



STATE OF DELAWARE  
DEPARTMENT OF NATURAL RESOURCES  
AND ENVIRONMENTAL CONTROL

OFFICE OF THE  
SECRETARY

89 KINGS HIGHWAY  
DOVER, DELAWARE 19901

PHONE: (302) 739-4403  
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Secretary's Order No. 2004-A-0058

Re: Premcor Refining Group, Inc.-Delaware City Refinery-Air  
Quality Management (Phase I) and Coastal Zone Permit  
Applications for the Pollution Control Upgrade Project

Date of Issuance: **November 30, 2004**  
Effective Date: **November 30, 2004**

In light of the nexus between the Coastal Zone Act and the Clean Air Act permit applications, I hereby consolidate the permit applications for purposes of issuing this Order. Based on the record developed, as reviewed in the Hearing Officer's Reports dated November 19, 2004 and attached hereto and incorporated herein, I find and conclude that the record supports approval of the proposed permits, subject to the reasonable conditions necessary to protect the public and the environment.

The conditions that I approve are set forth in the Response Document attached to the Hearing Officer's Report on the Air Quality permit applications, except for one clarification. The Hearing Officer indicated that the

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record supports the determination of the capacity limits that could be any duration between a single day and a daily average over a year. I find that the use of a rolling thirty day average is appropriate and reasonable method to limit the capacity of the Crude Unit and the Fluid Coker Unit. As opposed to a single day, the thirty day average will allow more flexibility in the refinery's operations, but it also will curtail high spikes in production (and the associated air emissions from the refinery process) that may be possible with a longer average time period, such as a year.

The Hearing Officer recommended adopting the Air Quality Management ("AQM") proposed limits. I concur and adopt this recommendation. The AQM Response Document details at length the reasons behind these conditions, and the reasoning is sound. The reasoning for this action is to ensure that the Delaware City Refinery operates in compliance with its permits, and minimizes the emission of potentially harmful pollutants into the air and water. The capacity limits included in the permits further the goal of minimizing any environmental harm, and will require the owner of the Delaware City refinery to show additional

environmental benefits for any increase to the capacity of the refinery. The Pollution Control Upgrade Project will provide a significant reduction to the air emissions, particularly sulfur dioxide, but this reduction can be diminished if the refinery is able to operate at a capacity above its current level. The consent decrees were not intended to enhance production capability.

In sum, I find and conclude that:

1.) The Department provided adequate public notice of the hearings in a manner required by the law and regulations;

2.) The Department's issuance of permits under the Clean Air Act and regulations promulgated hereunder for the construction of equipment known as the Pollution Control Upgrade Project for the Premcor Delaware City Refinery, as proposed by the Applicant and subject to the Department's conditions, is appropriate under the law and applicable regulations because such action will: a) improve the collection and recovery of air emissions; b) reduce the

emission of potentially harmful and offensive sulfur odors from the DCR; c) recover in an environmentally sound manner sulfur and reduce solid waste; and d) not have any offsetting environmental harm as a result of the energy needed to operate the pollution control equipment and remove the sulfur from the air and from the site;

3.) The Department's issuance of the AQM permits, as proposed by the Applicant and subject to the Department's conditions, is appropriate under the law and applicable regulations because the permits should protect the environment and reduce harmful air pollution emissions to the lowest achievable levels;

4.) The Department's proposed conditions to the permits, as set forth in the Response Document, are adopted to protect the public and reduce harmful air emissions;

5.) The Department has an adequate record for its decision on the AQM permits and no further public hearing or comments are appropriate because it would delay the implementation of the permit and the net positive environmental benefits associated with the air quality improvements;

6.) The Department's issuance of a permit under the Coastal Zone Act and regulations promulgated thereunder for the construction and operation of the Pollution Control Upgrade Project for Premcor's Delaware City Refinery, as proposed by the Applicant, is approved subject to such reasonable and adequately supported conditions necessary to protect the environment and ensure that any increased production in the coastal zone occurs with prior approval;

7.) The Department shall impose a condition to prohibit any unauthorized capacity increase at DCR from the level that currently exists, as stated by the Applicant in the applications<sup>1</sup> as 185,142 barrels per day for the Crude Unit and 57,199 barrels per day for the Fluid Coking Unit, as measured, on average, over a rolling thirty day time period;

8.) The Department has considered the environmental impact and finds that there are significant benefits that overwhelmingly offset any additional emissions, and that use of the draft permits' limits, as recommended by the Department's AQM Program, will further increase the PCUP's offsets;

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<sup>1</sup> Applications figures were converted to daily limits.

9.) The Department has considered the economic effect and finds that the estimated \$200 million investment in PCUP will be a positive benefit to the local and state economy and will employ skilled and unskilled labor and contribute \$13.7 million to the payroll paid to the employees and contractors who will build the PCUP and work at DCR.

10.) The Department has considered the aesthetic effect of the PCUP and finds that the marginal adverse impact will be small in a steam plume, which is more than offset by the significant reduction in air borne emissions from the PCUP;

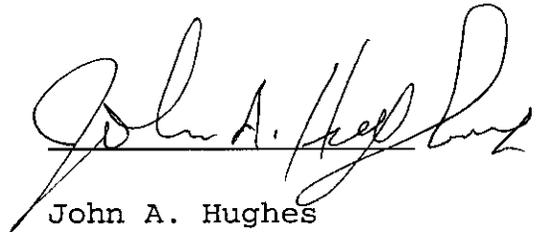
11.) The Department has considered the discharge of wastewater impact and finds that the discharge will be within the existing discharge permit limits, which means that they will be in compliance with all existing law and regulations.

12.) The PCUP will improve the collection and recovery of harmful air emissions from DCR, and the PCUP will reduce the emission of sulfur odors from the DCR.

13.) The Department's issuance of a CZA permit, as proposed by the Applicant and subject to the Department's

conditions, is appropriate under the law and applicable regulations because the permit is supported by adequate offsets as calculated by the Applicant and confirmed independently by the Department's Offset Review Committee.

14.) The Department considered all timely public comments and questions on the permit applications, as presented to the Department in writing and orally at the public hearing, and its Staff's expert technical advice and investigation of the applications in issuing these permits.

A handwritten signature in black ink, appearing to read "John A. Hughes", written over a horizontal line.

John A. Hughes  
Secretary

Hearing Officer's Report

MEMORANDUM

TO: The Honorable John A. Hughes  
Secretary of the Department of Natural Resources and  
Environmental Control

FROM: Robert P. Haynes, Esquire,   
Hearing Officer  
Office of the Secretary  
Department of Natural Resources and Environmental  
Control

RE: Premcor Refining Group Inc.  
Coastal Zone Act Permit Application  
Delaware City Refinery

DATE: November 19, 2004

Table of Contents

I. BACKGROUND ..... 1  
II. SUMMARY OF THE PUBLIC HEARING RECORD ..... 3  
III. DISCUSSION ..... 5  
IV. RECOMMENDED FINDINGS AND CONCLUSIONS ..... 12

I. BACKGROUND

This Hearing Officer, delegated authority by the Secretary of the Department of Natural Resources and Environmental Control ("DNREC" or "Department") pursuant to 29 Del. C. §8803, presided over a duly noticed public hearing commencing 6:00 p.m. on October 14, 2004 in the Grass Dale Center, Delaware City, Delaware. The hearing considered public comments and questions on the Premcor Refining Group, Inc. ("Premcor" or "Applicant") application for a permit under the Coastal Zone Act. 7 Del. C. §7001 et seq. ("CZA").

Motiva Enterprises, LLC submitted to the Department a CZA application, dated March 26, 2004. On May 1, 2004, Premcor acquired Motiva's Delaware City Refinery ("DCR") assets, and all permits and pending applications for the DCR were assigned to and assumed by Premcor as the new owner of the DCR.

The Department published legal notice of the application in The News Journal and New Castle Weekly, and proceeded to review the application for compliance with the Department's CZA regulations. The Department requested from Premcor responses to certain questions, which were provided.

On September 16, 2004, Dr. Harry Otto, Chair of the Department's CZA Offset Review Committee, sent a memorandum to Dennis Brown, the Department's Coastal Zone Administrator, which indicated that the Application's offset proposal was acceptable under the CZA and the Department's regulations. On September 16, 2004, the Secretary of the Department signed the Environmental Assessment Report for the permit, and Mr. Brown issued a letter determination to Premcor indicating that the CZA application was complete. Thus, on September 16, 2004 the CZA's ninety-day review period began and the CZA's public hearing procedure. The Department published legal notices on September 19, 2004 and September 22, 2004 in newspapers of general circulation in New Castle County of an October 7, 2004 informal public workshop and

an October 14, 2004 public hearing on the CZA permit application at the Department's Grass Dale Center in Delaware City.

The application, if approved, would allow Premcor to construct and operate additional industrial equipment as part of Premcor's Pollution Control Upgrade Project ("PCUP") at DCR. DCR is an existing industrial facility constructed in the defined "coastal zone" prior to June 28, 1971. 7 Del. C. §7002. The PCUP also is to implement a federal court consent decree between the Department, other governmental agencies, and Motiva, the then owner of the DCR. Premcor assumed the consent decree's obligations as the new owner of the DCR.

## **II. SUMMARY OF THE PUBLIC HEARING RECORD**

The record contains 129 transcribed pages from the public hearing and written documents. At the conclusion of the hearing, a member of the public requested that the public record be kept open pending the conclusion of the hearing to be held on the following week on Premcor's PCUP's Phase I Air Quality Management ("AQM") permit applications. This request was granted in an October 25, 2004 letter to all public participants, the Applicant and the Department. The letter required that all supplemental comments be received by 4:00 p.m. November 5, 2004. Timely comments were submitted by the Delaware Nature Society

and untimely comments were received from Premcor and Green Delaware.

Dennis Brown, the Department's Coastal Zone Act Administrator, presented DNREC Exhibits 1 through 15 for the record. The exhibits are the documents from Premcor that the Department reviewed, and the Department's documents that set forth the Department's analysis.

Premcor made a Power Point presentation of its application and the related AQM applications required for the PCUP. Premcor explained that the PCUP, when completed in two phases, will result in installing a regenerative wet gas scrubber ("WGS") and associated equipment that are designed to significantly reduce DCR's sulfur dioxide emissions by 31,000 tons annually. The proposed equipment will be situated on approximately 1.5 acres in the existing site that is zoned for heavy industrial use. The PCUP will significantly increase the recovery of sulfur, which Premcor plans to sell.

Remarkably, all members of the public who spoke at the public hearing supported the PCUP. The public support, however, was divided. Some of the public comments from refinery workers or skilled contract labor supported Premcor's position, which was to approve the CZA and AQM applications as submitted. The reasoning was based upon the consent decree's prior agreement

that they considered should not be changed in the permitting process. These public comments also noted the need to proceed quickly forward with approval in order to start building the equipment and sooner achieve reduced air pollution through the PCUP. The PCUP represents an estimated \$200 million pollution reduction investment, of which \$13.7 million is payroll.

The other members of the public wanted more environmental protection safeguards and lower emission levels in the permits. These persons primarily based their position on the Department's AQM Program's proposed conditions in the AQM draft permits. The draft AQM permits included lower emission limits than Premcor had proposed, and included a capacity throughput limit of approximately 185,000 barrels per day. The capacity limit was particularly contentious. In addition, public comments were heard on the PCUP's impact on the wastewater discharge, and on the aesthetics from an additional steam plume from the wet gas scrubber.

### **III. DISCUSSION**

I requested the assistance of the Department's experts in considering the public hearing record, particularly on the issues and questions that required the Department's technical expertise. The Department's response ("Response Documents") are attached hereto as Appendix A and incorporated herein.

The Department's Response Documents were prepared by the CZA Program and the Water Division, and they provide an excellent summary and review of the questions and comments raised by the public hearing. The Response Documents review and respond to the important and relevant issues identified at the public hearing. The public comments and questions have been considered in the Response Documents, which are incorporated as part of this report.

Given the nexus between Premcor's PCUP CZA and the AQM permit applications, I hereby consolidate the public hearing records for purposes of efficiency and completeness of the public hearing record. The public record of the AQM is reviewed in the Hearing Officer's Report issued on this same date, and which is incorporated herein.

Based on the record developed, as reviewed above, and the technical expertise of DNREC's personnel, I find and conclude that the record supports approval of Premcor's application for the CZA permit, subject to the conditions to be included by the Department, as discussed below.

There was considerable controversy and debate over the issues of the air emissions and a limit on the DCR's capacity. These issues primarily were addressed in the hearing on the AQM permit applications.

Premcor opposed any limits on DCR's production. Premcor contended that the DCR operates at various levels of capacity depending on economic conditions and the variety of crude oils that may be used in the refining process. Members of the public who supported Premcor's position voiced support for the PCUP based upon its considerable favorable economic impact on them and the State of Delaware. The record indicates that the PCUP will require Premcor to invest an estimated \$200 million in DCR, of which \$13.7 million is estimated to be for the payroll of workers and contractors.

The AQM Program's position, as adopted by other members of the public, was that the DCR has increased capacity over the years. The PCUP may eliminate production bottlenecks that currently exist in the refining process, which means that even though the PCUP may not directly add capacity by design, it may allow Premcor to process more crude by removing environmental restrictions or other physical restrictions that limit the DCR's current ability to refine crude oil more than 185,000 barrels a day on average.

Premcor's repeatedly stated that it has no plan to increase its capacity as a result of the PCUP. Moreover, Premcor acknowledged that any increase in capacity at DCR would entail additional permits. While I do not dispute anything that Premcor

states about its current plans, those plans may change tomorrow and if the AQM Program is correct, then the PCUP could result in more production than currently exists. The need to obtain necessary permits, as Premcor contends, offers little comfort when the record disclosed that Motiva may have increased the size of a boiler, and hence refining capacity, without any Department regulatory review, approval, permit, notice or even knowledge of the change until August 2004 during the Department's review of the permit applications. Unfortunately for Premcor, as the successor to Motiva, it also must assume DCR's history of public and regulatory agency suspicions as to what may occur at DCR. It is a valid environmental concern to require that the PCUP be approved in the manner proposed, which is today's promise of no increase in production capacity and that any increase in production capacity be tied to other CZA and AQM permit applications where the offsetting benefits must be demonstrated in order to support a permit. An appropriate place to impose a capacity limit is the CZA permit because the CZA was intended to control the expansion of industrial uses in the coastal zone. The fact that PCUP may allow DCR to increase its capacity above the present stated approximately 185,000 barrel per day level justifies including the present capacity in the CZA permit for the PCUP. In addition, AQM proposes a limit

on the Fluid Coking Unit of 57,199 barrels per day, as well as other unit limits.

The inclusion of capacity limits in the CZA permit also is supported by the fact that the current CZA and AQM applications and DCR capacity were based upon an increase capacity for crude oil atmospheric heater unit that Motiva apparently installed without any permit.<sup>1</sup> Any installation of industrial equipment to increase capacity is the exact type of conduct that the CZA was intended to regulate. The imposition of capacity limits in the CZA also was supported through public comments. One commenter noted that the CZA is more a land use regulation than an environmental restriction, and is a better place to regulate the DCR's use even if that use does not result in any more pollutants.

The imposition of a capacity restriction based upon the capacity amount of approximately 185,000 barrels per day is a reasonable condition given the circumstances and history of the DCR. Premcor was somewhat evasive in stating what the existing capacity of DCR was, and this is in part understandable due to the various feedstock components used in the process. Nevertheless, in DNREC Ex. 6 in the CZA hearing record, Premcor

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<sup>1</sup> One possible solution is to require Premcor to use the permitted level for the crude oil atmospheric heater, which could reduce the DCR capacity below the 185,000 gallons per day that currently exists. AQM Program considered this option and declined, without precluding a future enforcement action.

set forth DCR's capacity limit. I find and conclude that the use of this self-imposed limit in the CZA permit is appropriate and recommend to the Secretary that it be included in the CZA permit as a reasonable condition. The record supports limits based upon a single day capacity, as set forth in the AQM permit applications. Thus, there is discretion to select any time period between a single day or the rolling average over a longer three hundred and sixty five day time period. The single day would be the most restrictive while the year would allow considerable flexibility to exceed the limit on numerous days, particularly if the refinery is in a prolonged shutdown.

The CZA is environmental legislation that bars future industrial development in the coastal zone and makes any existing industrial facility obtain a permit for increased production. Clearly it is important to establish a certain current capacity in a CZA permit for the DCR as "capacity creep," has occurred and no capacity limit presently is in place. In the future, DCR will be required to justify further pollution offsets in a CZA review of any increase over the existing capacity limits. Any increase in the DCR's capacity is appropriate to address as a condition in the CZA permit. The inclusion of a permit condition based on Premcor's estimated existing capacity of 185,142 barrels per day for the Crude Unit.

Under the regulations for the permit application, this is to be the maximum capacity. The use of this capacity is reasonable and adequately supported by the record. Similarly, the capacity of the Fluid Coking Unit in the AQM permit application was stated as 57,199 barrels per day, and again it is reasonable to reflect this capacity in the permit.

The CZA hearing also had an issue raised on the wet gas scrubber's creation of another steam plume. This concern is aesthetic and is properly considered in a CZA application proceeding. The addition of an additional steam plume I find and conclude would not harm the environment or the existing aesthetics of DCR, which has numerous existing steam plumes generated by the considerable heat producing applications. The treatment of a heat plume is to heat the steam, which, in turn, creates another heat source and fossil fuel emissions. Thus, the aesthetic mitigation of the PCUP's steam plumes is not recommended.

A member of the public raised the issue of the disposal of treated water from the PCUP that would contain high amounts of sodium sulfides. Experts from DNREC's Water Division personnel considered this and concluded that the proposed discharge would not harm the environment in the amount proposed and into the Delaware River conditions where the DCR's wastewater plant's

outfall is located. The PCUP will not result in any proposed discharges in excess of the DCR's existing National Pollutant Discharge Elimination System ("NPDES") permit. The PCUP's proposed discharge of 3,720 tons per year of sulfate into the Delaware Bay is acceptable since it is into existing salt water. Based upon the advice from the Department's experts, I find that the proposed discharges will not harm the environment.

The CZA requires the calculation of offsets, but the sole purpose of the PCUP is to reduce pollution. The sulfur production unit is expanded to account for the increased recovery of sulfur from the PCUP, but this is not a real production increase, but merely a byproduct of the pollution reduction process. Premcor admitted that the sulfur product from the PCUP may have a negative value. Nevertheless, the PCUP's increased "production" of sulfur triggers the CZA permit under 7 Del C. §7004.

The CZA requires consideration of certain factors under Section 7004, which have been considered and no reason found in the record to prohibit the issuance of the permit upon consideration of the factors.

#### **IV. RECOMMENDED FINDINGS AND CONCLUSIONS**

In conclusion, I recommend adoption of the following findings and conclusions:

1) The Department provided adequate public notice of the application and public hearing, and held a public hearing in a manner required by the law and all applicable regulations;

2) The Department's issuance of a permit under the Coastal Zone Act and regulations promulgated there under for the construction and operation of the Pollution Control Upgrade Project for Premcor's Delaware City Refinery, as proposed by the Applicant, is approved subject to such reasonable and adequately supported conditions necessary to protect the environment and ensure that any increased production in the coastal zone occurs with prior approval;

3) The Department shall impose a condition to prohibit any unauthorized capacity increase at DCR from the level that currently exists, as stated by the Applicant in the amount of 185,142 barrels per day for the Crude Unit and 57,199 barrels per day for the Fluid Coker Unit, as measured over a time period between a single day limits to limits based upon a rolling average of three hundred and sixty five days, as to be determined by the Secretary;

4) The Department has considered the environmental impact and finds that there are significant benefits that overwhelming offset any additional emissions, and that use of the draft

permits' limits, as recommended by the Department's AQM Program, will further increase the PCUP's offsets;

5) The Department has considered the economic effect and finds that the estimated \$200 million investment in PCUP will be a positive benefit to the local and state economy and will employ skilled and unskilled labor and contribute \$13.7 million to the payroll paid to the employees and contractors who will build the PCUP and work at DCR.

6) The Department has considered the aesthetic effect of PCUP and finds that the marginal adverse impact will be small in a steam plume, which is more than offset by the significant reduction in air borne emissions from the PCUP;

7) The Department has considered the discharge of wastewater impact and finds that the discharge will be within the existing discharge permit limits, which means that they will be in compliance with all existing law and regulations.

8) The PCUP will improve the collection and recovery of harmful air emissions from DCR, and the PCUP will reduce the emission of sulfur odors from the DCR.

9) The Department's issuance of a CZA permit, as proposed by the Applicant and subject to the Department's conditions, is appropriate under the law and applicable regulations because the permit is supported by adequate offsets as calculated by the

Hearing Officer's Report  
Premcor Refining Group Inc.  
Delaware City Refinery-Coastal Zone Permit Application  
Dated: November 19, 2004  
Page 15 of 15

Applicant and confirmed independently by the Department's Offset Review Committee.

10) The Department considered all timely public comments and questions on the permit applications, as presented to the Department in writing and orally at the public hearing record, and its Staff's expert technical advice and investigation of the applications in issuing these permits.



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Robert P. Haynes, Esquire  
Hearing Officer  
Dated: November 19, 2004

**APPENDIX A**  
**Response Documents**



STATE OF DELAWARE  
DEPARTMENT OF NATURAL RESOURCES  
AND ENVIRONMENTAL CONTROL

89 KINGS HIGHWAY  
DOVER, DELAWARE 19901

PHONE: (302) 739-4403  
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OFFICE OF THE  
SECRETARY

**From:** Dennis Brown   
**To:** Robert P. Haynes, Esq., Hearing Officer  
**RE:** Response Document of the Coastal Zone Act Program to the October 14, 2004 Public Hearing on the Application of Premcor Refining Group Inc. for a Permit under the Coastal Zone Act  
**Date:** November 12, 2004

During the Coastal Zone Act (CZA) permit public hearing of October 14, 2004, five topics were discussed which I believe require a response from the CZA Program. None were specific questions, merely issues which could be clarified for the public record. These five issues are summarized below with an accompanying response.

**ISSUE 1: Production Limits:** On page 91 of the transcript, there is discussion about capacity limitations for the applicant in the draft air permit. The speaker, Mr. Muller, seems to suggest this limit be a part of the Coastal Zone Act Permit.

**RESPONSE 1:** DNREC Exhibit 6 states the refinery could, under the best possible conditions with safety and environmental constraints in place, process 185,142 barrels per day of crude oil. As a non-conforming heavy industry use, expansion or extension of this facility is allowable under the Coastal Zone Act, provided a permit is granted. Historically, there has been no baseline of crude throughput for determining when an expansion or extension might have occurred. Establishing a baseline now, at a rate specified by the company on exhibit 6, could provide the Secretary with a means of determining if future permits are required for future activities at the facility.

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**ISSUE 2: Steam Plume:** On page 95 of the transcript, there is discussion about the expected steam plume from the new equipment. Mr. Muller expresses concern that this plume may have a "psychological impact" on the people of Delaware City. He was questioning DNREC as to whether or not the Department was aware of this plume.

**RESPONSE 2:** During the hearing Department representatives stated that the Company mentioned this plume in the application and that the Department does not consider the plume to be "an alarming issue". The applicant stated at the hearing that they would investigate the possibility of reheating the plume to destroy it prior to discharge and report findings in seven business days, which will become part of the record. In considering this issue further, the Program does not consider that an additional steam plume would significantly alter the aesthetic effect of the existing facility, where

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numerous steam plumes already exist. The energy used to heat to eliminate the steam plume also could generate another emission source that may also create another steam plume. As such, we do not believe this issue warrants further consideration under the Act.

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ISSUE 3, Claim of “Fundamental Problems”: On page 117 of the transcript, Mr. Muller claims there are “fundamental problems” with the Division of Water Resources and the Coastal Zone program. He did not elaborate or site specific problems or errors for either program.

RESPONSE 3: Since no specific problems were stated, it is difficult to technically refute his personal opinion. However, let the record show that in the past 15 years (at least), the State Coastal Zone Industrial Control Board has upheld every permit decision brought before it for review through the appeal process. Also, Superior Court has rarely, if ever, over-ruled the Board’s decisions to uphold the DNREC Secretary. This record indicates that the DNREC Secretary and its Coastal Zone staff are administering the Act in a manner consistent with the law.

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ISSUE 4, Presentation: Page 126 contains a suggestion/criticism from Ms. McGonegal that Dennis Brown did not make a formal presentation regarding this CZA Permit application, but should have done so.

RESPONSE 4: The time period for review makes it difficult to prepare a presentation. An informal workshop was held and this often is better than a presentation in that it allows more dialogue than a presentation. In hindsight, a formal presentation may have been helpful with this hearing. The DNREC may include in future hearings a presentation similar to the assessment report required by each project (exhibit number 12 in this case).

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ISSUE 5: Serious Failing of this Hearing: Ms. McGonegal, on page 126, considers the hearing to be, at least in part, a failure due to the “wide discrepancy” between the Premcor presentation and what Air Quality Management (AQM) presented.

RESPONSE 5: The AQM and the Coastal Zone Act Programs are different in that the CZA is more of a land use act while DNREC’s air permitting programs regulate pollution control equipment and emissions. The CZA Program has an air emissions component within the offset provisions of the regulations[cite], however, the offset within this project is sufficient regardless of whose emission limits are eventually adopted in the air permit. Neither the Coastal Zone Act nor the Regulations confer on DNREC the authority to ratchet down a facility’s emissions, require adoption of MACT standards (as an example) or use other regulatory techniques unless they are deemed to be necessary to supplement an Offset Proposal. Given the obvious reductions in total emissions, this project is clearly and demonstrably better for the Coastal Zone than not doing it. The discrepancy referred to by Ms. Mc Gonegal is irrelevant for the purposes of the Coastal Zone permit determination because the fact that the offset was based upon the applicant’s application, and not the AQM’s draft permit, does not alter the Program’s recommendations, but would reinforce the Offset Proposal.

# Memorandum

November 18, 2004

To: Robert P. Haynes, Esq., Hearing Officer  
From: John DeFriece, P.E. *JRB*

Subject: Potential for Adverse Impacts from Sodium Added by Proposed Wet Gas Scrubbers (WGS)

Your e-mail dated November 10, 2004, "RE: Additional material for CZA Response Document", requested a response on whether there would be an adverse impact to the environment by the PCUP's introduction of additional 1,781 tons annual discharge of sodium at concentrations ranging from 34 to 2,865 ppm into the Delaware Bay at the site, reflecting a net increase of 3.3 ppm sodium. This question was originally asked within the context of the Coastal Zone Hearing for the proposed Wet Gas Scrubbers at the Premcor Delaware City Refinery.

The main potential for adverse impact for sodium would be when it is discharged to a freshwater body in sufficient quantities to raise the salinity to levels that freshwater organisms could not tolerate. Of course, the Delaware River at Delaware City is usually brackish:

<b>STORET Data for Salinity in Delaware River Near De. City</b>		
	Salinity (ppm)	Sodium (ppm)
<b>Delaware River at Pea Patch Island (near Premcor Outfall 001)</b>		
Minimum	100	31
Average	3,158	971
Maximum	9,300	2,862
<b>Increase at Outfall 001 Due to Sodium Added by WGS</b>		
Maximum	3.3	3.3

**Potential effects of the WGS on either salinity or sodium are insignificant.**

## Attachment -- Calculations

These calculations should be prefaced with the note that sodium is not a toxic substance. For example, sodium is present in seawater at 10,760 ppm. Of course, like water, a lot of sodium in the wrong circumstances could be harmful. That circumstance would be the exposure of freshwater organisms to high levels of sodium, eg. to levels that would significantly affect the salinity of the receiving water body.

Delaware does not have a numeric Surface Water Quality Standard for sodium. Further, Sodium is not one of the 126 priority pollutants listed in the Federal Clean Water Act, nor is it listed among 550 pollutants referenced in the EPA Integrated Risk Information System (IRIS) (<http://www.epa.gov/iris/search.htm>).

In sequence, the WGS wastewater will pass through NPDES Outfalls 901 & 902, then 601, 101, 301, and 001. Pollutants added by the WGS are best measured at Outfall 601, since the other outfalls include stormwater and Delaware River water. The **NPDES Application Form 2D<sup>1</sup>**, "New Sources and New Dischargers, Application for Permit to discharge Process Wastewater", provides Sulfate discharges due to the proposed Wet Gas Scrubbers.

<b>Estimates of Maximum Daily Loads and Concentrations Before and After the Addition of WGSs – at Outfall 601</b>						
Pollutant	Existing Mass & Concentrations			Estimated Mass & Concentrations with WGSs		
	Mass		Concentration	Mass		Concentration
	lb/day	tons/year	mg/L	lb/day	tons/year	mg/L
<b>Sulfate (as SO<sub>4</sub>)<sup>2</sup></b>						
<b>Total</b>	31,546	5,757	402	51,930	9,477	660
<b><u>Net</u></b>				<u>20,384</u>	<u>3,720</u>	<u>257.5</u>
<b><u>Net%</u></b>				<u>65%</u>		<u>64%</u>
<b><u>Sodium (as Na)</u></b>						
<b><u>Total</u></b>	<u>15,100</u>	<u>2,756</u>	<u>193</u>	<u>24,857</u>	<u>4,536</u>	<u>316</u>
<b><u>Net</u></b>				<u>9,757</u>	<u>1,781</u>	<u>123</u>
<b><u>Net%</u></b>				<u>65%</u>		<u>64%</u>

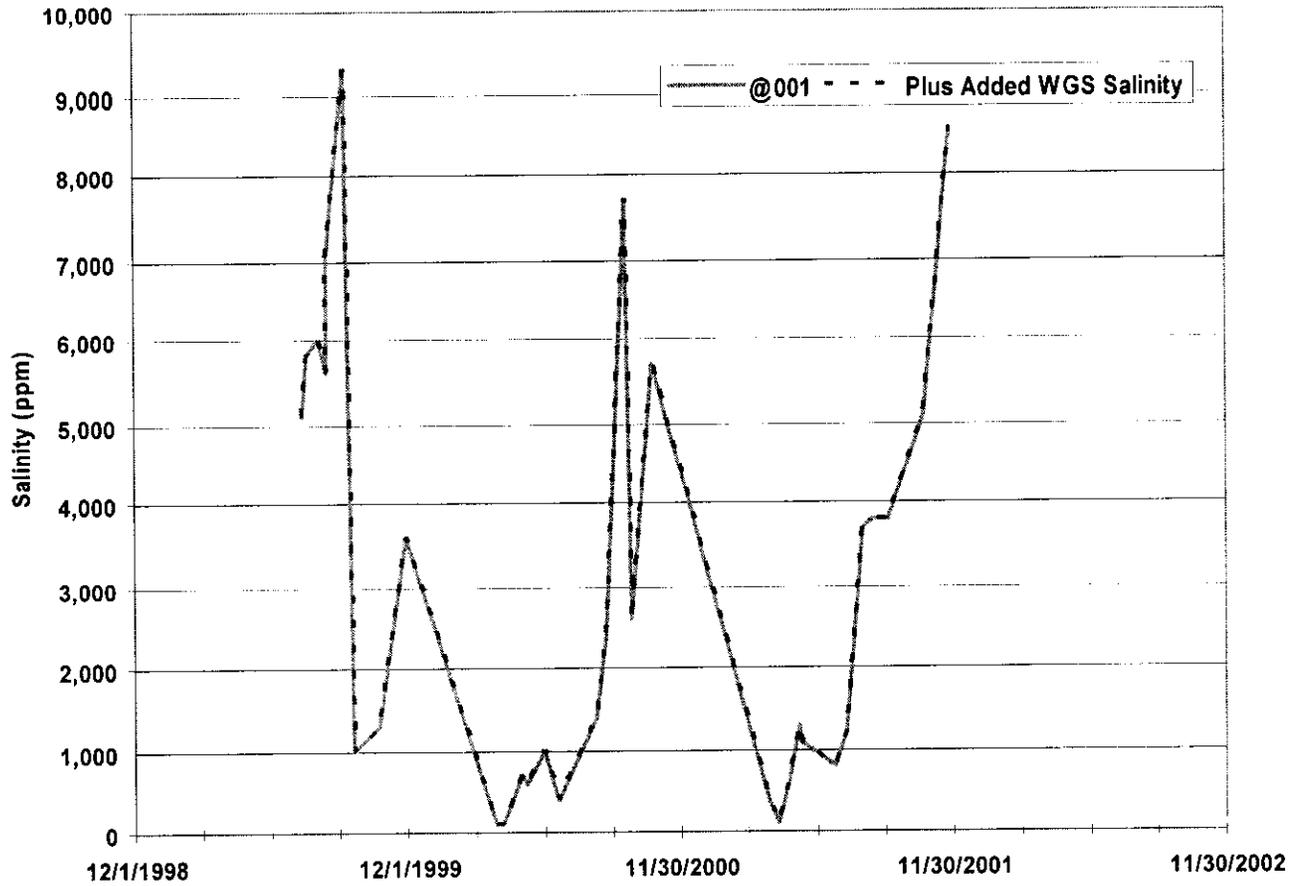
Sodium mass in the above table is estimated from molecular weights for sodium and sulfate, and assumes that sodium accounts for all positive ions (cations) associated with the negative ions (anions) of sulfate.

Element (Symbol)	Atomic Number	Avg. Atomic Mass	lbs./lb.
Oxygen (O)	8	15.9994	
Sulfur (S)	16	32.06	
Sodium (Na)	11	22.9897768	
Sulfate (SO <sub>4</sub> )		96.0576	
Sodium Sulfate (Na <sub>2</sub> SO <sub>4</sub> )		142.0371536	
lbs. Na per lb. SO <sub>4</sub>			0.478666483
lbs. SO <sub>4</sub> per lb. Na			2.08913729

<sup>1</sup> From page 45 of 46 of the Form 2D .pdf file

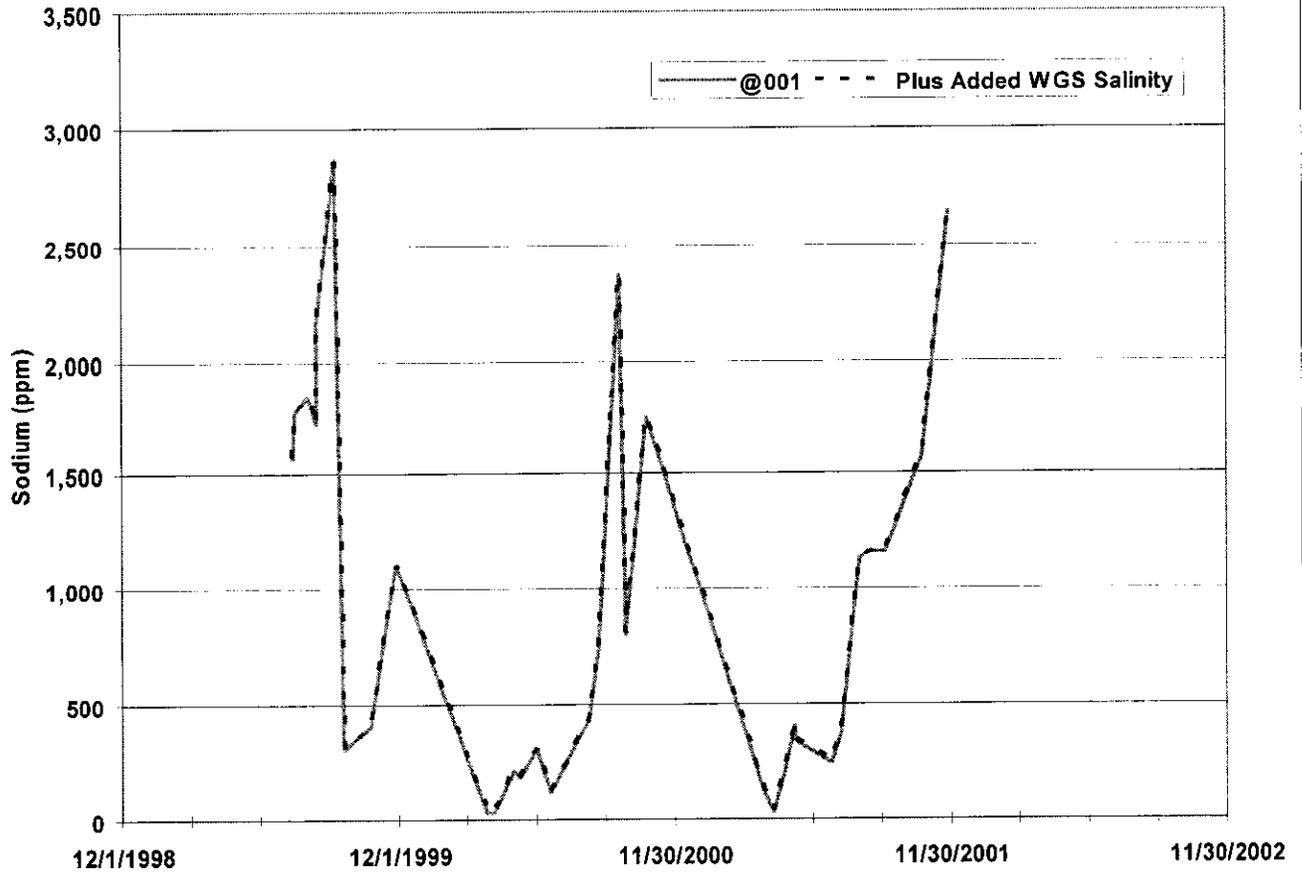
The following graphs show the Premcor discharge at Outfall 001, both without and with the effects of the sodium added by the Wet Gas Scrubbers (WGS). For both salinity and sodium, the "Plus Added WGS" discharges are indiscernible from the discharge at 001 without the WGS.

### Salinity at 001 Added by Wet Gas Scrubbers



0.04% to 3.3% Change in Salinity at 001 from Sodium Added by Proposed Wet Gas Scrubbers

### Sodium at 001 Added by Wet Gas Scrubbers



0.1% to 10.8% Change in Sodium at 001 from Sodium Added by Proposed Wet Gas Scrubbers

**Table 1 - Sodium Salinity Added At Premcor Outfall 001 by Proposed Wet Gas Scrubbers**

Water Density	8.4	lb/gal	Sodium in Seawater	10,760	ppm
001 Water Flow	350	Mgd	Salinity of Seawater	35	ppt
	= 2,940,000,000	#/day		= 35,000	ppm
Sodium Salinity Added by WGS	9,757	#/day			
	= 3.3187075	Ppm			

**STORET Station No. 091005 at Pea Patch Island**

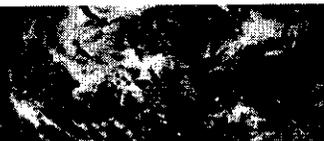
Date Sampled	Change in Salinity at 001 from WGS Sodium Added				Change in Sodium at 001 from WGS Sodium Added		
	Intake		@001	@001	Intake	@001	@001
	(ppt)	(ppm)	Plus Added WGS Salinity	Percent Change	@001	Plus Added WGS Salinity	Percent Change
7/14/1999	5.1	5,100	5,103	0.07%	1,568	1,571	0.21%
7/19/1999	5.8	5,800	5,803	0.06%	1,783	1,786	0.19%
8/4/1999	6.0	6,000	6,003	0.06%	1,845	1,848	0.18%
8/16/1999	5.6	5,600	5,603	0.06%	1,722	1,725	0.19%
8/16/1999	7.0	7,000	7,003	0.05%	2,152	2,155	0.15%
9/8/1999	9.3	9,300	9,303	0.04%	2,859	2,862	0.12%
9/13/1999	6.3	6,300	6,303	0.05%	1,937	1,940	0.17%
9/20/1999	1.0	1,000	1,003	0.33%	307	311	1.08%
10/25/1999	1.3	1,300	1,303	0.26%	400	403	0.83%
11/29/1999	3.6	3,600	3,603	0.09%	1,107	1,110	0.30%
3/27/2000	0.1	100	103	3.32%	31	34	10.80%
4/5/2000	0.1	100	103	3.32%	31	34	10.80%
5/1/2000	0.7	700	703	0.47%	215	219	1.54%
5/8/2000	0.6	600	603	0.55%	184	188	1.80%
5/31/2000	1.0	1,000	1,003	0.33%	307	311	1.08%
6/19/2000	0.4	400	403	0.83%	123	126	2.70%
8/9/2000	1.4	1,400	1,403	0.24%	430	434	0.77%
8/22/2000	2.4	2,400	2,403	0.14%	738	741	0.45%
9/18/2000	7.7	7,700	7,703	0.04%	2,367	2,371	0.14%
9/25/2000	2.6	2,600	2,603	0.13%	799	803	0.42%
10/23/2000	5.7	5,700	5,703	0.06%	1,752	1,756	0.19%
3/28/2001	0.4	400	403	0.83%	123	126	2.70%
4/10/2001	0.1	100	103	3.32%	31	34	10.80%
4/23/2001	0.6	600	603	0.55%	184	188	1.80%
5/8/2001	1.3	1,300	1,303	0.26%	400	403	0.83%
5/9/2001	1.1	1,100	1,103	0.30%	338	341	0.98%
6/25/2001	0.8	800	803	0.41%	246	249	1.35%
7/9/2001	1.2	1,200	1,203	0.28%	369	372	0.90%
8/1/2001	3.7	3,700	3,703	0.09%	1,137	1,141	0.29%
8/14/2001	3.8	3,800	3,803	0.09%	1,168	1,172	0.28%
9/4/2001	3.8	3,800	3,803	0.09%	1,168	1,172	0.28%
10/22/2001	5.1	5,100	5,103	0.07%	1,568	1,571	0.21%
11/27/2001	8.6	8,600	8,603	0.04%	2,644	2,647	0.13%

## References

From <http://ijolite.geology.uiuc.edu/>



**Department of Geology**  
University of Illinois at Urbana-Champaign



<http://ijolite.geology.uiuc.edu/02SprgClass/geo117/ppts/Lect17.pdf>

Which ions are found in seawater and how much of each is there?

SALINITY (review)

• **Ave. S = 35 g/kg; range = 30-37 g/kg**

• Variations due to gains vs. losses of H<sub>2</sub>O

### COMPOSITION OF DISSOLVED SALTS

• Dissolved substances are ions

– cations (+) & anions (-)

• 99.7% of salinity is made up of only 7 ions

• These dominant ions are called the "major elements"...

g/kg = parts per thousand JRD: Added conversions to ppm units.

mg/kg = ppm

Cations	g/kg	ppm	Anions	g/kg	ppm
Na <sup>+</sup>	10.8	10,800	Cl <sup>-</sup>	19.4	19,400
Mg <sup>2+</sup>	1.3	1,300	SO <sub>4</sub> <sup>2-</sup>	2.7	2,700
Ca <sup>2+</sup>	0.4	400	HCO <sub>3</sub> <sup>-</sup>	0.1	100
K <sup>+</sup>	0.4	400			

• **These are the Major Elements in Seawater**

• Others -- "minor" or "trace" elements

• Major dissolved species (& a few minor ones) are always present in "constant proportions"

– [Na<sup>+</sup>] / [Cl<sup>-</sup>] = a constant value everywhere

– [Na<sup>+</sup>] / Salinity = (ditto)

• "Conservative" elements - vary only with S

Constituents of Seawater (Table 5.4)

Constituent	Symbol	g/kg in seawater <sup>1</sup>	Percentage by weight
Chloride	Cl <sup>-</sup>	19.35	55.07
Sodium	Na <sup>+</sup>	10.76	30.62
Sulfate	SO <sub>4</sub> <sup>2-</sup>	2.71	7.72
Magnesium	Mg <sup>2+</sup>	1.29	3.68
Calcium	Ca <sup>2+</sup>	0.41	1.17
Potassium	K <sup>+</sup>	0.39	1.10
Bicarbonates	HCO <sub>3</sub> <sup>-</sup>	0.14	0.40
Bromide	Br <sup>-</sup>	0.067	0.19
Strontium	Sr <sup>2+</sup>	0.008	0.02
Boron	B <sup>3+</sup>	0.004	0.01
Fluoride	F <sup>-</sup>	0.001	0.01
Total		~ 35.00	99.99

**Major Ions**

**Minor Ions**