs. Plaintiffs prevailed on all 25 factual issues. District court decision upheld plaintiffs. State did not appeal. (1988-1991).

As Director of Special Projects (consulting position) at the Rio Grande Council of Governments, El Paso, Texas responsibilities included development and management of multi-disciplinary projects that focused primarily on land use and site planning issues in the region, e.g., site selection for

landfills, industrial parks, experimental energy storage systems, etc., (1989).

As Principal Planner at Sub-Land, Inc. El Paso, Texas responsibilities included management of environmental and economic feasibility studies for large-scale land use projects. (1986-1987).

As a Senior Staff Policy Analyst/Planner at EH & A Environmental Consultants, Austin, Texas was responsible for the design and implementation of land use, environmental/economic baseline and impact studies and other assessments. Also was responsible for various types of specialized studies (regulatory, budgeting and forecasting). Developed and managed computer-based models for environmental planning, e.g. riverine flow impacts on bays and estuaries, predictive models for archeological resources in large scale surveys. (1984-1987).

Expert Witness Experience: Federal and State Court; Regulatory Hearings. (Primary areas – permitting, environmental assessment, environmental remediation/restoration, land use analysis, solid waste facility regulations, municipal services assessment and redistricting). Expert testimony in Administrative/Regulatory Hearings on environmental/land use issues, e.g. RCRA permits, air quality permits, routing of electric transmission lines and water plans.

Academic Experience: Taught courses in systems analysis, site planning, land use management, environmental policy, alternative energy resource investigations, organization theory, industrial expansion analysis, policy typology assessment, public budgeting fiscal planning, anthropology and quantitative sociology.

Experience/Work History:

(Note: Several activities have overlapping/ concurring time frames)

Environmental Consultant	Burdett Morgan Williamson & Boykin Amarillo, Texas October 2018-January 2019
Systems/Regulatory Consultant	Kemp Smith Law Firm Austin, El Paso, San Antonio, Texas March 2018 - Present
Regulatory Consultant	Lea Land, L.L.C. Oklahoma City January 2018-Present

**Environmental/Regulatory
Consultant**

Envirolands, L.L.C.
Albuquerque, NM
May 2017 – Present

**Environmental/Regulatory
Consultant**

Staten Realty, L.L.C.
Brady, Texas
January 2017 – Present

**Systems/Regulatory
Consultant**

Synergy Medwaste, L.L.C.
Dallas, Texas
November 2016 – Present

**Systems/Regulatory
Consultant**

VJ Technologies
Bohemia, New York
September 2016 - Present

**Environmental/Regulatory
Consultant**

Pitchfork Landfarm, L.L.C.
Jal, New Mexico
January 2016 - Present

**Environmental/Land Use
Consultant**

Braun & Gresham, Attorneys at Law
on Behalf of the Coastal Prairie Alliance
Austin, Texas
August 2015- Present

**Environmental/Land Use
Consultant**

TVG Texas 1, LLC (Windsong Ranch
Development) Prosper, Texas
May – September, 2015

**Environmental/Land Use
Consultant**

Ewell, Brown & Blanke, Chuck Norris
Austin, Houston, Texas
May 2015-July 2015

**Site Selection, Oil and Gas
Waste Disposal Permitting
Consultant**

CK Environmental Services
Portland Oregon
February 2015

**Environmental/Land Use
Consultant**

Brady & Hamilton
Lubbock, Texas
November 2014-May 2015

Environmental/Land Use

FFPTHC Alliance

Consultant	Fredricksburg, Texas July 2014 through May 2015
Environmental/Land Use Consultant	City of Haslet, Texas March through July 2014
Environmental/Land Use Consultant	Braun & Gresham, PLLC Austin, Texas January 2014 through Present
Water Resource Consultant	Bechtel National, Inc. Michael Graham Sr. VP Reston, VA May 2013 to May 2014
Environmental/Land Use Consultant	Ewell, Brown, and Blanke, LLP Austin, Texas November 2012 to February 2013
Environmental/Land Use Consultant	Herrera & Boyle, PLCC Austin, Texas October to December 2012
Regulatory Consultant	Boston Government Services, LLC Lenoir City, TN June 2011 to May 2015
Environmental Consultant:	New Mexico State Land Office SLO v. Daniels, et al/ Pit Rule Amendments Santa Fe, New Mexico January 2012 to October 2014
Environmental Consultant:	Gordon Environmental, Inc. Sandoval County Landfill Albuquerque, New Mexico November 2011 to the present
Environmental Consultant:	Lafont, Tunnel, Formby, et al On behalf of Cogdell Trust Plainview, Texas August 2011 to September 2011

**Environmental Consultant/
Regulatory Compliance:**

Robert Hall
Oklahoma City, Oklahoma
June 2011 to the present

**Environmental Consultant/
Regulatory Compliance:**

Lea County Economic Development Corp
Lea County, New Mexico
March 2011 to September 2011

**Environmental Consultant/
Utility CCN Review:**

Stubbeman, McRae, Sealy, Laughlin &
Browder, LLC
Midland, Texas
January 2011 to March 2011

**Environmental Consultant/
Site Suitability Assessment:**

Big Bear Disposal Disposal
Lovington, New Mexico
November 2010 to November 2012

**Environmental Consultant/
Site Suitability Assessment:**

Lea County Economic Development Corp,
New Mexico
October 2010 to March 2011

**Environmental Consultant/
Utility CCN Review:**

Herrera & Boyle, PLLC
Austin, Texas
May 2010 to December 2010

**Environmental Consultant/
Utility CCN Review:**

Locke, Lord, Bissell and Lydell, PLLC
Austin, Texas
December 2009 to March 2010

Environmental Consultant:

Hicks & Co.

Austin, Texas
July 2009

**Land Acquisition/
Permitting Consultant:**

Waste Connections, Inc
Houston, Texas
August 2008 to October 2012

Permitting Consultant:

The Urlacher Group
Doing Business as DNCS
Phoenix, AZ
August 2008 to 2015

Regulatory Consultant:

Project Enhancement Consultants
Germantown, Maryland
February 2008 to October 2011

Regulatory Consultant:

Los Alamos National Security, LLC
Los Alamos National Laboratory
January 2008 to October 2014

Project Manager:

Waste Connections, Inc. (Houston, Tx)
Adjudicatory Permit Hearing for Camino
Real Landfill (Sunland Park, NM)
December 2007 (30 day hearing)

Site Suitability Consultant:

Lea County, New Mexico
Nuclear Facility Sites
Hobbs, New Mexico
August 2007 to January 2015

Principal Site Investigator:

Eddy-Lea Energy Alliance, WGI, AREVA
Global Nuclear Energy Partnership
Site Characterization for Spent Fuel
Reprocessing Facility and ABR
Carlsbad, NM
January 2007 to July 2009

Permitting Consultant:

Sundance Oilfield Services,
Eunice, New Mexico
December 2006-November 2012

Regulatory Consultant:	Ben Barnes & Associates, Austin, Texas October 2006-October 2008
Land Use/ Regulatory Consultant:	City of Clayton, New Mexico May 2006-January 2007
Land Use Consultant:	Lea/Eddy County GNEP Proposal Hobbs/Carlsbad, New Mexico, April 2006-2009
Land Use Consultant:	Southwest Landfill Albuquerque, New Mexico February, 2006-July 2006
Regulatory Consultant:	Las Uvas Dairies Hatch, New Mexico January 2006-present
Environmental Consultant/ Utility CCN Review:	Carroll, Gross, Reeder & Drews, L.L.P. Austin, Texas, July 2004-July 2005
Systems and Environmental Consultant:	CH2M Hill, Inc., Albuquerque, New Mexico August 2004-December 2009
Regulatory Consultant:	Advanced Technologies and Laboratories, International, Inc. Germantown, Maryland, April 2004-2007
Regulatory Consultant:	Nuclear Waste Partners, LLC Carlsbad, New Mexico U. S. Dept of Energy WIPP Facility January 2004-present
Regulatory Consultant:	National Enrichment Facility Albuquerque, New Mexico January, 2000 –January 2009
Policy Consultant:	Aquila/Canberra, Inc. Albuquerque, New Mexico July, 2003 - 2006
Land Use Consultant:	New Mexico State Land Office

Santa Fe, New Mexico
June 2003- July 2005

Regulatory Consultant:

Cogema, Inc.
Bethesda, Maryland
August, 2002 - 2003

Regulatory Impact Consultant:

Hicks & Co.
Austin, Texas
January, 2002-2009

Regulatory Consultant:

American 3CI
Dallas, Texas
February 2002-March 2004

Regulatory Consultant:

CTAC Technical Assistance
Carlsbad, New Mexico
U.S. DOE/WIPP Site
January 2002-2003

Regulatory Consultant:

Moncrief Oil Company
Fort Worth, Texas
Wind River Basin Wyoming
August 2001-2003

Regulatory Impact Consultant:

Edwards Aquifer Authority
San Antonio, Texas
June 2000-2009

**RCRA Permit Consultant:
(Sub-title C)**

Westinghouse / U.S. Dept.
of Energy WIPP Facility
Carlsbad, New Mexico
September 2000-December 2001

Expert Witness (remediation):

Bramblett & Bramblett
El Paso Texas 2000-2001

**Environmental Consultant:
(Regulatory Compliance)**

CRI, Inc.
Hobbs, New Mexico
January 2000-2006

**Environmental Consultant:
(Site Assessment)**

Raymond G. Sanchez and Bob Desiderio
Attorneys at Law

Albuquerque, New Mexico
February, 2000-February 2001

**Environmental Consultant:
(Water Development Strategy)**

Kemp- Smith Law Firm
El Paso, Texas
February, 2000-2006

**Environmental Consultant:
(DOE Policy)**

Lea County, New Mexico
1999- April 2000

**Environmental Consultant:
(Oilfield Contamination
Assessment-Expert Witness)**

Chandler and Associates, Lufkin, Tx
Spivey & Ainsworth, Austin, Tx
In Re: Martha Oilfield (Paintsville, Kentucky)
July, 1998-2009

**Environmental Consultant:
(Oilfield Contamination
Assessment-
Expert Witness)**

Phillips Petroleum
Borger Refinery (Tx)
Bartlesville, Oklahoma
1997-1998

**Environmental Consultant:
(Surface Water Protection-
Expert Witness)**

Richey Oil Company
Tyler, Texas
(Hudspeth Co. Texas) 1997-1998

**Environmental Consultant:
(Remediation Estimates-
Expert Witness)**

“Triangl” (sic) Equities
El Paso, Texas
1997-1998

**Environmental Consultant:
(RCRA/RAD Regulation)
DOE Interface**

Waste Control Specialists, LLC.
Dallas, Texas/
Pasadena, Texas 1995-2016

**Environmental Consultant:
(Land Use Analysis)**

Santa Teresa Development, Inc.
February, 1986 to 1994

**Environmental Consultant:
(Landfill Evaluation)**

El Paso County Commissioner's Court
El Paso, Texas
1989 to 1991

**Environmental Permit Consultant:

(Landfill Site Selection, Permitting)**

R.R.I. (Waste Disposal)
El Paso, Texas
June 1990-2012
(Purchased in 1999 by Waste Connections,

Inc.)

**Biomedical Waste Technology Development:
(Regulatory Consultant)**

Med-Compliance Services
El Paso, Texas
February, 1991-1999

**Environmental Consultant:
(Land Use)**

Horizon Environmental Services
Austin, Texas
1995-1996

Director, Environmental Projects:

Rio Grande Council of Governments
El Paso, Texas
March 1987-July, 1989

**Professor:
(Adjunct)**

New Mexico State University
Land Use Analysis
Las Cruces, New Mexico
1988

Principal Planner

Sub-Land, Inc.
El Paso, Texas
1986-1987

**Senior Policy Analyst / Land
Use Analyst:**

Espey, Huston & Associates, Inc
Austin, Texas
1984-1986

**Division Chairman:
(Interim)**

Social Sciences
Wayland University
Plainview, Texas
1983

**Lecturer - Budgeting and
Forecasting:**

MPA Program, Texas Tech University
Lubbock, Texas
1983

Research Associate:

Center for Energy Research
Texas Tech University
Lubbock, Texas 1979

Lecturer - Technology Assessment: Department of Industrial and Systems Engineering (Doctoral Program)
Texas Tech University
Lubbock, Texas 1979

Assistant Division Chairman: Public Administration/Systems
Wayland University
Plainview, Texas
1978-1983

Administrative Head/Interim Director: Computer Services
Wayland College
Plainview, Texas
1976-1978

Instructor - Public Policy: Department of Political Science
Texas Tech University
Lubbock, Texas
1976

Assistant to City Manager: City of Plainview, Texas
1976

Research Assistant, Stochastic Models: Frederick Hartmann, Alfred Thayer Mahan Professor of Maritime Strategy
Naval War College
1974-1975

Instructor- Department of Anthropology: Department of Anthropology
Wayland College
Plainview, Texas
1971-1974

Research Assistant: Department of Anthropology/Sociology
Texas Tech University
Lubbock, Texas
1970-1971

Technical Writer: Litton Industries
Lubbock, Texas
1969

Education: (Major Fields)

PhD: Systems Theory (Industrial Eng) and Environmental Policy (Public Admin)
Dissertation Topic – Typological Constructs
(Environmental Policy Issue—Environmental Resources Management)
Texas Tech University
Lubbock, Texas
August, 1985

MA: Anthropology/ Sociology/ Public Policy Analysis
Thesis Topic – Ideal Typology Development
Texas Tech University
Lubbock, Texas
1971

BA: Anthropology / Biology / Journalism
Texas Tech University
Lubbock, Texas 1969

Advisory Committees:

New Mexico Environment Department, Draft Dairy Regulation Advisory Committee, June 2009 to January 2011/2014-2016.

New Mexico Environment Department, Environmental Justice Planning Committee, December, 2003 to 2006.

New Mexico Governor-Elect Bill Richardson Transition Team Chairman (Tri-Chair) for the New Mexico Environment Department, November 14, 2002 to January 31, 2003.

New Mexico Environment Department Radioactive Materials Fees Advisory Committee (Waste Management and Disposal Industry Representative), May 1, 2000 to December 31, 2003.

USEPA Environmental Justice Advisory Council/ SWANA-- Waste Transfer Station Working Group, 1999 to May, 2001

New Mexico Environment Department, Tire Recycling Advisory Committee, 1995-1996

New Mexico Environment Department, Solid Waste Regulations Revision Advisory Committee, August - December, 1993

Rio Grande Council of Governments, Regional Solid Waste Management Plan (Far West Texas Planning Region), 1993

El Paso City/County Consolidated Data Processing Advisory Board - Oversight of computer operations for consolidated system, 1989 - 1991

Awards:

Solid Waste Association of North America—(Camino Real) Landfill Excellence Award for Best Landfill Operation in North America, 1997 (Coordinated effort for facility operation and evaluation).

Outstanding Contribution Award - Environmental Design Contest, Waste Education Research Consortium, (Los Alamos National Laboratory, Sandia National Laboratory, University of New Mexico, New Mexico Tech, New Mexico State University and U.S. Department of Energy) May, 1993.

Outstanding Graduate Student Teacher of the Year, Texas Tech University, 1976.

George Mahon Congressional Scholarship Award for Graduate Study of Public Policy, 1974-1975.

Joint Graduate Student/Graduate Faculty Research Grant, "Development of Dis-aggregative Analysis for Decomposition of Large Data Sets", Texas Tech University, 1974.

Technical Reports/Papers/ Pre-Filed Direct Testimony and Related Documents:

Note: All of the Espey-Huston (EH&A) reports and all of the regulatory assessments prepared for the Edwards Aquifer Authority were prepared in collaboration with multi-disciplinary teams of experts. Many of the documents listed here are proprietary and confidential and cannot be released for review. All of the PUC pre-filed testimony listed here is, however, publicly available and can be located on the Texas PUC Interchange.

Pre-filed Direct Testimony in re: Application of LCRA Transmission Services Corporation to Amend a Certificate of Convenience and Necessity for the Cooks Point 138-kV Transmission Line in Burleson County, Texas (PUC Docket No. 48358, January 10, 2019)

Pre-filed direct Testimony in re: Application of AEP Texas North Company and Electric Transmission Texas, L.L.C. for the proposed AEP TNC Heartland to ETT Yellow Jacket 138kV Transmission Line McCulloch and Menard Counties, Texas (PUC Docket No. 46234, January, 2017)

Pre-filed Direct Testimony in re: Application of AEP Texas Central Company for a Certificate of Convenience and Necessity for the Tuleta to Euler to Coleta Creek Double Circuit 138-KV Transmission Line in Bee and Goliad Counties, Texas prepared for the Coastal Prairie Alliance (PUC Docket No.44837), December 7, 2015. SOAH Administrative Law Judges cited my testimony in their ruling to require the Utility to adopt an alternative route described in my testimony as the route that best met the requirements of PURA and the Substantive Rule. The PUC adopted the ALJ's findings in their final decision.

Pre-filed Direct Testimony in re: Application of Centerpoint Energy Houston Electric, L.L.C. to Amend a Certificate of Convenience and Necessity for a Proposed 345-KV Transmission Line Within Grimes, Harris, and Waller Counties, Texas prepared for Concerned Property Owners Alliance (PUC Docket No. 44547) July 13, 2015.

Pre-filed Direct and Rebuttal Testimony in re: Application of Brazos Electric Power Cooperative Certificate of Convenience and Necessity for the Proposed Parvin Substation and a Double Circuit Transmission Line in Collin and Denton Counties, Texas prepared for TVG Texas 1, L.L.C. (Windsong Ranch Development) (PUC Docket No. 43878). June 22, 2015 and August 7, 2015

Pre-filed Direct and Rebuttal Testimony in re: Application of Lower Colorado River Authority (LCRA TSC) for a Double Circuit Transmission Line in Blanco, Gillespie, and Kendall Counties, Texas (Luckenbach Case) prepared for the FFPTHCA Alliance (PUC Docket No.43599). April 6, 2015 and May 5, 2015.

Pre-filed Direct Testimony in re: Application of Southwestern Public Service Company to Amend its Certificate of Convenience and Necessity for a Proposed 240-KV Transmission Line Within Lubbock County (Wolfforth to Carlisle) PUC Docket No. 42729) January 9, 2015.

Pre-filed Direct Testimony in re: Proposed Amendment to 20.6.6 NMAC (Dairy Rule) before the State of New Mexico Water Quality Control Commission on behalf of DIGCE, No.WQCC 13-08(R), November 2014.

Pre-filed Direct Testimony in re: Application of ONCOR Electric Delivery Company for Application for a Certificate of Convenience and Necessity for a Proposed Electric Transmission Line in Denton, Tarrant and Wise Counties, Texas prepared for the City of Haslet and the Blue Mound Alliance (PUC Docket No. 42087) June 9, 2014.

Pre-filed Direct Testimony in re: Application of Entergy Texas, Inc. for Application for a Certificate of Convenience and Necessity for a Proposed Transmission Line in Grimes and Montgomery Counties prepared for the Law Firm of Gresham & Braun, PLLC on behalf of Ray L. Audas, et al., Four S Investments, Henry Bethea and Jeff and Peggy Fye (SOAH Docket No. 473-14-0551, PUC Docket No. 41718) March 25, 2014.

Pre-filed Direct Testimony in re: Application of Texas-New Mexico Power Company to Amend its Certificate of Convenience and Necessity for the Proposed Westminster 138kV Transmission Line in Collin County, Texas prepared for the Law Firm of Braun & Gresham on behalf of Wayne "Skip" Hill, et al., Michael Bradley Nevil and Brunhild Investment, Inc. (SOAH Docket No.473-14-0807, PUC Docket No. 41756) February 13, 2014.

Pre-Filed Cross Rebuttal Testimony in re: Application of Electric Transmission Texas, LLC to Amend its

Certificate of Convenience and Necessity for the Proposed Rio Lobo to Rio Bravo to North Edinburg 345 kV Double Circuit Transmission Line in Webb, Zapata, Jim Hogg, Brooks, Starr, and Hidalgo Counties, Texas prepared for the Law Firm of Ewell, Bickham, and Brown on behalf of The East Wildlife Foundation (SOAH Docket No. 473-13-0846, PUC Docket No. 40728) February 12, 2013

Pre-Filed Direct Testimony in re: Application of Southwestern Public Service Company to Amend a Certificate of Convenience and Necessity for a Proposed Transmission Line within Hale, Floyd, Motley, Cottle, Briscoe, Hall, Childress, Donley, Collingsworth, and Wheeler Counties, Texas prepared for the Law Firm of Zach Brady & Co. on behalf of the Cogdell Trust (SOAH Docket No. 473-11-5978, PUC Docket No. 38877, Public Utility Commission of Texas) September 23, 2011.

Lea County, New Mexico Voluntary Remediation Program Application and Supporting Ground Water Documentation, submitted to the New Mexico Environment Department (“NMED”) May, 2011. Covenant Not to Sue issued by NMED September, 2011.

Pre-Filed Direct Testimony in re: Wind Energy Transmission Texas, LLC Proposed Long Draw to Sand Bluff, Sand Bluff to Divide, and Sand Bluff to Bearkat 345 kV CREZ Transmission Lines in Borden, Coke, Glasscock, Howard, Mitchell, & Sterling Counties, Texas prepared for the Law Firm of Stubbeman, McRae, Sealy, Laughlin & Browder on behalf of John B. Phillips, Skipper Driver, and Dane Driver (SOAH Docket No. 473-43-1266, PUC Docket No. 38825), January, 2011.

Pre-Filed Direct Testimony in re: ONCOR Willow Creek-Hicks 345-kV CCN for a CREZ Transmission Line in Denton, Parker, Tarrant and Wise Counties, prepared for the Law Firm of Herrera & Boyle on behalf of Group of Allied Land Owners (SOAH Docket No.473-10-4789, PUC Docket No. 38324), August 2010.

Pre-Filed Direct and Cross Rebuttal Testimony in re: Lone Star Central A to Central B to Sam Switch to Navarro CCN and Route Analysis, prepared for the Law Firm of Herrera & Boyle on behalf of the Ioni Creek Conservation Group (SOAH Docket No. 473-10-4398, PUC Docket No. 38230), August 2010.

Pre-Filed Direct Testimony in re: ONCOR Riley-Krum 345-kV CCN Route Study and Environmental Assessment, prepared for the Law Firm of Herrera & Boyle on behalf of the Clear Creek Preservation Coalition (SOAH Docket No. 473-10-4109, PUC Docket No. 38140), June 2010.

Pre-Filed Direct and Cross Rebuttal Testimony in re: LCRA CCN for a proposed 345-kV Transmission Line from Gillespie to Newton prepared for the Law Firm of Locke, Lord, Bissel and Lydell on behalf of CJ Ranch, Garrett Ranch, Point Peak resort and Jean Mueller (PUC Docket No. 37448), March 2010. ALJ’s adopted findings in my testimony to require the Utility to abandon their preferred route and use the alternative described in my testimony.

“Site Suitability Analysis for proposed Big Bear Oil and Gas Waste Disposal Facility (Section 32, T17S, R31E, NMPM, Eddy County New Mexico,” prepared for Big Bear, Inc., Lovington, New Mexico, December 2009.

“High Desert Site Suitability Analysis for a Sub-Title D Disposal Facility-Otero County, New Mexico,” prepared for WCI, Inc., Folsom, California, December 2008.

“Site Selection/Suitability Analysis for Proposed DOE Global Nuclear Energy Partnership (GNEP) Consolidated Fuel Reprocessing Facility and an Advanced Burner Reactor,” prepared for AREVA, Washington Group International and the Eddy-Lea Energy Alliance, December 2007.

“Volume IV: Siting and Land Use” IN THE MATTER OF THE APPLICATION OF CAMINO REAL ENVIRONMENTAL, INC. FOR A SOLID WASTE FACILITY PERMIT FOR THE CAMINO REAL LANDFILL, prepared for WCI, Inc. Folsom, California, March 2006.

“Rhino Landfill Status: Comprehensive Report to Otero County Commissioners,” presented on behalf of WCI, Inc., Folsom, California, November 2, 2005.

“Summary and Evaluation of New Mexico Oil Conservation Division Process and Procedure Under OCD Rule 711(B) In Re: Proposed Permits for Solid Waste Disposal for Artesia Aeration and Gandy Marley, Inc., prepared for CRI, Inc. Hobbs, New Mexico, June, 2005.

“Proposed Findings of Fact” In Re: THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING THE APPLICATION OF GANDY MARLEY, INC. TO MODIFY NMOC D PERMIT NO.NM- 01-019... Case No. 13,480, prepared for CRI, Inc. Hobbs, New Mexico, submitted to OCD June 24, 2005.

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO. 473-04-7609; P.U.C. DOCKET NO. 29684, Expert Testimony presented in HEARING ON THE PROPOSED ALTERNATIVE FOR THE HILL COUNTRY PROJECT, June 27- July 2, 2005.

In Re: APPLICATIONS OF SANDOVAL COUNTY TO EXTEND AND MODIFY SOLID WASTE PERMITS FOR THE SANDOVAL COUNTY REGIONAL LANDFILL BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Expert Testimony presented on Land Use and Site Suitability Criteria presented on May 11, 2005. (Permits Granted by NMED on June 17, 2005).

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO. 473-04-7609; PUC DOCKET NO. 29684, Expert Testimony pre-filed on December 8, 2004, Austin, Texas.

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO.473-04-7609; PUC DOCKET NO. 29684, Expert Testimony presented in HEARING ON ADEQUACY OF ROUTES, November 10, 2004, Austin, Texas.

“Siting and Land Use; Volume IV, Sandoval County Landfill Application,” prepared for Sandoval County, New Mexico under contract to Gordon Environmental, Albuquerque, New Mexico, July, 2004.

“Regulatory Impact Assessment for Proposed Amendments to Rule 711 (Groundwater Withdrawals), Subchapters E (Groundwater Withdrawal Permits), F (Standard Groundwater Withdrawal Conditions), G (Groundwater Available for Permitting; Proportional Adjustment; Equal Percentage Reduction), L (Transfers), and M (Meters; Alternative Measuring Methods; and Reporting): Rule 715 (Comprehensive Water Management Plan Implementation), Subchapters A (Definitions) and D (Demand Management and Critical Period Management Rules): Rule 702 (General Definitions): Rule 709 (Fees), Subchapter D (Aquifer Management Fees)” prepared for the Edwards Aquifer Authority under contract to Hicks and Co./ Kemp Smith, P.C., San Antonio, Texas, July 2004.

“New Mexico Environment Department: Transition Task Force—Follow-Up Analysis of NMED Issues Raised in December 2002 Transition Team Report” prepared for the New Mexico Governor’s Office, Santa Fe, New Mexico, December 9, 2003.

“Regulatory Impact Assessment for Proposed Rules Chapter 711 (Groundwater Withdrawal Permits) Subchapters E (Groundwater Withdrawal Permits), G (Groundwater Available for Permitting; Proportional Adjustment; Equal Percentage Reduction) and K (Additional Groundwater Supplies)” prepared for the Edwards Aquifer Authority under contract to Hicks & Co./ Kemp Smith, P.C., San Antonio, Texas, November 2003.

“Draft Surface Resource Protection Guidelines for Oil and Gas Operations on New Mexico State Trust Lands” prepared for the New Mexico State Land Office, Santa Fe, New Mexico, October, 2003.

“Regulatory Impact Assessment for Proposed Rules Chapter 715 (Comprehensive Water Management Plan Implementation Rules) Subchapters A (Definitions), B (Variance Procedures) and C (Groundwater Conservation and Reuse Rules) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./ Kemp Smith, P.C., Austin, San Antonio, and El Paso, Texas, July, 2003.

“New Mexico Environment Department: Transition Task Force Report” prepared for the Hon. Bill Richardson, Governor-Elect, State of New Mexico, Santa Fe, New Mexico, December, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 711 (Groundwater Withdrawal Permits) Subchapter J (Aquifer Recharge, Storage and Recovery Projects) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, September, 2002.

“Regulatory Impact Assessment of Alternative Proposed Rule 715 (Comprehensive Water Management Plan Implementation Rules) Subchapter A (Definitions) and D (Demand Management and Critical Period Management Rules) [15 Percent Reduction in Stage IV Critical Period Management Groundwater Withdrawals] prepared for the Edwards Aquifer Authority under contract

to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, September, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 713 (Water Quality) Subchapters A (Definitions), B (General Provisions), C (Well Construction, Operation and Maintenance) and D (Abandoned Wells; Well Closures) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, August, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 715 (Comprehensive Water Management Plan Implementation Rules) Subchapters A (Definitions) and D (Demand Management and Critical Period Management Rules) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, July, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 713 Water Quality; Subchapter A (Definitions) and Subchapter G (Recharge Zone Protection—Phase I Regulated Substance Tank Rules)” prepared for The Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, June 2002.

“Disposal of Non-Weapons Materials: GTCC Privatization Efforts.” Prepared for Aquila, Inc., July 2001.

“Revised Cost Estimates for Remediation of Contaminated Sites on Cantrell et al. Properties in Johnson and Lawrence Counties, Kentucky (Martha Oilfield)” prepared for the Chandler Law Offices and Spivey-Ainsworth Law Firm, July 5, 2000.

“Final Site Assessment and [14 Day Report] for Maloof Holdings at 100 Industrial Avenue, Albuquerque, N.M.”, prepared for Raymond G. Sanchez and Robert Desiderio. Submitted to the New Mexico Environment Department, UST Bureau, May 19, 2000.

“Disposition of Pre-Subtitle D Landfills”, presented at the SWANA Arid Landfill Symposium, Albuquerque, New Mexico, April 12, 2000.

“Preliminary Cost Estimates for Remediation of Contaminated Sites on Cantrell et al. Properties in Johnson and Lawrence Counties, Kentucky (Martha Oilfield)”, prepared for the Chandler Law Offices and Spivey-Ainsworth Law Firm, May 25, 1999.

In Re: APPLICATION FOR SOLID WASTE PERMIT FOR LEA COUNTY REGIONAL LANDFILL BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Presented Expert Testimony on Land Use and Site Suitability Criteria, Eunice, New Mexico October 15, 2005.

“Permit Application for Lea County Solid Waste Authority Regional Landfill”, prepared for Lea County Solid Waste Authority, Lea County , New Mexico, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), January, 1998 (Permit granted December, 1998).

"Evaluation of Proposed Longo Construction, Inc. Sludge Application Project (27,000 acres) in southern Hudspeth County, Texas", prepared for Harlan Richey, March 1, 1998.

In Re: APPLICATION FOR SOLID WASTE RECYCLING AND DISPOSAL PERMIT FOR CAMINO REAL ENVIRONMENTAL CENTER BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Presented Expert Testimony on Land Use, Socioeconomics, Demographics, Epidemiological Statistics and Site Suitability Criteria, Sunland Park, New Mexico, June 15, 1997.

"Permit Application for Camino Real Environmental Center Regional Landfill and Recycling Center, (Sunland Park, New Mexico), prepared for RRI, Inc., El Paso, Texas, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), Nov. 1996. (Permit granted August 1997).

"Changing Patterns in Regulatory Frameworks for Incinerator Technology", presented to National Solid Waste Management Association - Colorado/New Mexico Annual Meeting, Telluride, Colorado, October 11 - 12, 1996.

"Regulation of Incinerator Technology in New Mexico" (joint presentation with New Mexico Environment Department) presented to Interim Committee on Radioactive and Hazardous Waste - New Mexico Legislature, Santa Fe, New Mexico, September 12, 1996.

"Environmental Justice and Landfill Siting in New Mexico", with Hicks & Co. co-author -contract research for C.R.E.C., August, 1996.

"Las Azaleas Constructed Wetlands - Environmental Assessment", prepared for El Paso County, Texas Lower Valley Water District Authority. Submitted to Texas Water Development Board, August, 1994.

"U. S. Bureau of Reclamation as Regional Water Manager - Rio Grande Project", written testimony presented to Senate Sub Committee on Natural Resources (Senator Bill Bradley, Chair) U.S. Senate, Washington, D.C., May, 1994.

"Plainview Independent School District (Hale County, Texas) Redistricting Submission", Prepared for Plainview ISD, Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, August 1993. Pre-clearance Granted.

"Permit Application for Carlsbad/Eddy County, New Mexico Regional Landfill", prepared for Carlsbad/Eddy County, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), July 9, 1993. (Permit granted 1994).

Nu-Mex Landfill Supplementary Data Report/Documentation of Compliance, Submitted to U.S. Environmental Protection Agency Region 6, Prepared for JOAB, Inc., Sunland Park, New Mexico, May 28, 1993.

"Final Permit Application for Regulated Medical Waste Processing Facility - Albuquerque, New Mexico", prepared for Med Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, May 1, 1993. Permit granted January 1994.

"Brownfield Independent School District (Terry County, Texas) Redistricting Submission", Prepared for Brownfield ISD Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, January 1993. Pre-clearance Granted.

"Floydada Independent School District (Floyd County, Texas) Redistricting Submission", Prepared for Floydada ISD Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, December 1992. Pre-clearance Granted.

"Preliminary Site Selection/Site Characterization of Proposed Carlsbad/Eddy County, New Mexico Regional Landfill", Prepared for City of Carlsbad/Eddy County, New Mexico, Submitted to Solid Waste Bureau, NMED, August 10, 1992.

"Draft Permit Application for Bio-Medical Waste Processing Facility - Albuquerque, New Mexico", prepared for Med. Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, July 15, 1992.

"Documentation in Support of a Bio-Medical Waste Transfer Facility, Las Cruces, New Mexico", Prepared for Med. Compliance Services, Inc., Submitted to NMED and City of Las Cruces, July 1, 1992.

"Transportation Contingency Plan for Bio-Medical Waste Services", Prepared for Med. Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, June 15, 1992.

"Documentation in Support of a Proposal to Provide Bio-Medical Waste Services to the New Mexico Hospital Association", Prepared for Med. Compliance Services, Inc., Submitted to Hospital Services Corporation, May 15, 1992.

"Alternative Redistricting Plans for the City of Brownfield, Texas - City Council Precincts", Prepared for the City of Brownfield, Texas, May 15, 1992. Pre-clearance Granted.

"Alternative Redistricting Plans for the Post Independent School District - School Board Trustee Districts", Prepared for the Post Independent School District (Garza County, Texas), June 30, 1992. Pre-clearance Granted.

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