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VIA FACSIMILE & ELECTRONIC MAIL

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Dear Ms. Smith:

Golden Valley Electric Association's Healy Unit No. 1 plant (the "Plant") is – as the Department of Environmental Conservation ("Department") recognizes, a substantial contributor to air pollution in Denali National Park, and elsewhere in the Region. Those contributions require "Best Available Retrofit Technology" (BART) limits, under the U.S. Environmental Protection Agency's Regional Haze Rule. 40 C.F.R. §§ 51.300.-.309. The limits proposed for sulfur dioxide and nitrogen oxides at the Plant fall well short of the "best system of continuous emission reduction" required by law. 40 C.F.R. § 51.301 (defining BART). *See also* 18 AAC 50.260(q)(1) (adopting federal definition).

The Plant, moreover, was constructed in 1967 – over forty years ago. Its small size, increasingly dated design, and short remaining lifespan provide poor justification for further expenditures that fall short of achieving meaningful emission reductions. As set forth below, not only does the Plant contribute to air pollution in Denali National Park, it contributes to violations of fine particulate air quality standards in the nearby Fairbanks-North Star Borough. And by burning coal, the Plant contributes more greenhouse gases per megawatt than any other available source of electricity, exacerbating climate changes that post devastating consequences for Alaska and the world.

In the long term, Alaska's energy future is best founded on clean, efficient energy – not coal. The region has readily available alternatives that could replace

the power provided by the Plant, with less pollution, and at lower cost. In the short term, at a minimum, the Department should impose BART requirements sufficient to protect public health, the environment and Denali National Park.

These comments are submitted on behalf of the Sierra Club, Denali Citizens Council, National Parks Conservation Association, Alaska Center for the Environment, Northern Alaska Environmental Center and Cook Inletkeeper.

A. The Department Should Require Stricter Sulfur Dioxide Controls.

The Plant could achieve significantly better reductions in its sulfur dioxide (SO_2) pollution. As the Department's BART Determination acknowledges, other technologies could remove close to 90 percent of the Plant's sulfur dioxide, while the Department's limit would require only 50 percent removal.

The Department's BART Determination provides two reasons for rejecting more stringent SO_2 controls. First, it expresses concerns about a "brown cloud." *See* BART Determination p. 10. That describes a phenomena resulting from accelerated conversion of NO to NO_2 This conversion normally occurs in the atmosphere, so these emissions are likely being relocated closer to the source by more rapid conversion; they do not, however, represent new emissions. There is no demonstration that more rapid conversion to NO_2 nearer to the source, rather than later in the atmosphere, will make any difference to visibility in Denali National Park. Lacking appropriate modeling from GVEA, it would be equally reasonable to propose that this transformation may accelerate particle deposition and provide a visibility benefit to Denali.

Second, the Department cites costs as a reason to reject better sulfur dioxide pollution-controls. The Department's economic analysis, however, fails to support that conclusion. The existing system is described as achieving 40 to 50 percent control with the capability of increasing control efficiency to 70 percent. BART Determination, page 9. The increase in control used in the cost analyses (see Table 6-2 of the BART Determination) assumes a 40 percent increase over baseline conditions. This implies that the cost analyses are based on 80 to 90 percent control, while GVEA is reporting that the theoretical maximum control efficiency is 70 percent.

Similarly, if we add a 76.7 percent control efficiency improvement to the wet limestone scrubber efficiency combined with the 40 to 50 percent baseline control, the result is a predicted 116.7 to 126.7 percent control which is obviously an impossible result. Similar problems exist with the presumption that 1,400 (Page 10, paragraph 3) or 1,200 pounds (page 20) per hour of reagent sodium bicarbonate will be needed to achieve 70 percent control. As GVEA has reported

that they are achieving 40 to 50 percent control using 370 pounds per hour of reagent, this claim seems inconsistent.

GVEA reported to the Department of Energy (Form EIA-767) that the Plant burned 214,400 tons of coal with an average sulfur content ranging from 0.18 to 0.26 percent sulfur. Using the AP-42 assumption that 95 percent of fuel sulfur is released as SO_2, this results in estimated emissions of 428.8 tons per year of SO_2 for the year 2005.

Table 1 - Form EIA-767 Data for Healy Power Plant

Month	Tons Coal Burned	Percent Sulfur	AP-42 (95% conversion) Tons of SO_2
January	18,600	21.00%	74.1
February	16,700	24.00%	76.1
March	18,400	20.00%	69.9
April	18,000	18.00%	61.5
May	18,800	18.00%	64.2
June	14,400	21.00%	57.4
July	18,600	21.00%	74.1
August	17,700	23.00%	77.3
September	17,300	20.00%	65.7
October	19,100	19.00%	68.9
November	18,600	22.00%	77.7
December	18,200	26.00%	89.8
sum	214,400		856.7

In 2005, GVEA reported on Form EIA767 that they controlled 47.8 percent of this SO_2. This equates to 409.5 tons that were controlled in 2005 compared with the uncontrolled rate of 856.7 tons of SO_2 for 2005. In order to reach the target of the BART analysis of 70 percent control using sodium bicarbonate as the reagent, GVEA needs to control another 190.2 tons per year of SO_2.

Converting the annual emissions rate of 856.7 tons per year using the same 8,388 hours of operation results in an average annual emissions rate of 204.3 lbs/hr of SO_2 prior to control, and an average emissions rate of 106.6 lbs/hr of SO_2 after control. Using the 8,388 hours of operation reported on the EIA767 for 2005, this results in the need to control an additional 45.3 pounds per hour of SO_2.

The cost analysis provided by GVEA is based on controlling 177 tons per year of SO_2 and using 1,200 to 1,400 pounds per hour of reagent to achieve this control (GVEA reports that an additional 830 lb/hr of reagent will be required). We have calculated the need to control an additional 190.2 tons per year of SO_2, which is very comparable to the 177 tons per year estimated by GVEA. However, the estimate of 830 lb/hr of additional reagent seems inconsistent with other applications of this technology.

As GVEA has asserted, a higher injection rate of reagent is required to achieve higher levels of SO_2 removal. A study conducted under a Dept. of Energy contract at Arapahoe Station shows this rate increasing from reagent addition (titration) ratio.[1] The titration ratios are based on using two moles of sodium bicarbonate per mole of SO_2. The titration rate at 40 to 50 percent control at Arapahoe Station was 0.7 and at 70 percent control was 1.0. This means that about 1.43 (1.0 divided by 0.7) times as much reagent is required to achieve 70 percent control as to achieve 40 to 50 percent control. This calculates to 525.4 lbs/hr of reagent, which is 155.4 more pounds per hour than the currently titrated 370 lb/hr (compared to the 830 lb/hr reported by GVEA).

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[1] *Integrated Dry NOx/ SO_2 Emissions Control System Sodium -Based Dry Sorbent Injection Test Report*, U.S. Department of Energy (1995), available online at http://www.netl.doe.gov/technologies/coalpower/cctc/cctdp/bibliography/demonstration/pdfs/pscol/M97054372.pdf. This website, and the other websites cited herein, are publicly available. Should the Department be unable to locate or otherwise access any of these materials, please contact me and we will provide paper copies.

Figure 1 – Arapahoe Power Station Sodium Bicarbonate Data

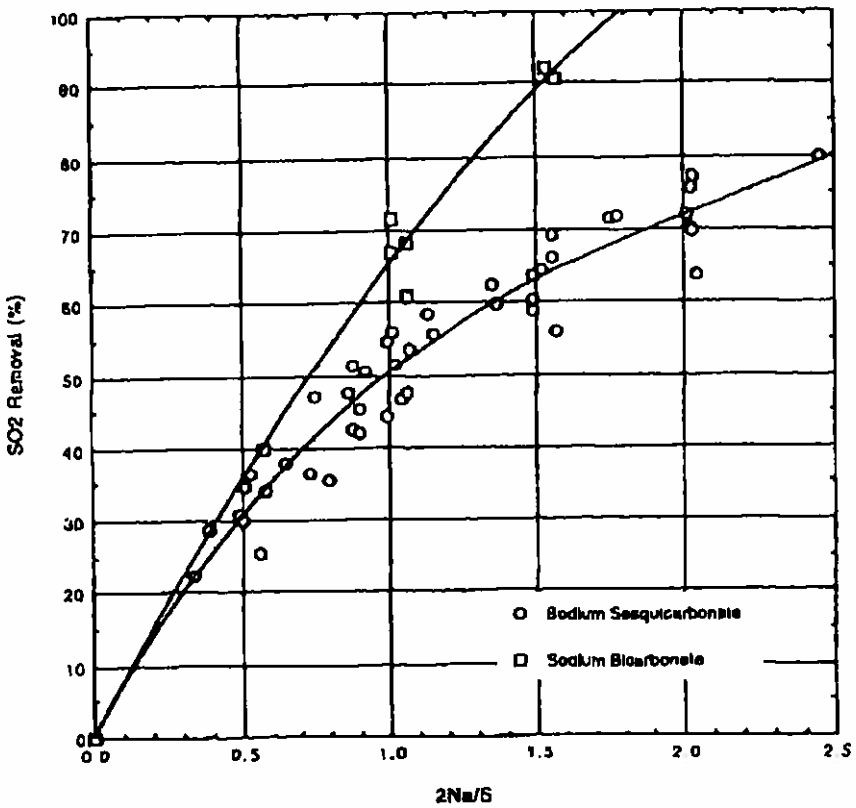

Figure ES-1. Comparison of SO_2 Removals for Injection of Sodium Sesquicarbonate (Fabric Filter Inlet) and Sodium Bicarbonate (Air Heater Inlet)

Source. *Integrated Dry NOx/ SO_2 Emissions Control System Sodium -Based Dry Sorbent Injection Test Report*, U.S. Department of Energy (1995).

Using 155.4 additional pounds per hour of reagent for the 2005 value of 8,388 hours of operation results in a requirement for an additional 651.7 tons of reagent per year. Using the cost supplied by GVEA of $335 per ton, the annual cost of reagent is $218,335 per year instead of the reported value of $1,217, 859 estimated by GVEA. Using the value estimated above of removal of an additional 190.2 tons per year of SO_2, this translates to cost effectiveness of $1,148 per ton of SO_2 removed based on the reagent cost alone (compared with $6,880 per ton for reagent in the GVEA analysis).

GVEA also asserts that an entire new reagent injection system is required in order to inject the 1,200 or 1,400 lbs/hr of sodium bicarbonate the claim will be required to achieve 70 percent control at a capital cost of $2,000,000. To the extent

that the claim that 1,200 to 1,400 pounds per hour of reagent seems excessive, the claim that a new system of this size also appears excessive.

Reagent utilization at Healy appears to be poor; controlling 97.6 lb/hr of SO_2 by injection of 370 pounds per hour of reagent indicates that the current stoichiometric ratio is about 1.44. Temperature, mixing time and particle size are key factors in achieving efficient control. Literature suggests that a properly designed, optimated and operated system should achieve 70 to 90 percent control. Improved reagent utilization would result in improved cost without installing a larger feed system or injecting more reagent.[2],[3]

The Department should require an independent assessment of the current dry sorbent injection system to determine the maximum SO_2 emissions reduction that is achievable with optimized temperature, mixing and reagent selection including particle size of the reagent. The general BART guideline for control of SO_2 is $2,000 per ton. If the maximum reduction is determined not to be cost effective, incremental solutions of improved control must be specified until a cost effective solution is found. This incremental approach is consistent with the "Top Down" BACT approach that is specified for BART analyses.

However, as the National Park Service has stated, "BART is not necessarily the most cost-effective solution. Instead, it represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors." *See* National Park Service Comments on the Oregon Department of Environmental Quality's Best Available Retrofit Technology Proposal for the PGE-Boardman Power Plant, page 2, January 30, 2009 (Attachment 1).

B. The Department Should Require Stricter Oxides of Nitrogen (NOx) Emissions Limitations.

The Department was correct in requiring Selective Catalytic Reduction (SCR) as BART for control of NOx. However, the selected emissions limitation of 0.07 lb/MMBtu on a 30-day rolling average basis is inconsistent with the performance of the combined NOx control technologies.

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[2] *Integrated Dry NOx/SO_2 Emissions Control System*, Public Service Corporation of Colorado (2003), available online at http://www.nell.doe.gov/technologies/coalpower/cctc/cctdp/bibliography/demonstration/pdfs/pscol/IDECS.pdf

[3] *Dry Sorbent Injection of Sodium Bicarbonate for SO_2 Mitigation*, Kong, La Hoz, Atwell & Wood, Solvay Chemicals (2008), available online at http://www.solvair.us/static/wma/pdf/1/4/3/1/7/PowerGen2008.pdf.

The current NOx controls, low-NOx burners with overfire air (LNB with OFA) are currently achieving an emissions rate of 0.25 lb/MMKBtu. Selective catalytic reduction (SCR) is a technology that is generally accepted to achieve 90 percent and better in reduction of NOx. The combined technologies are, therefore, capable of achieving 0.025 lb/MMBtu or better. The rate specified by the Department of 0.07 lb/MMBtu requires the SCR to perform at only slightly better than 70 percent reduction to achieve this limitation.

The Department has not provided a rationale as its failure to consider, and require, the combination of LNB/OFA with SCR to achieve 0.025 lb/MMBtu.

C. The Plant Contributes to Air Pollution in Excess of the National Ambient Air Quality Standard for Fine Particulates.

The pollutants regulated under the BART determination are elements of $PM_{2.5}$. Federal modeling guidelines suggest the use of the closest ambient monitoring data to establish a background concentration. The record includes no air quality modeling based upon local monitoring. The nearest ambient monitoring data to the Healy Power Plant is located in the Fairbanks North Star Borough – a nonattainment area for $PM_{2.5}$. As a result, the presumptive background concentration of $PM_{2.5}$ is at a level that violates the National Ambient Air Quality Standard (NAAQS). The Healy Plant's emissions will add additional $PM_{2.5}$ to those background concentrations, and thereby contribute to air pollution in excess of the NAAQS.

The Healy Power Plant is a major source of air pollution. The emissions limitations proposed as BART as well as the procedures that require the control equipment to be "properly operated and maintained" (40 C.F.R. § 51.308(e)(1)(v)) are required elements of the Healy Power Plant's Title V permit. State issuance of permit conditions that violate the NAAQS are illegal under 18 AAC 50.110. As such, the BART determination should address, and eliminate, the above-described violation.

D. Modeling of Impacts.

In an effort to evaluate the modeling for the Healy Power Plant, two sets of information on model input parameters were located. One was located on the Western Regional Air Partnership (WRAP) website.[1] This site contained a spreadsheet containing visibility monitoring parameters for Healy Power Plant (ak_emi_01172007.xls) that describes two sources at Healy. These two sources were described as AK03 and AK04 and appear to be Healy 1 and the auxiliary

[1] Available online at http://pah.cert.ucr.edu/aqm/308/bart.shtml.

boiler at Healy. This document suggests that the mothballed Healy Unit 2 (HCCP) was not included in visibility monitoring and has an allocation of zero emissions in the Visibility SIP.

In addition to the apparent exclusion of Healy HCCP from the SIP, the modeling inputs for Healy 1 appear to be flawed. Table 2, below, contains the emissions rates in grams per second contained in the WRAP modeling files along with calculations of the hourly and daily emissions rates associated with these values as given in grams per second.

In Section A, above, we calculated an emissions rate based on the 2005 EIA data of 106.6 lb/hr of SO_2; this translates to 2,560 lb/day of SO_2. As the emissions rates for SO_2 and NOx are comparable at Healy 1, the NOx data in Table 2 appears reasonably consistent with these calculations. The SO_2 data, however, is not.

Table 2 – WRAP BART Modeling Inputs

	Unit Name	S02 Rate (g/s)	NOX Rate (g/s)	PM25 Rate (g/s)
AK03	GVEA Healy Power Plant (173)	0 0163	14.4218	0 0023
AK04	GVEA Healy Power Plant (173)	0 0007	0.0002	0.1008
AK03	lb/hr	0.1291	114.3575	0.0183
AK03	lb/day	3.0973	2744.5797	0.4396

This error is replicated in a second spreadsheet that says the values were provided by the State of Alaska. This spreadsheet gives the value for the SO_2 emissions rate in pounds per day at 3 1 for SO_2, consistent with the value calculated in Table 1 for the information provided in grams per second.

Table 3 - BART Modeling Parameters "Provided by the State of Alaska"

This spreadsheet contains the stack parameters provided by the State of Alaska for the BART-eligible sources.										
GVEA Healy Power Plant (173) Source Location: 83° 51' 00" North, 148° 58' 00" West										
1	Boiler	327 mmBtu/hr	110	11	289	139	2,747	3 1	0.4	(1) NOX EF 0 35 lb/mmBtu from 9/10/01 letter from GVEA to Tom Chapple SOX and PM EF based on short term limits of TVP, rev 11/10/04 (p 11 and 12). (2) Stack parameters from AIRTOOLS, entered by Alice Edwards group based on info submitted by GVEA
3	Aux Heater	10.4 mmBtu/hr	85	13	450	20	0.036	0.13	19.2	Added 9/12/06 SAR (1) NOX EF 20 lb/1000gal 173TVP01, p 12. SOX and PM EF based on short term limits of TVP, rev 11/10/04 (p 11 and 12). (2) Stack parameters from AIRTOOLS, entered by Alice Edwards group based on info submitted by GVEA

The Department should revise this erroneous modeling, include the Healy HCCP steam generating unit, and re-issue the proposed determination for public comment.

Do not hesitate to contact me if you have any questions or concerns, at (415) 977-5749, or sanjay.narayan@sierraclub.org.

Sincerely,

Sanjay Narayan

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TAKE PRIDE IN AMERICA

January 30, 2009

N3615 (2350)

David Collier
Air Quality Planning Manager
Oregon Department of Environmental Quality
811 SW Sixth Avenue
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Dear Mr. Collier:

We are concerned that the Oregon Department of Environmental Quality (ODEQ) is considering revising its proposal to reduce fine particulate matter (PM_{10}), sulfur dioxide (SO_2), and nitrogen oxides (NO_x) emitted by Portland General Electric's (PGE) Boardman Plant (Boardman). The plant is located within 300 km of 14 Class I areas, including Mount Rainier and North Cascades National Parks (which are Class I areas administered by the National Park Service--NPS). Modeling analyses have shown that the plant causes visibility impairment in all 14 Class I areas within 300 km of the plant; this represents the greatest magnitude and extent of visibility impairment we have seen to date from any single source subject to Best Available Retrofit Technology (BART). Our continued review of the ODEQ proposal now leads us to believe that, if any changes should be made, they should lower the proposed limits on SO_2, NO_x, and PM_{10} and expedite their application.

In the enclosed Technical Support Document, we address the following issues in greater detail, but provide these summaries for your initial review.

Cost-Effectiveness Metrics

ODEQ has relied primarily upon PGE's cost estimates (instead of those lower estimates produced by ODEQ's consultant) in deriving the cost-per-ton ($/ton) of pollutant removed and the incremental cost for the control strategies it evaluated. While this $/ton approach is recommended by the EPA BART Guidelines, it is important that the costs be substantiated, the emission reductions be reasonably estimated, and the results placed into the proper perspective.

Cost analyses should follow the EPA BART Guidelines and make greater use of EPA's Office of Air Quality Planning & Standards (OAQPS) Control Cost Manual (Cost Manual) and vendor quotes and estimates. Instead, PGE has used a mix of various costing methods, as well as unsupported estimates. While we agree with PGE that inflation must be a factor, we have been advised by EPA OAQPS that this factor should be based upon the Chemical

Engineering cost indices, which we have incorporated into our analyses. We also agree that the costs of major capital projects had been increasing rapidly (although that may have changed with the recent global recession), but inflation is an issue faced by all major industries and should not become an excuse for inaction.

We also believe that the cost-per-deciview of visibility improvement ($/dv) metric can be an appropriate tool to evaluate the costs and benefits of reducing emissions from a source that is relatively close to one or more Class I areas. And, we emphasize that BART is not necessarily the most cost-effective solution. Instead, it represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors.

Visibility Improvement Metrics

BART is unique in that it incorporates an environmental benefit component, visibility improvement, into the analysis. While we commend ODEQ for presenting data on the cumulative impacts and benefits of the control strategies it evaluated, ODEQ has not described how it used that information. BART is much more than a simple $/ton technological exercise, and greater emphasis should be placed upon addressing visibility improvement.

We suggest that ODEQ review its dispersion modeling results to asses the relative effectiveness of reducing SO_2 versus NO_x at the Boardman site. Our analysis of the ODEQ modeling results leads us to conclude that it is much more effective to reduce NO_x there than SO_2. (Of course, we support reductions in all pollutants.) As we will show, **ODEQ has proposed SO_2 scrubbing as BART, but rejected Selective Catalytic Reduction (SCR), even though addition of SCR would yield greater visibility improvements at a lower annual cost and a lower cost per deciview of improvement.**

SO_2 BART

ODEQ has proposed that SO_2 BART at Boardman is a 30-day rolling average limit of 0.12 lb/mmBtu based upon application of Semi-Dry Flue Gas Desulfurization (SDFGD). **ODEQ has estimated that its SO_2 BART proposal would cost $36.6 million per year,** and reduce SO_2 emissions by 11,988 tons per year (tpy). **ODEQ placed great weight on the calculated $3,055/ton of this strategy.** ODEQ further estimates that this reduction in SO_2 emissions would result in a 1.04 dv improvement in visibility at Mt. Hood, and a cumulative improvement of 10.59 dv summed across all 14 Class I areas. (ODEQ's modeling analysis showed that, for every 1,000 tons of SO_2 reduced, visibility at Mt. Hood would improve by 0.09 dv, and by 0.88 dv across all of the Class I areas.) **The cost/dv of improvement was $35 million at Mt. Hood and $3.5 million across all 14 class I areas.**

NO_x BART

ODEQ has proposed that NO_x BART at Boardman is a 30-day rolling average limit of 0.28 lb/mmBtu based upon a combination of Low-NO_x Burners (LNB) and Modified Over-Fire Air (MOFA). ODEQ has estimated that its NO_x BART proposal would cost $3.7 million per year, and reduce NO_x emissions by 4,756 tpy. ODEQ placed great weight on the calculated $782/ton of this strategy. ODEQ further estimates that this reduction in NO_x emissions would result in a 0.58 deciview dv improvement in visibility at Mt. Hood, and a cumulative

improvement of 4.62 dv summed across all 14 Class I areas. The cost/dv of improvement was $6 million at Mt. Hood and $0.8 million across all 14 class I areas.

ODEQ has rejected addition of SCR to the combination of LNB and MOFA on the basis of cost. **ODEQ has estimated that this NO_x BART strategy would cost $26.8 million per year,** and reduce NO_x emissions by 8,647 tpy. **ODEQ placed great weight on the calculated $3,096/ton of this strategy.** ODEQ further estimates that this reduction in NO_x emissions would result in a 1.84 deciview dv improvement in visibility at Mt. Hood, and a cumulative improvement of 12.31 dv summed across all 14 Class I areas. (ODEQ's modeling analysis showed that, for every 1,000 tons of NO_x reduced, visibility at Mt. Hood would improve by 0.21 dv, and by 1.42 dv across all of the Class I areas.) **The cost/dv of improvement was $15 million at Mt. Hood and $2.2 million across all 14 class I areas.**

Although the cost of adding SCR to the combined NO_x control system results in greater costs than the LNB+MOFA strategy proposed by ODEQ as BART, **the resulting NO_x BART strategy would yield greater visibility improvement at a lower annual cost and a lower cost per deciview of improvement than proposed by ODEQ for its SO_2 BART strategy. Based upon ODEQ's own data (as shown its Table 24), a combination of LNB+MOFA+SCR is more cost-effective and produces greater visibility improvement than the strategy ODEQ has proposed for SO_2, and should therefore be accepted as BART for NO_x.**

We look forward to working with the OR DEQ as this process advances, and we commend the department for its proposal. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd (don_shepherd@nps.gov, 303-969-2075) or Elizabeth Waddell (elizabeth_waddell@nps.gov, 206-220-4287) if you have any questions or comments.

Sincerely,

John Bunyak
Chief, Policy, Planning and Permit Review Branch

Enclosures

cc:
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