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June 15, 2007

BY HAND

Mr. Joel H. Peck, Clerk
State Corporation Commission
Document Control Center, First Floor
1300 East Main Street
Richmond, VA 23219

Re: Application of Virginia Electric and Power Company
For a certificate of public convenience and necessity
for facilities in Loudoun County: Pleasant View – Hamilton
230 kV Transmission Line and 230 kV-34 .5 kV
Case No. PUE-2005-00018

Dear Mr. Peck:

Enclosed for filing are an original and fifteen copies of the ***Direct Testimony on Remand of Katherine H. Rudacille, Charles Simmons, Donald E. Zimar, Jason H. Gart, and Steven A. Studabaker*** in the above matter.

I have also enclosed an additional copy. I would appreciate it if you would indicate the fact and date of filing by affixing your file stamp to the additional copy and returning it to my courier.

Thank you for your assistance.

Sincerely,

Cliona Mary Robb

CMR/nh
Enclosures
cc: Service list
Todd Hafner
Kate Rudacille
Charles Simmons

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CERTIFICATE OF SERVICE

I hereby certify that a true copy of the following documents were hand-delivered, emailed, faxed, sent via overnight delivery, and/or mailed, first-class postage prepaid, to the parties listed below on this 15th day of June, 2007.

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List of Park Authority Remand Testimony and Appendices

Rudacille Testimony

Simmons Testimony

Zimar Testimony
--DEZ-1 Zimar Professional Qualifications
--DER-2 Zimar Inventory

Gart Testimony
--JHG-1 ZMAP 2005-0010 Proposed Expansion of Goose Creek

Studabaker Testimony
--SAS-1 Studabaker Professional Qualifications

Appendix A Chart of Remand Issues

Appendix B VDOT Land Use Permit

Appendix C Legend Showing Photo Locations for Tower 2, Tower 3, Tower 4, and Tower 5

Appendix D Tower 2 Photos (# 1 and # 2)

Appendix E Tower 3 Photos (# 3 and # 4)

Appendix F Tower 4 Photos (# 5 and # 6)

Appendix G Tower 5 Photos (# 7 and # 8)

Appendix H Legend Showing Photo Locations for Tower 14 and Tower 15

Appendix I Tower 14 Photos (# 12 and # 13)

Appendix J Tower 15 Photos (# 14 and # 15)

Appendix K Legend Showing Photo Locations for Tower 17

Appendix L Tower 17 Photos (# 16, 17, 18)

Appendix M Legend Showing Photo Locations for Tower 21

Appendix N Tower 21 Photos (#19, #20, #21)

Appendix O Legend Showing Photo Locations for Tower 24

Appendix P Tower 24 Photos (# 22, # 23, # 24, # 25)

Appendix Q Photo of Beaumeade-Greenway Pole

Appendix R Virginia Power Responses to Park Authority Interrogatories

Appendix S Photo of Distribution Clearing # 1

Appendix T Photo of Distribution Clearing # 2

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

Application of	)	
	)	
VIRGINIA ELECTRIC AND POWER COMPANY	)	
	)	
D/B/A DOMINION VIRGINIA POWER	)	
	)	Case No. PUE-2005-00018
For a certificate of public convenience and	)	
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Pleasant View-Hamilton 230 kV Transmission Line	)	
and 230 kV-34.5 kV Hamilton Substation	)	

Pre-filed Direct Testimony on Remand
of

Katherine H. Rudacille

on behalf of

Northern Virginia Regional Park Authority

June 15, 2007

PRE-FILED DIRECT TESTIMONY ON REMAND

OF

KATHERINE H. RUDACILLE

Q. Please state your name and position.

A. My name is Katherine H. Rudacille, and I am Deputy Director of Planning and Grants for the Northern Virginia Regional Park Authority (the "Park Authority").

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of the Park Authority to address the topics set forth in the February 21, 2007 Order Remanding for Further Proceedings ("Remand Order") regarding the Application of Virginia Electric and Power Company for Approval and Certification of Electric Facilities: Pleasant View-Hamilton 230kV Transmission Line (the "Application") docketed as SCC Case No. PUE-2005-00018 ("Application").

Q. What is the purpose of your testimony?

A. My testimony provides an overview of the Park Authority testimony in this proceeding and then specifically addresses issues related to construction time and detailed engineering for Modified D.

Q. What is your educational and professional background?

A. I have a Bachelor of Science in Forestry from Virginia Tech. I have been employed by the Park Authority since 1986 as follows: Administrative Associate (1986), Permits Administrator (1987–1994) Land Administration & Planning Manager (1995-2005), and Deputy Director of Planning and Grants for the Northern Virginia Regional Park Authority (2006—present). Prior to working for the Park Authority, I have worked in a

variety of jobs with other park agencies, state and federal.

Q. What are your responsibilities in your current position?

A. I work in the Planning and Development department at the Park Authority, an independent government agency that manages 20 Regional Parks and more than 10,000 acres of land. My areas of responsibility include permitting and licensing of non-park uses on Park Authority lands, land and easement acquisition, park and trail planning, annual and long-range capital budgeting, and administering grant applications. During my 20 years at the Park Authority I have worked on numerous W&OD Trail projects and am extremely familiar with the entire 45-mile long park.

Q. Please describe how the Park Authority witnesses will address the topics set forth in the Remand Order.

A. The Park Authority's testimony will address all seven remand topics set forth on pages 8 and 9 of the Remand Order, as shown in Attachment 1 to my testimony. First, I will provide a general overview of the Park Authority testimony, and then I will address Remand Topic 1 (construction time) and Remand Topic 3 (detailed engineering) based on my familiarity with the physical constraints within the W&OD Park and my familiarity with Virginia Power's execution of work plans associated with transmission line installation within the W&OD Park. Second, Mr. Simmons, based on his experience in overseeing the design, construction, maintenance, and operation of transmission lines, will address Remand Topic 1 (construction time), Remand Topic 3 (detailed engineering), Remand Topic 4 (future transmission routing), Remand Topic 5 (the use of XLPE rather than HPFF for underground lines), and Remand Topic 7 (siting an underground line adjacent to the W&OD Park). Third, Mr. Zimar will, based on his

forestry expertise, address Remand Topic 3 (detailed engineering concerning the impact of specific pole placements). Fourth, Mr. Gart will, based on his expertise in historical matters, address Remand Topic 6 and 9 (the impact of undergrounding on historic districts). Fifth, Mr. Studabaker will, based on his expertise in real estate appraisal, address Remand Topic 2 (right of way acquisition costs).

Q. **Please provide an overview of the Park Authority's assessment concerning Remand Topic 2 (right of way acquisition) and Remand Topic 4 (future transmission benefits).**

A. The Park Authority's testimony will show that these topics have been extensively considered by Virginia Power and will also show that Virginia Power's analysis makes sense and should be adopted by the Commission. The Park Authority testimony supports Virginia Power's analysis that right of way acquisition on D3 will cost twice as much as right of way acquisition on E7, and that right of way acquisition on Modified D is by far the most expensive (over twice as much as E7 and exceeding D3 by $2 million). The Park Authority's testimony supports Virginia Power's analysis that D3 and E7 offer significant benefits for future transmission routing and that Modified D offers much fewer benefits in this regard.

Q. **Please provide an overview of the Park Authority's assessment concerning Remand Topics 6 and 7 (underground impacts on right of way, cost, reliability, and impact on scenic assets, historic districts, and environment).**

A. The Park Authority's testimony will show that Virginia Power has duly considered the impacts of undergrounding on right of way, cost, reliability, scenic assets, historic districts and environment, and Virginia Power's assessment generally makes sense.

Virginia Power's testimony shows that more right of way is physically impacted by the E7/D3 segments used for undergrounding, due to installation of additional facilities for a future double circuit. Virginia Power's testimony also shows that the Modified D segments have considerably greater impacts on residences and historic and cultural resources. Virginia Power's testimony shows that the E7/D3 segments have essentially the same impact on forested lands and floodplain, with the important exception that Modified D crosses three streams, while the E7/D3 segments do not cross any streams. Finally, the E7/D3 segments offer more potential for screening the visual impacts of terminal stations, which is a significant consideration since the entire rationale for undergrounding is to minimize visual impacts. Overall, Virginia Power's testimony regarding physical and visual impacts appears to support undergrounding on the E7/D3 segments, while Virginia Power's cost analysis shows that a much greater cost is required to achieve these benefits. The Park Authority's testimony will support a finding that undergrounding on the E7/D3 segments will minimize physical and visual impacts on resources. The Park Authority testimony will not address cost issues related to undergrounding.

Q. Please provide an overview of the Park Authority's assessment concerning Remand Topic 5 (XLPE vs. HPFF).

A. Regarding type of underground cable, the Park Authority will note that Virginia Power's testimony appears to support consideration of XLPE, which is consistent with Mr. Simmons' previous testimony.

Q. Please provide an overview of the Park Authority's assessment concerning the remaining Remand Topics.

A. For the remaining Remand Topics, which concern construction time and detailed engineering data, the Park Authority will testify that there is a sharp contrast between Virginia Power's extensive examination of the previous Remand Topics and its cursory analysis of these Remand Topics. Regarding construction time, Virginia Power only provides a general timeframe that does not make a distinction between the different routes, other than to add six months if the portions of E7 or D3 being undergrounded extend to the Hamilton substation. Regarding detailed engineering data, Virginia Power limits its investigation to *tentative* pole placements on aerial photos. Although Virginia Power's remand testimony on undergrounding discusses in some detail the disadvantages posed by excavated soil, heavy equipment, and road crossings, it makes no such analysis regarding these factors for pole placement on the Modified D route, noting that it has not done a ground survey. The Park Authority's assessment is that a ground survey--a thorough review of conditions on the ground, rather than from the air--is essential in accurately assessing the impacts of Modified D, and its testimony provides such analysis.

Q. Regarding construction time, which is the first topic that you will directly analyze in your remand testimony, what is your basic conclusion?

A. My basic conclusion is that routing along Modified D will entail more time than routing along D3 or routing along E7.

Q. What is the basis for this conclusion?

My conclusion is based on my review of Virginia Power's Remand Testimony, my review of Virginia Power's responses to interrogatories following its Remand Testimony, and my recent experience with Virginia Power's execution of work plans associated with transmission line installations within the W&OD Park.

Q. Regarding detailed engineering, which is the second topic that you will directly analyze in your remand testimony, what is your basic conclusion?

A. My basic conclusion is that the pole placement and design demonstrated in Virginia Power's Remand Testimony will not mitigate but actually causes severe impacts on areas surrounding the Modified D route. Segment B.1 and the alternatives presented in JAC-2, 3, and 4 place the poles virtually in the center of the park (which was specified in the original hearing to not be the intent of the route), and yet to move these poles just outside the park significantly impacts the adjacent homes.

Q. What is the basis for this conclusion?

A. My conclusion is based on my review of Virginia Power's Remand Testimony, my review of Virginia Power's responses to interrogatories following its Remand Testimony, and my recent experience with Virginia Power's execution of work plans associated with transmission line installations within the W&OD Park.

Q. How does your recent experience with Virginia Power's execution of work plans associated with transmission line installations with the W&OD Park support your conclusions regarding construction time and detailed engineering?

A. My recent experience supports this conclusion because the Beaumeade-Greenway project, which is a much more limited construction project along the W&OD Park project than the Modified D project, has proven to be far more complicated and far more difficult to implement than was envisioned when the State Corporation Commission authorized the Beaumeade-Greenway line. That authorization resulted in a work plan which, based on the terrain and vegetation within the W&OD Park, proved to be unworkable and needed to be revised, and even with revisions resulted in considerable impacts to the

W&OD Park. The fact that this far more limited project within the W&OD Park has involved unforeseen complications, which have delayed construction, is proof that, even with an actual work plan (which Modified D does not come close to having), construction within the W&OD Park will result in construction delays notwithstanding the "engineering" outlined in Virginia Power's Remand Testimony. Mr. Cox's remand testimony says that actual engineering with a detailed ground survey and exact pole placements will not take place until a route is approved by the Commission. It has been my experience that the map is not the territory—that is, the on-the-ground factors are far different from tentative pole placements on a map, due to specific site constraints, access, nearby development, and other issues affecting constructability that do not show up on a plan.

Q. Haven't you already described the Park Authority's experience with the Beaumeade-Greenway/BECO project in your previous testimony?

A. Yes, but that testimony involved the first stage of the project in 2005 for the Beaumeade-Greenway portion of the line along the W&OD. My current testimony involves the Park Authority's most recent involvement in the second stage, the Beaumeade-Beco project in March 2007.

Q. Why do you describe the Beco project as a far more limited construction project along the W&OD Park than the Modified D project would be?

A. It is more limited in several regards. First, the number of transmission poles involved was much fewer: six for Beaumeade-Greenway and one for Beaumeade-Beco as compared to twenty-five for Modified D. Second, the amount of clearing involved is much less, because the Beaumeade-Greenway/Beco projects are located within a section

of the W&OD that is already cleared for existing transmission lines. Third, the terrain is generally more hospitable to transmission line projects: five of the six poles on the Greenway project are located within a section of the W&OD that is not characterized by the steep cuts and fills that are along the Modified D route. The sixth pole is on a steep fill area that Virginia Power had to come back and stabilize after construction because the disturbed embankment was sloughing off and undermining the trail pavement (see Appendix Q to Park Authority Remand Testimony). Fourth, the Greenway and Beco projects do not have to take into consideration close proximity to residential neighborhoods: the Beaumeade projects are bordered on the south side by commercial/industrial development, and bordered on the north side by undeveloped land. Virginia Power was able to access the poles sites without driving on the Trail and without disturbing adjacent development. Modified D is, on both its north and south borders, immediately adjacent to homes.

Q. Why do you say the Beco project has proven to be far more complicated and far more difficult to implement than was envisioned when the State Corporation Commission authorized the Beco line?

A. That authorization resulted in a plan which, based on the terrain involved within the W&OD Park, has proven unworkable. After meeting in the field to look at construction access, Virginia Power construction staff questioned whether the proposed pole to run the line to the Beco substation could be relocated or redesigned so as to be "buildable." Virginia Power is having a difficult time getting construction access to the proposed pole site. Construction access is constrained because the W&OD paved and gravel trails are at the top of a narrow fill section, similar to the terrain on Modified D, and the proposed

pole site is at toe of the railroad embankment, and access is further limited by the following factors: adjacent Broad Run creek, a narrow wooden pedestrian bridge over Broad Run, the high fill section, park safety fence to protect trail users from the steep drop off, an existing distribution line, and an adjacent newly developed private golf course. It that appears Virginia Power can only access the pole site by driving ¾ of a mile from the nearest road on the same side of the creek as the pole, and by crossing a tributary stream paralleling the park.

Q. **You stated earlier that your review of Virginia Power's Remand Testimony and your review of Virginia Power's responses to interrogatories support your conclusions regarding construction time and detailed engineering. Explain your assessment of Mr. Cox's interrogatory response concerning use of the gravel trail.**

A. In question 9 of the Park Authority's 4th Set of Interrogatories propounded to Virginia Power, the Park Authority asked Virginia Power about its planned method and location of access roads for overhead lines. Mr. Cox's response indicated that Virginia Power has not given this issue any serious consideration, as discussed in Mr. Simmons' remand testimony. Then Mr. Cox went on to say that "access on the W&OD Trail would be on the equestrian trail if at all possible, in which case little surface protection would be required." This response is troubling in several regards. First, installation of transmission lines for the Dulles Junction-Reston project (SCC Case No. PUE-1999-0009) made it impossible to keep the trail open by only using the gravel trail for access, as illustrated in Appendix N(2) to the Park Authority's Pre-filed Direct Testimony submitted on November 30, 2005. This photo shows a crane taking up the entire flat space in the cut section: this photo is in an area of Reston where the bottom of the cut

contains both the paved and gravel trails, and both trails were wider sections than they are in the Shenstone section of Modified D. In Reston, the paved trail is 12 feet and a full 10 foot gravel section plus 2 foot shoulders and 4 foot median (30 feet total), whereas in Shenstone, the paved trail is 8 feet and the gravel trail is either narrower than its 10 foot typical section due to lack of horizontal space to locate it, or the gravel trail meanders on surrounding grade above the cut. In Shenstone, the cut sections are narrower so only the paved trail fits in the flat space. Therefore, big construction equipment will not fit in the narrower sections. Even though Virginia Power had a work plan for its construction operations on the W&OD Park for the Dulles Junction-Reston project, and even though the work plan included a provision for matting the paved trail, the paved trail still was damaged and had to be patched.

Two other significant considerations concerning the use of the W&OD Trail Park as an access route is that (a) Virginia Power's existing easement would entitle it to use the Park for such purposes and (b) there simply is no easy way to get on and off the Modified D route. When faced with bringing large construction equipment down Route 7, winding through the entire Shenstone neighborhood to Cannongate Drive, and then going through Shenstone backyards and avoiding Shenstone's drain fields to get to the poles located just outside the W&OD Park property, or, instead, coming off Dry Mill Road and using an existing easement within the Park, it is hard to believe that Virginia Power's contractor would choose the first option rather than the second option.

Q. Do you have other concerns about Mr. Cox's response?

A. Yes: Mr. Cox's response downplays the impact of construction on the trails by saying Virginia Power will use the gravel trail for access and will mat the paved trail. It's simply

not possible to use the gravel trail to construct the line north of the park where the gravel trail is on the south side of the paved trail, from the 4-H property eastward through Shenstone for about 4,000 feet (JAC-1, sheets 4, 5, part of 6, 8, 9 and 10). (This is shown in NVRPA Trail Development Plan, sheet 7 of 21, station 2118+00 to sta. 2137+00, sheets 5 and 6 of 21, sta. 2077+00 to 2096+00.) Where the gravel trail is on the north side of the park, 1,000 feet of gravel trail abuts the paved trail with no median due to the narrow fill sections, so it won't be possible to stay solely on the gravel. Even where Virginia Power would stay on the gravel on the W&OD Park's north side, Virginia Power would have to clear vegetation just to get large vehicles onto the horse trail: it will not be possible to get an 18-wheel low boy, concrete truck, crane, and similar vehicles onto the gravel trail without doing clearing. Just as Mr. Koonce's remand testimony points out for underground construction, pole locations on and near the W&OD are accessible primarily from the two ends. Equipment must be moved longitudinally along the route since there are no public roads crossing the park and adjacent residential areas on Modified D, and the sheer size and weight of the equipment means a substantial amount of temporary road building must occur for materials to be brought to the site. These same challenges would apply to the park trails, as they are not designed to withstand heavy loads, nor are clearances around the trails maintained for passage by large vehicles. The Park Authority only mows and trims horizontally and vertically for equestrians and pedestrians.

Finally, the list of heavy equipment used to set poles is considerable. For instance, the Beaumeade/Greenway work plan called for the following:

<u>Concrete Foundation Installation</u>

A. Pressure digger (Auger diameter to 8'0" and 28' digging depth)

B. Concrete Truck (9 yard capacity)

C. Pick up (3/4 ton—1 ton crew cab)

D. Hoe ram (rock removal—32' reach)

E. Boom truck (12 ton capacity)

G. Generator (3500 watt)

F. Back hoe/ rubber tired loader (3/4 yard front bucket—14' reach backhoe)

F. Dump truck (single or tandem axle)

Pole Installation Construction

A. Crane (rubber tired 45-100 ton)

B. Bucket truck (75'-150' reach)

C. Road tractor Trailer (tandem axle with 40' trailer)

D. Material truck (3 ton stake body)

E. Pick up truck (3/4 ton- 1 ton crew cab)

F. Small bulldozer (D3 with 6' blade)

G. Wire pulling equipment

It is difficult to see how all this equipment can be restricted to a 10 foot wide or less trail for access, and to a 2,500 square foot area around each pole for installation, without damaging park resources. The lack of response on how construction will be implemented also demonstrates that virtually no planning has been done to consider how the Company will actually be able to keep the trails open for safe public use during the year and a half to two years of installation. As Mr. McCray described in his testimony previously filed on behalf of the Park Authority, it is practically impossible to close the trail due to the public's ability to enter the park by foot almost anywhere.

Q. What is your assessment of the proposal to move the existing distribution line onto the transmission poles that would be installed for Modified D?

A. This proposal is a good example of the theory that it might look good on paper, but this plan does not work on the ground. On the surface, the idea of combining the distribution and transmission poles seems like a good approach, and the Park Authority tried hard to have this happen in a previous case (PUE-2001-00154), but Virginia Power strenuously opposed to this approach. If Virginia Power's testimony in PUE-2001-00154 is given any credibility, underbuilding the distribution line also would add to the construction time and cost, and would entail additional risks to Virginia Power workers. In the current case, co-location of the distribution lines on the transmission poles makes no sense at all. Virginia Power's aerial photos enabled Virginia Power to determine that the distribution line runs, in Mr. Cox's words, "generally parallel to the Trail property." What Virginia Power's aerial photos did not enable Virginia Power to determine, and what is evident from an on-site evaluation, is that moving the distribution lines onto the transmission poles would exacerbate the amount of tree clearing. The advantage of using the extended height transmission poles would be entirely defeated by stringing distribution wires that require much lower clearance heights. In addition, the distribution line would be moved much closer to the Park property, further exacerbating the impact on Park vegetation. This impact is not trivial, as illustrated in Appendix S and Appendix T of the Park Authority Remand Testimony showing ongoing distribution clearance activities as of June 13, 2007 on Segment 40 on the north side of the W&OD Park in the vicinity of Kincaid Forest. This proposal specifically shows why the Commission should not rely on Virginia Power's "detailed engineering" to determine the impact of Modified D: the material

Virginia Power provided on Remand is not really detailed engineering because Virginia Power will not perform that until the route is determined, and the real impacts will not become evident until *actual* site conditions are evaluated.

Q. What is your overall assessment of the detailed engineering in Virginia Power's Remand Testimony, particularly the location of the extended height structure locations?

A. I do not believe the location of the poles or their extended height will mitigate having a major construction project within a section of the W&OD Park that has never been impacted by transmission lines. The presence of poles, some right in the middle of the park, and the clearing for construction and maintenance will completely change the character of a section of the park that is secluded by an arching canopy of trees. Using the aerial photos in JAC-1 and JAC-4, I was able to locate some the of the features visible in the photos on site, such as pavement markings and driveways on the Trail, and was able to locate the vicinity of the tentative pole locations. From these locations, I used a measuring wheel to determine the approximate distance to the next poles based on the span lengths shown on Mr. Cox's plan and profiles. I took photos at several of these pole locations to give a sense of the vegetation and terrain on and adjacent to the park. See Appendices C to P to Park Authority Remand Testimony.

Q. Please describe the photographs and corresponding legends that are in the Park Authority Remand Testimony Appendices C through P.

A. These appendices include a series of photographs that were taken on June 13, 2007. The photos were taken from the approximate location of the transmission towers that are shown in Virginia Power's attachments JAC-1 and JAC-4, which were included in its

remand testimony. As a matter of fact, the Park Authority scanned these attachments and marked on them to create the legends and to note the location and direction of the photographs. As you can see, we added in large blue or white type face the corresponding tower numbers to make them more visible.

Appendix C notes the location and direction of photographs 1 through 8. These first eight photographs were taken at towers 2, 3, 4 and 5 looking in each direction down the trail. These photos note the significant amounts of vegetation and tree cover that exist on this portion of the trail. In photos 3 and 4 you can see some of the dense buffer, which in many places separates the paved trail from the gravel trail, allowing equestrians and walkers to separate themselves from the paved trail traffic.

Appendix H notes the location and direction of photographs 12 through 15. Photos 12 and 13 were taken near tower 14. Photo 12 is looking down the gravel trail and photo 13 is looking out toward the Shenstone subdivision. Photos 14 and 15 were taken near Tower 14 and also look out toward Shenstone. You can see in these photos how close these residences are to the proposed transmission line.

Appendix K notes the location and direction of photographs 16, 17, and 18. All three were taken from the approximate location of Tower 17, and these photos further illustrate just how close people live to this proposed transmission line route. In photo 17, you can see the existing distribution pole that is also shown on sheet 7 of JAC-1.

Appendix M notes the location and direction of photographs 19, 20 and 21, which were taken from the approximate location of tower 21 on JAC-4. These photos show the trail is in a deep cut here and that some of the tall trees at the top of the cut would be at a higher elevation than the base of the proposed tower near the elevation of the trail,

therefore increasing the amount of clearing or topping that would be required. It appears that the tower location would be somewhere in the embankment shown in photo 21. This also illustrates how difficult it would be to construct the poles and protect the public and the trail in this area.

Finally, **Appendix O** notes the location and direction of photographs 22 through 24, which were taken from the approximate location of tower 24 on JAC-4. These photos illustrate more of the significant tree canopy and the effect it provides on the trail. They also show more of the steep slopes and embankments that exist on much of the trail and that would cause access and other construction difficulties.

Q. Please describe your overall impression of the Modified D pole sites on this particular section of the W&OD Trail Park.

A. I was struck by how close together the proposed transmission poles would be. The short spans placed the transmission poles almost as close together as the existing distribution poles. For the poles on the trail, since the areas surrounding each pole would be cleared for construction access, it became clear that any reduced tree clearing due to increased pole height would be offset by the short span length. As I walked along the yards of the adjacent homes, it also became clear that some houses would be impacted by more than one transmission pole, and that the added height and number of poles would really increase that impact. Because the land slopes down from Route 7 toward the W&OD, the taller poles also will be more visible to the entire Shenstone subdivision, not just homes immediately by the park. Overall, even with the significant pole relocation and design efforts, the impacts on the scenic and historic resources and the environment of this route simply cannot be mitigated, and therefore another route should be chosen.

Q. Does this conclude your pre-filed direct testimony?

A. Yes. #817666v5

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

Application of	)	
	)	
VIRGINIA ELECTRIC AND POWER COMPANY	)	
	)	
D/B/A DOMINION VIRGINIA POWER	)	
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Pre-filed Direct Testimony on Remand
of

Charles Simmons

on behalf of

Northern Virginia Regional Park Authority

June 15, 2007

PRE-FILED DIRECT TESTIMONY ON REMAND

OF

CHARLES SIMMONS

Q. Please state your name.

A. My name is Charles Simmons.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of the Northern Virginia Regional Park Authority (the "Park Authority") to address topics set forth in the February 21, 2007 Order Remanding for Further Proceedings ("Remand Order") regarding the Application of Virginia Electric and Power Company for Approval and Certification of Electric Facilities: Pleasant View-Hamilton 230kV Transmission Line (the "Application") docketed as SCC Case No. PUE-2005-00018 ("Application").

Q. Are you the same Charles Simmons who submitted pre-filed direct testimony on November 30, 2005 and who testified during the evidentiary hearings in 2006 in this proceeding?

A. Yes.

Q. What is the purpose of your testimony?

A. My testimony will address Remand Topic 1 (construction time), Remand Topic 3 (detailed engineering), Remand Topic 4 (future transmission routing), Remand Topic 5 (the use of XLPE rather than HPFF for underground lines), and Remand Topic 7 (siting an underground line adjacent to the W&OD Park).

Q. Please provide your overall assessment of the information currently before the Commission concerning remand issues.

A. Virginia Power has conducted considerable analysis of undergrounding, future transmission planning, and right of way acquisition costs, but Virginia Power has done relatively little analysis of construction time or how its detailed engineering will be implemented for *overhead* construction along the Modified D, D3, and E7 routes. Virginia Power's analysis of construction time and implementation has not differentiated between routes except to indicate an underground option to Hamilton would require up to 6 months additional time over the other options. Information on the construction impacts is limited to the underground implementation. When those same factors are considered for overhead construction along the Modified D, D3, and E7 routes, more accurate conclusions can be drawn concerning construction time and concerning implementation of its engineering design. It is crucial to consider such factors because, as discussed in Ms. Rudacille's testimony, it is the *implementation* of engineering design by Virginia Power's contractors that plays a key role in how the W&OD Park is impacted by transmission line construction. I don't mean to fault Virginia Power in this regard: Virginia Power is in the business of planning and designing transmission lines, and then it turns the construction of such lines over to contractors. However, it is critical that the Commission understand the difficulties likely to be encountered at the construction stage when it evaluates whether the detailed engineering for the Modified D route is capable of truly mitigating impacts on the W&OD Park, and when it evaluates the construction time required for Modified D, D3, and E7.

Q. You stated that Virginia Power has done considerable analysis of undergrounding. Can you elaborate on that?

A. Yes. I have reviewed Donald Koonce's Remand Testimony for Virginia Power concerning undergrounding, and I have reviewed Virginia Power's responses to interrogatories that included undergrounding assessments on materials, costs, and the like. Virginia Power appears to be giving XLPE more serious consideration, and that approach makes sense to me, as discussed in my response to Staff's cross examination during the 2006 evidentiary hearings. Also, Mr. Koonce notes in his Remand Testimony that underground will have significantly more construction impact due to factors like the greater amounts of excavated soil, the weight of heavy equipment like manholes and cable reels, and the crossings of Route 7. I agree that all these factors should be taken into account, but such factors should not be limited to analyzing the impacts of underground construction. They are equally applicable to overhead construction in constricted areas like the W&OD Trail Park and Route D3, as I will discuss in more detail later in my testimony.

Q. You stated that Virginia Power has also done considerable analysis of transmission planning. Can you elaborate on that?

A. Yes. I have reviewed Mr. LaVigne's Remand Testimony for Virginia Power concerning reasonably expected future transmission lines, and I have reviewed responses to interrogatories that Virginia Power has provided since the issuance of the Remand Order. Based on these materials, and based on my own experience in overseeing the design, construction, operation, and maintenance of transmission lines, I think it makes all the sense in the world to make provisions for a future double circuit transmission line when

constructing a single circuit transmission line now. The rationale here is that, if the Commission ultimately decides down the road that a Middleburg to Hamilton line is necessary to deal with increasing load and to ensure greater reliability, then one option available for consideration would be to simply string a second conductor on several miles of existing transmission poles. I am not saying that would be the only option the Commission should consider at that point, nor am I saying that additional right of way and pole construction should be done solely on the basis of accommodating a future line. However, if there are other considerations that make a route viable, and if that route could also accommodate a future transmission line, then I think the Commission really ought to take that into consideration, especially in light of how contentious siting issues are getting to be in the Northern Virginia area. By Mr. LaVigne's calculations, E7 would permit Segments 4, 6, 22, 23, 25, 49, 50, 10c, 51, and 52 (to its southern portion)—totaling 9.73 miles—to be utilized for any future double circuit, and D3 would permit Segments 1, 4, 6, 22, 23, 25, and 49—totaling 6.01 miles—to be utilized for any future double circuit. In sharp contrast, only Segments 1, 4, and 6—totaling 2.36 miles—could be utilized for a future double circuit. I do not think there is any dispute as to increasing right of way costs, greater concern over environmental impacts, increasing contention over siting issues, and, now with the new federal legislation, possible new time constraints on considering transmission line applications for the Northern Virginia region. All these factors support considering use of a route for a future double circuit if, I as I said, the route is an otherwise viable route.

Q. You stated that Virginia Power has also done considerable analysis of right of way acquisition issues. Can you elaborate on that?

A. Yes. I should emphasize here that Mr. Studabaker is providing a more thorough analysis of right of way acquisition issues. My point here is that, simply based on the materials Virginia Power has provided in responses to interrogatories submitted since the Remand Order, its analysis of the comparative costs for right of way acquisition for the Modified D, D3, and E7 routes should be given considerable weight by the Commission, while its limited analysis of construction issues should be given less weight.

Q. You stated that Virginia Power has done relatively little analysis of construction time or how its detailed engineering will be implemented for overhead construction. Can you elaborate on that?

A. Yes. The basis for this conclusion is my review of Mr. Cox's Remand Testimony for Virginia Power and his response to interrogatories included in Virginia Power's June 5, 2007 response to the Park Authority's Fourth Set of Interrogatories (see Appendix R to Park Authority Remand Testimony). Mr. Cox's Remand Testimony regarding construction time did not provide any analysis of the relative times for *overhead* construction time. In addition, Mr. Cox's Remand Testimony concerning detailed engineering for Modified D was based entirely upon an *aerial* survey, which he said permitted Virginia Power to determine more precisely how the line could be engineered, "including minimizing the removal of the tree canopy." Mr. Cox indicated in his Remand Testimony that Virginia Power had not done a ground survey: instead, a "detailed ground survey" would not be done until a route had been established by the Commission. This lack of analysis concerning the specific impacts of overhead construction was borne out by Mr. Cox's responses to interrogatories. In Virginia Power's June 5, 2007 response to the Park Authority's (see Appendix R to the Park Authority Remand Testimony, Question

9), Mr. Cox indicated that the specific method and location of access roads for an overhead line *has not been determined* and would not be known until a contractor had inspected each site. Similarly, in response to question 10 concerning the width of access roads (see Appendix R, Question 10), the surface treatment for such access roads, and the proposed reclamation process, Mr. Cox said that such matters had not been determined and would not be known until a contractor had inspected each site. In response to question 11 seeking diagrams showing methods of structure placement that demonstrate the ability to erect the tall structures within a 2500 square foot area, (see Appendix R, Question 11), Mr. Cox noted that no detailed planning has been done, and the exact shape of area that would be cleared and required by the contractor would not be known until the structure sites were staked and the sites had been visited by the contractors, Virginia Power, and the Park Authority jointly in connection with a work plan. Ms. Rudacille's Remand Testimony will speak more directly to the difficulties encountered in executing work plans associated with the installation of transmission lines within the W&OD Park. My point here is simply that Virginia Power has not done the kind of analysis necessary to determine what impacts will result from implementation of its engineering design, nor has it done the kind of analysis necessary to determine construction time for overhead lines on Modified D, D3, and E7. Again, I don't necessarily mean to fault Virginia Power in this regard: Virginia Power is in the business of planning and designing transmission lines, and then it turns the construction of such lines over to contractors. However, the Commission would be remiss if it relied solely on Virginia Power's analysis to assess construction time required for routes E7, D3, and Modified D, and the Commission

would also be remiss if relied solely on Virginia Power's analysis for detailed engineering data to assess the impacts of the Modified D route.

Q. **In regard to the construction time required for overhead routes E7, D3 and Modified D, do you have an opinion as to which of these would require the longest time period?**

A. Yes. There is no question in my mind but that Modified D will require the most time to construct.

Q. What leads you to this conclusion?

A. There are a number of factors that must be considered in making such a determination as to the construction time for various routes including:

- The number of structures involved
- The type of structures involved (tangent or angle)
- The size of the structures (height and diameter)
- The size of the foundations
- Equipment used
- Method of access and subsequent reclamation requirements
- Disposal of excess excavation material
- Traffic control when working on or near highways

In addition to these factors, Modified D would require special efforts to protect the Trail users during construction.

Q. Can you quantify these factors impacting construction time to some degree for D3?

A. Yes. D3 has the fewest number of structures involved: according to the oversize map made available by Virginia Power in its June 1, 2007 response to question 9 in

Davenport's Fourth Set of Interrogatories, approximately 93 structures will be used, but nearly 40% are angle structures. This is significant because angle structures require greater strength than tangent structures to accommodate the transverse loading created by the angles. Consequently, the foundations for angle structures tend to have a larger diameter and a deeper foundation requiring more time and effort. The installation of foundations is often the pacing item in transmission line construction. For D3, the height is expected to average 120 feet with the tangent structures 4 feet in diameter and the angle structures up to 6 feet in diameter. Foundations will range from 6 feet in diameter and 18 feet deep for tangent structures to 6 feet in diameter and 32 feet deep for angle structures. D3 has 5 residences within 100 feet and over 700 between 100 and 500 feet. This proximity to residences limits excess soil disposal options, requiring hauling such soil off site. This proximity to residences also limits the ability to utilize explosives in the excavation process, resulting in increased time for excavation. Over 50% of D3 is along roads, which maximizes need for traffic control and contributes to the potential for delays.

Q. Can you quantify these factors impacting construction time to some degree for E7?

A. E7 has the largest number of structures: according to the oversize map made available by Virginia Power in its June 1, 2007 response to question 10 in Davenport's Fourth Set of Interrogatories, approximately 113 structures will be used, but 66% of them (75 structures) are tangent structures and 34% (38 structures) are angle structures. These structures will also be expected to average 120 feet with the single circuit portion using the same structure and foundation dimensions as listed above for D3. E7 traverses areas that are relatively undeveloped (no homes within 100 feet and only 38 within 500 feet),

which will minimize any access problems. The more open and undeveloped area provides many more options than a constrained area such as the eastern portion of D3 and much of Modified D. The nature of the areas crossed will also permit Virginia Power to carry out the disposal of soil by spreading in the area of excavation as outlined in the Application. E7 has only 13% of its length along roads and would be expected to have minimum needs for traffic control and related delays.

Q. How does Modified D compare with D3 and E7 concerning the factors impacting construction time?

A. Modified D represents the worst of all worlds in my opinion. Basically, Modified D takes a route (D3) that already has complications associated with close proximity to residences and close proximity to roads and then exacerbates these problems by increasing the number and proximity of homes and placing it in a constricted, forested corridor on and/or adjacent to a heavily used Trail Park. The number of structures on Modified D are estimated to be only slightly lower than E7 (113 for E7 compared to 105 to 107 for Modified D) but over 50% of the structures on Modified D are angle structures. The structures and foundations on Modified D would be expected to have similar height and size characteristics as described for D3 and E7 except for the 24 to 26 structures on or adjacent to the W&OD Trail. These 24 to 26 structures (23% to 24% of the total structures on Modified D) average approximately 142 feet in height. These extended height tangent structures will have foundations of 6.5 feet or more in diameter and a depth of 20 feet or more with the angle structure foundations 8 feet or more in diameter and 32 feet in depth. Depending on the option chosen, the number of angle structures on or adjacent to the W&OD Park ranges from 14 to 17 (59 % to 65% of the extended height

structures.) The additional height and weight of these structures will require larger, heavier cranes than would be required for the structures proposed for D3 and E7. The weight of a single lift can be reduced by using segmented poles (see Appendix R, question 11), but this introduces the need for a bucket truck with a height capability of 100 feet or more to enable access to the bolting flanges or slip fit joints.

Q. How about access issues for the different routes and what effect would these issues have on construction time?

A. The major impact of access routes on construction time is the maintenance of such roads to limit environmental impacts and the restoration requirements following construction of the transmission line. A route such as E7 is in an area that is largely undeveloped and thus offers many options for access with minimal impact on the environment. Compaction of the earth by the heavy equipment and any rutting can generally be corrected simply by light grading, disking and seeding. Confined routes such as the eastern portion of D3 and the major part of Modified D have few options as to placement of access roads. This leads to conflicts, delays and greater restoration costs. The portion of Modified D on and/or adjacent to the W&OD is an example of access that is subject to severe constraints due to the slope of the cuts and fills and the need to minimize tree removal on the Trail property. While I am sure that Virginia Power will take steps to reduce damages to Trail property, severe damages are inherent in the building of roads and the transport of heavy equipment even with the best advance planning. It is evident at this point from Virginia Power's responses to interrogatories that there has been little advance planning as questions as to access roads, tree removal and restoration have not been addressed in any meaningful way. In Mr. Cox's recent response to Park Authority

interrogatories, he states that access would be on the equestrian trail "if at all possible," and if the paved trail were used for the access road, it would be matted to protect the surface (see Appendix R, question 9). Mr. Cox also notes in his response that if the route were adjacent to and off the W&OD Park, access would be from the outside of the property. Finally, he states that if access were located on the trail, such areas would be "rehabilitated" when construction is complete. I believe Ms. Rudacille's testimony will address these claims in more detail, but I did want to note that I am highly skeptical that using the W&OD Park as an access route can be avoided because Virginia Power already has an easement on Park property, and portions of Modified D will have to be constructed within the Park no matter what option is chosen. The reasonable expectation is that the damages to the W&OD Trail will be severe regardless of protective steps such as matting the asphalt bike trail. Complete replacement over traveled areas will be required. The need for protective measures, the more difficult maintenance requirements of the access roads in a cut and fill area, and the ultimate reconstruction of the Trail will all add to the construction time.

Q. You mentioned that the disposal of the excavated material was affected by the route selection. Would you elaborate on that factor?

A. The general practice in the industry and a practice Virginia Power proposes for E7 is to spread the excavated material over an area in the vicinity of each structure and incorporate this material into its reclamation effort. Such a practice would not be acceptable along streets, highways, the W&OD Trail Park, and in the yards of the residences abutting the Park. This would result in the need to haul away the excavated soil over portions of D3 and a major part of Modified D. This is not a minor factor. The

smallest foundations will require excavation and disposal of 20 yards of soil each with those for the 145 feet angle structures reaching the 60 yard level. This is an additional element of work that will certainly add to construction time.

Q. You have made reference to traffic control issues particularly as they pertain to D3 and Modified D. Can you quantify the impact on construction time of traffic control?

A. No. This won't be quantified until work zone protection plans are prepared and approved by VDOT. I can say with absolute certainty that the requirements for work zone protection including signage, flagmen, etc. are now a major factor when working along highways. The much higher length of route along roads for D3 and Modified D would be expected to result in Traffic Control Plans creating a much greater impact on construction time for these routes. See Appendix B to Park Authority Remand Testimony (Virginia Department of Transportation Land Use Permit.) The Permit states that by acceptance of the permit, the permittee accepts the responsibility among other obligations for compliance with all notification requirements and for compliance with the specifications of the Virginia Work Area Protection Manual. The Virginia Work Area Protection Manual is a comprehensive document of 240 pages which includes the elements of the Temporary Traffic Control Plans necessary for compliance as well as employee certification requirements.

Q. You earlier expressed the opinion that Modified D represented the worst of all the options. Can you summarize your reasoning that leads you to this conclusion?

A. The siting of transmission lines has been a major part of my duties over much of my 50 years in the industry, and I am aware of the trade-offs that must be considered. In

reviewing the routes presently under consideration, D3 has the fewest number of structures with a conventional average height of 120 feet. This lower number of conventional structures results in D3 having the lowest estimated construction cost of the three routes. When right of way acquisition costs are taken into account for D3, the total estimated cost of D3 is $38.7 million compared to the lowest cost route, E7, at $37.9 million. The downside for D3 is that D3 impacts an extremely high number of residences as well as historic resources. D3 also relies on occupying or sharing VDOT right of way with the potential for future conflicts and possible relocation expenses. (See Item 4 in Appendix B concerning a utility having to pay relocation expenses.)

E7 has the largest number of structures at 113 due to the length of a route that was designed to minimize impact on residences as well as critical environmental and historic areas. The structures are conventional 120 feet high structures. Unlike D3 and Modified D for which major portions of the routes were determined by existing facilities, the E7 route was developed as a new route designed to minimize environmental impacts. Despite the longer spans and higher percentage of tangent structures, E7 is, therefore, estimated by Virginia Power to have a higher construction cost. The location of this route, however, and its reduced impact is estimated to reduce right of way acquisition cost, resulting in E7 having the lowest estimated total cost at $37.9 million.

When comparing Modified D to the other two routes, all of the changes from D3 appear to be negative with no observable offsetting positives. The number of structures is estimated at 105 to 107 compared to the 93 of D3 and the 113 of E7. The difference in number of structures compared to E7 is not significant in view of the fact that 24 to 26 of the structures on Modified D are extended height structures with much higher costs and

visibility. The impact on residences, already extremely high on D3, is increased by the use of Modified D with an especially high impact on the Shenstone area by the close proximity of the 145 feet structures with essentially no shielding (see Appendix I, Appendix J, and Appendix L to Park Authority Remand Testimony showing photographs 12, 13, 14, 15, 16, 17 and 18, which were taken from the approximate location of towers 14, 15 and 17). These photos demonstrate that structures which are actually placed on the Trail, as shown on Mr. Cox's alternate alignments, would have no shielding from the Shenstone residences (there is no dispute that, at a minimum, a 2500 square foot space will be cleared for each 145 foot structure). The impact on these residences is further magnified by the short spans and larger number of structures created by attempting to parallel this segment of the W&OD Trail. Depending on the alignment selected, the average span east of structure 14 appears to range from 308 ft. to 360 ft. which is only marginally greater than the distribution line span lengths. This short span construction doubles or more than doubles the number of structures per mile in the Shenstone area when compared to the average span for E7.

The impact on the W&OD Trail is difficult to precisely quantify due to the limited amount of information and the limited planning of Virginia Power. It is apparent, however, that the impact will be severe under the best of circumstances, and it is an impact that is clearly not present for either of the other two routes. The cost of construction as estimated by Virginia Power is only marginally higher than D3 ($28 million for Modified D and $27.2 million for D3), which does not appear to reflect the 15% increase in the number of structures nor the need for the taller structures, difficulty of access along the Trail portions, and additional equipment such as bucket trucks. Even

with what appears to be a line construction estimate subject to revision with more investigation, the right of way acquisition cost will result in Modified D being the most costly as well as the most environmentally damaging route.

Q. Returning to the question of construction time, do you have an opinion as to the difference in construction time for D3 as compared to E7?

A. No. The time required for the estimated 20 additional structures on E7 could well offset the access issues, soil disposal requirements and increased traffic control requirements for D3. There is simply not enough information to make such a judgment at this point with any certainty. The one point that is clear is that Modified D would require considerably more work and, subsequently, more time than either D3 or E7. Additionally, E7 is a more straight-forward construction project with individual access roads to most structures and not a lot of room for surprises or unexpected problems. Building along roads and certainly along the Trail with the extended height structures as proposed for Modified D will entail addressing many unforeseen challenges and will require a lot of special equipment and planning by Virginia Power and the contractors involved, and will in all likelihood result in complications and delays that will not be encountered along E7.

Q. Will the pole placement and design alternatives displayed in the remand filing mitigate the impacts of Modified D on the area along or adjacent to the W&OD Trail?

A. No. Not in my opinion. The original concept of Modified D as proposed by the Hearing Examiner was to place the route far enough off the Trail property to avoid the need to cutting of trees on the Trail, which at that time was considered as 80 feet. As the hearing progressed, this distance continued to change. At the conclusion of the original

suspended hearing, we were left with the pole locations along the Trail ranging from the possibility of a few poles on the Trail near the Shenstone residences to pole locations a minimum of 30 feet off the Trail Property. The 30 feet has now turned into 10 feet as a maximum distance off the Trail property with 5 to 10 poles actually on the Trail adjacent to the bike path. Depending on which of the various alternate routes adjacent to the Trail is considered, the actual conductor installation on the Trail would range from 1500 to 2500 feet. In addition to the clearing required for the line clearance, each structure would require an area of a size to be determined at some time in the future to accommodate structure erection. The initial estimate of 2500 square feet per structure appears to have been made without any firm basis. Even accepting the 2500 square feet figure as valid, this would require the clear cutting of 1½ acres, a large part of which would involve trees on the Trail.

In my opinion the 2500 square foot estimate greatly underestimates the area required for excavation, storage and erection of the 145 foot poles. In response to interrogatories to Virginia Power seeking a basis for the 2500 square foot estimate, Virginia Power admitted no diagrams showing the space required had been developed. Its only substantive response was that the poles could be fabricated in flanged sections with lengths that would assist the contractor in erection. While the poles can be fabricated in sections, the major benefit is in the shipping and transporting to the site with little if any reduction in the area required for erection. To place personnel in a position to safely bolt the flanged sections together requires the simultaneous use of a crane and large bucket truck. The crane would be expected to have a boom height of 150 feet and a lift capability of 60 to 90 tons. The bucket truck would need to have a working height of 100

feet or more. The need for both of these large pieces of heavy equipment for erection would tend to increase the space requirement rather than reduce the space needed.

Q. What is your assessment of the proposal to move the existing distribution line onto the transmission poles that would be installed for Modified D?

A. This proposal precisely illustrates my point about the danger of the Commission relying on Virginia Power's lack of detailed engineering to determine the impact of Modified D. In theory, this sounds like a good idea. In fact, in a previous transmission proceeding, PUE-2001-00154, the Park Authority argued vigorously for this approach, but its efforts were defeated based on Virginia Power's opposition. In this proceeding, the proposal for co-location of the distribution lines on the transmission poles appears to be based on the impression that the distribution parallels the Trail. This is not the case. The distribution line does not parallel the Trail but rather, to use Mr. Cox's term "meanders" along with the center line ranging from just off the Trail property to over 100 feet from the northern edge of the Trail property. Moving the distribution line to the transmission structures could greatly increase the impact on the Trail rather than reduce impact. The intent of the use of the 145 foot structures was to increase conductor height to reduce the amount of trimming needed. Distribution lines must also be kept free of tree contact and when attached to the transmission structures would be at a much lower level (20 to 25 feet lower) and closer to the Trail than the lowest Transmission conductor. This will require additional trimming and/or cutting and has the potential to negate any mitigation accomplished by the use of the taller structures.

Q. What is your overall assessment of the detailed engineering in Virginia Power's Remand Testimony, particularly the location of the extended height structure

locations?

A. The taller poles are a mixed blessing. Once again, we are dealing with trade-offs. The taller poles offer the ability to reduce trimming and save some amount of canopy on portions of the Trail along Modified D. The net amount of such saving will only be known when construction is complete and any reduction in trimming can be balanced against the increased clear-cutting required for access and erection. The down side is the increase in visibility and impact on the residences. From the standpoint of the residences, the use of the taller poles simply makes a bad situation worse.

Q. Are you satisfied that the potential problems of constructing an overhead transmission line on the Modified D route have been fully explored?

A. No. In the remand testimony and in responses to interrogatories, there is a great amount of information on right of way acquisition costs for both overhead and underground as well as considerable detail on underground reliability and comparisons of different cable types and configurations. There is little information on actual construction methods for overhead construction along Modified D. The fact that information on such critical items as access roads and vegetation clearance for structure erection is not available is evident from Virginia Power responses. This is not particularly surprising since, as Virginia Power points out in some cases, the contractors will ultimately have to deal with the questions of access, tree removal, tree trimming, traffic control, Trail user safety, reclamation, restoration and the other issues involved with working in a constrained area. It is in these types of details that field conditions quite often result in much different impacts than those based on engineering designs.

For example, for poles on the Trail property and for many if not all poles located adjacent

to the Trail, there will be a large incentive in time and effort for the contractor to use the Trail for access including the paved bike trail. Additionally, the presence of drain fields in the Shenstone area adjacent to the Trail may preclude direct access from the north. In short, absent clearly spelled out access routes and specific prohibitions with adequate enforcement, contractors and individual employees are prone to follow the path of least resistance. This is the real world outside the courtroom.

The statements of Virginia Power Witness Mr. Koonce as to the construction impacts of moving large equipment and heavy loads longitudinally along routes other than highways or city streets is doubly applicable to impacts along the W&OD Trail. Mr. Koonce refers to weights of up to 80,000 pounds or 40 tons involved in underground installations. Similar and larger weights are involved in overhead construction. The weight of a loaded concrete truck is approximately 40 tons, and 6 such truckloads would be required for a single 145 foot angle structure. A crane to erect a 145 foot structure is estimated to weigh nearly 50 tons. An auger truck is estimated to weigh approximately 40 tons. This raises again the question of the degree of investigation of potential impacts of construction of a route such as Modified D.

Considering the equipment required, the large number of concrete trucks, cranes, etc. and the constraints imposed by the terrain, I do not believe that it is possible to build on the Modified D route without very severe impacts on the nature and usage of the W&OD Trail.

Q. How would you compare the three routes in their capability to provide for future transmission reinforcement ?

A. There is no question but that transmission reinforcement will be needed in this area in the

future to provide reliable service. Upon completion of this project, the Hamilton Station would be served by a radial line as is the case currently for the Middleburg Station. Reliability considerations will mandate a second source to both stations as load growth makes long term outages less acceptable. The logical solution is one foreseen by Virginia Power in its planning for a Hamilton to Middleburg line in the 2020 time frame. Route E7 would provide the opportunity for placing a major portion of such a line to Middleburg on the same structures for a distance of over 9.7 miles. In comparison, D3 would provide the opportunity for a circuit to Middleburg to occupy the same structures for 6 miles. Modified D would provide the double circuit option for only 2.4 miles.

Q. In regard to the question of the use of XLPE underground cable compared to the HPFF pipe type cable, has your opinion changed?

A. No. I would continue to support the use of the XLPE cable for any underground in this case for the same reasons expressed in my response to cross-examination by the Staff earlier in this proceeding.

Q. What, in your opinion, would be the impact on the W&OD Trail if the line were to be installed underground on Modified D along the Trail?

A. If Mr. Bailey's Testimony on Remand is interpreted to mean utilizing a 30 foot right of way offset 10 feet from the Trail property (centerline 25 feet north of the Park property), the impact would be limited to the visual impact of the transition structures provided: (1) no portion of the Trail was used for access during the underground construction except for the crossing at the western end and (2) the crossing from the north to the south on the western end of the paved portion of the Trail was performed by directional boring.

Q. Would the visual impact of the transition structures be significant?

A. Yes, it would be significant as there appears to be little in the way of screening opportunities.

Q. Does this complete your pre-filed testimony on Remand?

A. Yes.

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

Application of	)	
	)	
VIRGINIA ELECTRIC AND POWER COMPANY	)	
	)	
D/B/A DOMINION VIRGINIA POWER	)	
	)	**Case No. PUE-2005-00018**
For a certificate of public convenience and	)	
necessity for facilities in Loudoun County:	)	
Pleasant View-Hamilton 230 kV Transmission Line	)	
and 230 kV-34.5 kV Hamilton Substation	)	

Pre-filed Direct Testimony on Remand
of

Donald E. Zimar

on behalf of

Northern Virginia Regional Park Authority

June 15, 2007

PRE-FILED DIRECT TESTIMONY ON REMAND

OF

DONALD E. ZIMAR

Q. Please state your name and position.

A. My name is Donald E. Zimar, and I am President of Zimar & Associates, Inc.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of the Northern Virginia Regional Park Authority (the "Park Authority") to address topics set forth in the February 21, 2007 Order Remanding for Further Proceedings ("Remand Order") regarding the Application of Virginia Electric and Power Company for Approval and Certification of Electric Facilities: Pleasant View-Hamilton 230kV Transmission Line (the "Application") docketed as SCC Case No. PUE-2005-00018 ("Application").

Q. What is the purpose of your testimony?

A. My testimony addresses the third item listed in the Remand Order, which concerns the detailed engineering for the portion of Modified D comprising sections within or adjacent to the W&OD Trail Park, including pole placements and existing and/or new right of way.

Q. What is your educational and professional background?

A. I am a Registered Consulting Arborist and Certified Forester with extensive background in evaluating trees in conjunction with all types of construction projects. I have been employed by utility companies both as a forester and consultant working directly on transmission vegetation management. This included peripheral involvement and

exposure to new construction as well as the management of vegetation on existing facilities. As ASCA representative to the ANSI A300 committee, I have been involved in drafting and editing the standards for vegetation management on electric utility right of ways. I have been a consultant in Northern VA. For nearly twenty years and in that capacity have had several occasions where work I have done has dealt with the W&OD Trail Park. I have a B.S. in Forestry and Natural Resources Management form Syracuse University and the State University of New York, College of Environmental Science and Forestry (SUNY CESF) and an A.A.S. in Forest Technology from SUNY CESF, Wanakena. A more complete description of my credentials is shown on **Attachment DEZ-1** to my testimony.

Q. What are your responsibilities in your current position?

A. My current position is the president of a consulting firm that specializes in the preservation of trees, forests, and natural resources during construction; tree and plant evaluation and appraisal; forest resource management; landscape management; and expert witness services and testimony.

Q. Have you previously testified before the Virginia State Corporation Commission?

A. No.

Q. Please provide an overview of your testimony in this proceeding.

A. I conclude that the detailed engineering described in Mr. Cox's Remand Testimony for Virginia Power, which was based on an aerial survey, is not sufficient to minimize the removal of tree canopy. I also disagree with Mr. Bailey's assessment that clearing for Modified D would not be extensive, as stated in his Remand Testimony for Virginia Power. My assessment is that the detailed engineering will result in considerable

removal of the tree canopy, and Virginia Power's assessment to the contrary is not accurate.

Q. Why do you disagree with Mr. Bailey's assessment that clearing for Modified D will not be extensive, as stated on page 9 of Mr. Bailey's Remand Testimony?

A. Mr. Bailey's assessment is based on explanations provided in Mr. Hoover's and Mr. Cox's earlier testimony during the 2006 evidentiary hearing. These explanations are suspect in several regards. Mr. Hoover's hearing testimony said you could leave more trees at the pole sites because that is where the conductor is highest (*see* Transcript, page 2199, line 6), but of course those trees will be completely cleared to erect the poles (*see* Transcript, page 2201, line 10). Also, Mr. Hoover's hearing testimony says that actual clearing will all depend on topography, tree species, where the pole is located, and the cut or fill sections: This means that Virginia Power really does not know what trees will be spared until the construction has been done. Mr. Cox's Remand Testimony confirms this: He states that "once a route has been established by the Commission, a detailed ground survey will be done and exact pole locations would be determined."

Q. What is your assessment of Mr. Bailey's statement on page 9 of his Remand Testimony that fragmentation is not a problem on Modified D because it parallels an existing corridor?

A. This statement does not recognize that the W&OD Park is an uncleared corridor, and that to construct poles #2, 3, 4, 5 (B.1) on JAC-1 sheet 2, and poles #21-26 on JAC-4, Virginia Power would have to clear trees from the park. The alternatives in JAC-2, JAC-3, and JAC-4 will all have about the same clearing impacts.

Q. Have you conducted any studies that would contradict Mr. Hoover's and Mr. Cox's assessment?

A. Yes. I did a complete inventory of the trees between poles 4 and 5 on JAC-1 sheet 2. I collected species, diameter, height, canopy position, whether it would be pruned or removed (according to Mr. Hoover's description in his testimony), and live crown ratio, as well as any pertinent comments that may be relevant. This inventory is attached as **Attachment DEZ-2** to my testimony. The data I collected seem to indicate some significant differences with the generalities made by Mr. Hoover. I selected this section as it seemed to represent fairly typical conditions along the trail. I then summarized the data to determine what the actual species percentages are and how many trees would be removed according to Mr. Hoover's testimony. I found that, according to his species criteria, and based on the proximity to the tower locations, 92% of the trees in this span would be removed, far different from the conditions suggested by Mr. Hoover.

Mr. Hoover indicated that, in the species mix, ailanthus was about 25% of the trees. In this span, ailanthus represents 63% of the total trees. He suggested black locust might be 5% and in this span it is 14%. Some of the species he mentions are not present, though they are elsewhere along the trail. Indeed, none of his percentages were even close to what I measured. Whatever method he used to estimate the percentage of species in this corridor is unreliable at best. This is significant, because species is one of the primary criteria he uses for what trees will be removed. Because these numbers are so wrong, his estimates of canopy retained cannot be right.

Mr. Hoover admits that 39% of the trees are of species that will require removal. Regardless of the specific mix of species in any given stand, these trees would generally

be the dominant and co-dominant canopy trees. Therefore, removing these trees would result in a far greater canopy loss than 39%. It would very likely be closer to eighty to ninety percent of the total canopy. Furthermore, it is virtually impossible to remove the larger trees and avoid damage to the understory they say will be preserved. It just doesn't work that way.

Mr. Hoover suggests that a tree with a mature height of 85 feet might be trimmed twenty feet back to appropriate laterals. An analysis of the live crown ration (LCR), a measure that indicates the amount of the total height of the tree that is made up of the smaller branches and foliage, indicates the average LCR for the trees in the corridor that I inventoried is 27%. If an 85 foot tree is pruned to 65 feet, 24% of the height of the tree will be removed, or, approximately 89% of the crown, on average, will be removed. This would not meet any of the standards of pruning Mr. Hoover referred to and will severely harm the tree physically and aesthetically. A tree under such circumstances should be removed. Otherwise, we end up with the scenario similar to pictures previously submitted showing trunks of trees with no branches where this type of pruning occurred in eastern sections of the trail, as shown in Appendix M 3 to the Park Authority's Pre-filed Direct Testimony submitted on November 30, 2005. Indeed, this will kill the trees. I do not believe the assertions that the towers can be constructed and the conductors pulled up by clearing fifty feet around the towers while maintaining the vegetation not to be removed in between. First of all, the access from tower location to tower location is insufficient for the typical equipment that will be necessary to install them and the space around the towers insufficient to stage, position, and maneuver. Next, it seems very unrealistic to expect the conductors can be raised through an existing canopy or that

additional clearing won't be necessary to move equipment back and forth along the corridor. There is no way a crane capable of lifting 140 foot towers into place can traverse either of the existing trails, asphalt or bridle. Access for equipment will result in more extensive clearing than was indicated in the prior testimony. This alone may require clearing of fifty percent of the canopy or more.

Time did not permit me to conduct the same level of analysis for the parallel segments. However, from my visual observations, I cannot confirm the accuracy of Virginia Power's testimony. Indeed, I very uneasy about any statements that "impacts will be minimal." My observations suggest that for clearance and to improve safety by addressing danger trees, significant tree removal will be necessary along several areas of the corridor. This is especially true where the trail is in fill and substantially above the pole locations. At any rate, a more detailed study could be done to prove this. It would simply require counting the trees that meet the requirements for removal as presented, as I did for the span within the ROW.

Q. What is the basis for your conclusions?

A. My conclusion is based on my review of Virginia Power's Remand Testimony and Mr. Hoover's testimony during the evidentiary hearings in 2006, my review of Virginia Power's responses to interrogatories following its Remand Testimony, and my general experience with assessing forestry issues (including that related to utility right of ways), and an inventory and study of a specific case along the trail of the W&OD Park area impacted by Modified D.

Q. Does this conclude your pre-filed direct testimony?

A. Yes.

#817949

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Curriculum Vitae for Donald E. Zimar

Work Experience:

7/97-present: Zimar & Associates, Inc.

President: Owner of full service arboricultural consulting firm providing tree and landscape management consulting to clients nationwide. Services include:

- Landscape, tree, and natural resource management plans;
- Natural resource inventories and consulting;
- Tree preservation plans and consulting;
- Forest conservation plans and consulting;
- Expert witness services and consulting;
- Arboricultural training and consulting;
- Business development, sales, leadership, and communication training and consulting;
- Plant appraisal and evaluation;
- Safety program development.
- GPS services.

10/89 - 7/97: The Care of Trees

Principal Forester and District Manager: Responsible for all consulting activity in the Mid-Atlantic Region and contracting services in Northern Virginia, including:

- Tree preservation programs for public, private, and commercial projects;
- Tree inventories and management plans;
- Tree evaluations and hazard assessments;
- Expert witness testimony;
- Training and education programs;
- Leading, managing, and training of sales, production, and office staff;
- Sales and marketing of client services.

12/87-6/89 ACRT, INC. ENVIRONMENTAL SPECIALISTS

Utility Services Supervisor: Responsible for all utility related consulting activity including:

- Data collection and analysis and inventories;
- Computer programming and software development;
- Training and education programs;
- Report preparation for public utility, municipality, and forest vegetation management programs;
- Proposal preparation and presentation to clients.

Education:

Syracuse University/State University Of New York, College Of Environmental Science And Forestry

Resource Management and General Forestry; Bachelor of Science Degree, May 1987, Syracuse

Forest Technology; Associate of Applied Science Degree, May 1984, Wanakena

Certification, Registrations, and Training:

- Registered Consulting Arborist #
- Certified Arborist, MA-0039.
- Registered Professional Forester, MD #377.
- Registered Consulting Arborist, #446
- Maryland Licensed Tree Expert.
- PAR Group: Sales and leadership training (trainer).
- Covey: leadership and time management training, (trainer).
- Perone Ambrose & Associates: leadership, mentoring, and business management training.
- Client Development Institute: sales and management training and personnel evaluation.

Affiliations and Memberships:

- Virginia Urban Forestry Council, President 1995, 1998, 1999.
- International Society of Arboriculture, Mid-Atlantic Chapter.
- American Society of Consulting Arborists
- Northern Virginia Builders Industry Association.
- Greater Washington Golf Course Superintendents' Association.
- Society of American Foresters.

Selected Projects:

- Dominion Country Club, 2,000-acre P.U.D. and golf course development tree preservation project.
- Lansdowne, 2,500-acre P.U.D. tree preservation project, Leesburg, VA.
- Belmont, 1,800-acre P.U.D. and golf course tree preservation project, Leesburg, VA.
- Woodland Hills, 200 -acre commercial development and park tree preservation project, Herndon, VA.
- Cadwalader Park, tree inventory and management plan, Trenton, NJ.
- Howard Hughes Medical Institute, tree preservation master plan for new facilities, Bethesda, MD.
- Fairview Park, tree preservation plan for commercial office park, Fairfax, VA.
- Navy Federal Credit Union, tree preservation master plan, Expansion Project, Vienna, VA.
- Sallie Mae Consolidation Project, tree preservation for new facilities, Reston, VA.
- Tompkins Basin U.S. Army Recreation Area, tree preservation master plan, Alexandria, VA.
- Virginia Tech./UVA Education Center, tree preservation master plan, Falls Church, VA.
- South Riding, P.U.D. tree preservation, South Riding, VA.
- Jefferson Memorial, historic landscape preservation plan, Washington, DC.
- University of Virginia, historic landscape preservation, Charlottesville, VA.
- Dumbarton Oaks, historic tree preservation, Washington, DC.
- Georgetown Visitation School, tree preservation plan, Washington, DC.
- International Finance Corporation, streetscape design, Washington, DC.
- World Bank, streetscape design, Washington, DC.
- Falls Church Episcopal Church, historic landscape preservation plan, Falls Church, VA.
- American Center for Physics, tree preservation master plan, Riverdale, MD.
- NASA Earth Science Systems Building, tree preservation plan, Greenbelt, MD.
- U.S. Naval Observatory, (V. P.'s Residence), historic tree preservation plan, Washington, DC.

NVRPA Study

6/14/2007

Species	Diameter	Height	Canopy Position	Treatment	Live Crown Ratio	Comments
ailanthus	4	27	I	R	5	
black cherry	8	31	S	R	5	Tower Pad Site
ailanthus	6	15	S	R	10	Tower Pad Site
ailanthus	2	15	S	R	10	Tower Pad Site
ailanthus	2	15	S	R	10	Tower Pad Site
ailanthus	2	15	S	R	10	Tower Pad Site
ailanthus	2	15	S	R	10	Tower Pad Site
ailanthus	4	22	S	R	10	Tower Pad Site
ailanthus	6	32	I	R	10	Tower Pad Site
ailanthus	4	23	I	R	10	Tower Pad Site
ailanthus	4	25	I	R	10	Tower Pad Site
ailanthus	8	31	S	R	10	Tower Pad Site
ailanthus	6	31	S	R	10	Tower Pad Site
ailanthus	14	31	S	R	10	Tower Pad Site
ailanthus	6	17	S	R	10	Tower Pad Site
ailanthus	6	76	D	R	10	
ailanthus	2	21	S	R	10	
ailanthus	4	29	I	R	10	
ailanthus	2	29	S	R	10	
ailanthus	4	32	I	R	10	
ailanthus	8	46	D	R	10	
ailanthus	8	45	D	R	10	
ailanthus	8	45	D	R	10	
ailanthus	6	51	C	R	10	
ailanthus	4	42	I	R	10	
ailanthus	4	22	S	R	10	
ailanthus	6	47	C	R	10	
ailanthus	2	17	S	R	10	
ailanthus	4	16	S	R	10	
ailanthus	6	34	C	R	10	
ailanthus	4	34	C	R	10	
ailanthus	4	12	S	R	10	
ailanthus	4	27	S	R	10	
ailanthus	4	16	I	R	10	
ailanthus	4	17	S	R	10	
ailanthus	4	17	S	R	10	
ailanthus	6	7	S	R	10	
black locust	10	81	D	R	10	
black locust	6	45	S	R	10	
black locust	14	80	D	R	10	
black locust	12	52	I	R	10	Tower Pad Site
black locust	16	30	S	R	10	
black locust	12	62	D	R	10	
black locust	10	69	C	R	10	
black locust	12	69	C	R	10	
black locust	6	32	I	R	10	
black locust	6	47	I	R	10	
black locust	8	47	I	R	10	
black locust	12	72	D	R	10	

black locust	12	73	D	R	10	
hackberry	4	27	S	R	10	
hackberry	6	34	S	R	10	
hackberry	4	41	S	R	10	
ailanthus	8	71	C	R	15	
ailanthus	6	32	I	R	15	
ailanthus	4	31	I	R	15	
ailanthus	6	31	I	R	20	Tower Pad Site
ailanthus	2	17	I	R	20	Tower Pad Site
ailanthus	8	45	C	R	20	
ailanthus	10	45	C	R	20	
ailanthus	4	42	S	R	20	
ailanthus	4	49	S	R	20	
ailanthus	6	37	C	R	20	
ailanthus	6	37	C	R	20	
ailanthus	6	37	I	R	20	
ailanthus	6	49	I	R	20	
ailanthus	4	27	S	R	20	
ailanthus	6	38	I	R	20	
ailanthus	6	39	I	R	20	
American elm	4	21	S	P	20	
hackberry	2	20	S	R	20	
hackberry	2	20	S	R	20	
hackberry	2	20	S	R	20	
hackberry	4	32	S	R	20	
hackberry	2	17	S	R	20	
hackberry	2	17	S	R	20	
hackberry	8	37	C	R	20	
red mulberry	10/6	35	I	R	20	Tower Pad Site
ailanthus	4	23	S	R	25	Tower Pad Site
ailanthus	14	76	C	R	25	Tower Pad Site
ailanthus	12	63	C	R	25	Tower Pad Site
ailanthus	10	72	D	R	25	
American elm	12	53	C	R	25	
black cherry	2	23	S	P	25	
black locust	6	41	I	R	25	Tower Pad Site
black locust	12	76	D	R	25	
black locust	16	79	D	R	25	
hackberry	6	43	I	R	25	
red mulberry	24/16	44	D	P	25	
ailanthus	10	71	C	R	30	Tower Pad Site
ailanthus	2	39	I	R	30	
ailanthus	2	39	I	R	30	
ailanthus	4	31	I	R	30	
ailanthus	6	41	I	R	30	
ailanthus	14	73	C	R	30	
ailanthus	2	14	I	R	30	
ailanthus	12	77	D	R	30	
ailanthus	14	77	D	R	30	
American elm	6	35	I	P	30	
black locust	4	17	D	R	30	
hackberry	6	37	I	R	30	
hackberry	16	73	D	R	30	

hackberry	6	47	I	R	30	
red mulberry	6/6/	32	C	R	30	Tower Pad Site
ailanthus	12	77	C	R	35	
ailanthus	12	77	C	R	35	
hackberry	8	51	C	R	35	
ailanthus	10	73	C	R	40	Tower Pad Site
American elm	8/4	45	I	P	40	
American elm	4	27	I	P	40	
American elm	8	35	I	P	40	
black locust	36	57	C	R	40	
hackberry	10	44	I	R	40	
hackberry	4	22	S	R	40	
red mulberry	14/8/6	37	C	R	40	Tower Pad Site
sasafrass	8	23	D	R	40	Tower Pad Site
hackberry	14	47	C	R	50	
hackberry	12	57	I	R	50	
black locust	14	73	D	R	60	
red mulberry	6/6/4	35	I	R	60	Tower Pad Site
black locust	6	35	D	R	70	Tower Pad Site
hemlock	6	30	C	R	70	Tower Pad Site
hemlock	6	30	C	R	70	Tower Pad Site
hemlock	6	19	C	P	70	
hemlock	4/4/4	19	C	P	70	
hemlock	6	19	C	P	70	
red mulberry	10/8/6/4	15	I	P	70	
white pine	24	67	D	R	70	Tower Pad Site
black locust	8	74	D	R	90	
hemlock	4	19	C	P	90	
hemlock	4	19	C	P	90	
hemlock	10	32	C	P	90	
hemlock	6	20	I	P	90	
hemlock	6/4	20	I	P	90	
hemlock	6	20	I	P	90	
ailanthus	2	17	S	R		
ailanthus	2	16	S	R		
ailanthus	2	17	S	R		
ailanthus	4	32	S	R		
ailanthus	2	17	S	R		
ailanthus	4	41	I	R		
ailanthus	6	33	I	R		
ailanthus	2	17	S	R		
ailanthus	2	17	S	R		
ailanthus	2	17	S	R		Tower Pad Site
ailanthus	2	21	I	R		Tower Pad Site
ailanthus	6	37	C	R		Tower Pad Site
ailanthus	6	37	C	R		Tower Pad Site
ailanthus	8	41	C	R		Tower Pad Site
ailanthus	4	17	S	R		Tower Pad Site
ailanthus	6	45	C	R		Tower Pad Site
ailanthus	6	47	C	R		Tower Pad Site
ailanthus	4	41	C	R		Tower Pad Site
ailanthus	2	17	S	R		Tower Pad Site
ailanthus	4	17	S	R		Tower Pad Site

ailanthus	16	65	D	R	Tower Pad Site
ailanthus	4	17	S	R	Tower Pad Site
ailanthus	4	21	S	R	Tower Pad Site
ailanthus	4	23	S	R	Tower Pad Site
ailanthus	4	25	S	R	Tower Pad Site
ailanthus	4	21	S	R	Tower Pad Site
ailanthus	4	17	S	R	Tower Pad Site
ailanthus	6	45	I	R	Tower Pad Site
ailanthus	6	42	I	R	Tower Pad Site
ailanthus	6	42	I	R	Tower Pad Site
ailanthus	6	47	I	R	Tower Pad Site
ailanthus	2	17	S	R	Tower Pad Site
ailanthus	2	17	S	R	Tower Pad Site
ailanthus	2	15	S	R	Tower Pad Site
ailanthus	6	31	I	R	Tower Pad Site
ailanthus	6	35	I	R	Tower Pad Site
ailanthus	4	29	I	R	Tower Pad Site
ailanthus	4	34	I	R	Tower Pad Site
ailanthus	2	27	S	R	Tower Pad Site
ailanthus	6	65	C	R	Tower Pad Site
ailanthus	6	67	C	R	Tower Pad Site
ailanthus	6	63	C	R	Tower Pad Site
ailanthus	6	65	C	R	Tower Pad Site
ailanthus	6	65	C	R	Tower Pad Site
ailanthus	6	65	C	R	Tower Pad Site
ailanthus	4	45	I	R	Tower Pad Site
ailanthus	4	45	I	R	Tower Pad Site
ailanthus	4	45	I	R	Tower Pad Site
ailanthus	2	31	S	R	Tower Pad Site
ailanthus	4	45	I	R	Tower Pad Site
ailanthus	4	33	S	R	Tower Pad Site
ailanthus	4	31	S	R	Tower Pad Site
ailanthus	12	65	C	R	Tower Pad Site
ailanthus	10	57	I	R	Tower Pad Site
ailanthus	8	52	I	R	Tower Pad Site
ailanthus	6	47	I	R	Tower Pad Site
ailanthus	2	29	S	R	Tower Pad Site
ailanthus	6	45	I	R	Tower Pad Site
ailanthus	6	51	I	R	Tower Pad Site
ailanthus	2	39	S	R	Tower Pad Site
ailanthus	6	41	I	R	Tower Pad Site
ailanthus	6	47	I	R	Tower Pad Site
ailanthus	4	41	I	R	Tower Pad Site
ailanthus	2	23	S	R	Tower Pad Site
ailanthus	4	27	S	R	Tower Pad Site
ailanthus	8	63	C	R	Tower Pad Site
ailanthus	10	69	C	R	Tower Pad Site
ailanthus	4	43	I	R	Tower Pad Site
American elm	4	17	S	R	Tower Pad Site
American elm	8	47	I	R	Tower Pad Site
black cherry	4	21	S	R	Tower Pad Site
black locust	12	71	C	R	Tower Pad Site
black locust	8	71	C	R	Tower Pad Site

black locust	8	71	C	R	Tower Pad Site
black locust	14	75	D	R	Tower Pad Site
black locust	8	71	D	R	Tower Pad Site
black locust	14	65	C	R	Tower Pad Site
black locust	6	39	I	R	Tower Pad Site
black locust	12	71	D	R	Tower Pad Site
black locust	14	75	D	R	Tower Pad Site
black locust	16	77	D	R	Tower Pad Site
hackberry	4	23	I	R	Tower Pad Site

Species Distrubution

ailanthus	136	63.0%
black locust	31	14.4%
hackberry	20	9.3%
hemlock	11	5.1%
American elm	8	3.7%
red mulberry	6	2.8%
black cherry	2	0.9%
sasafrass	1	0.5%
white pine	1	0.5%
	216	100.0%

Canopy Position Distribution

Dominant	28	12.9%
Codominant	52	24.0%
Intermediate	68	31.3%
Suppressed	69	31.8%
	217	100.0%

Treatment Summary

Remove	200	92.2%
Prune	17	7.8%
	217	100.0%
Average Live Crown Ration	27	percent