COMMONWEALTH OF PUERTO RICO
Office of the Governor
Environmental Quality Board

Air Quality Area

December 4, 2008

MARIE G BURNS
ACTING CHIEF PLANNING DIVISION
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS
OF ENGINEERS
PO BOX 4970
JACKSONVILLE FL 32232-0019

Dear Mrs Burns:

Re: VARIANCE REQUEST – RULE 301 OF THE RCAP
ON-SITE TERMAL REDUCTION
PORTUGUES DAM FLOOD CONTROL PROJECT
PONCE, PUERTO RICO

On December 1st, the Air Quality Area received a letter (dated November 25, 2008) from the US Environmental Protection Agency with technical comments regarding the application in reference. Please find a copy of this letter enclosed.

We are requesting an official response to these comments on your behalf no later than December 15, 2008.

If you need more information please contact us at 787-767-8181.

Cordially,

Evelyn Rodríguez Cintrón
Manager
Air Quality Area

Cruz A Matos Environmental Agencies Bldg , San José Industrial Park Urbanization
1375 Ponce de León Ave., San Juan, PR 00926-2604
PO Box 11488, San Juan, PR 00910
Tel. 787-767-8181 • Fax 787-756-5906

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

NOV 25 2008

Ms. Evelyn Rodríguez Cintrón
Manager, Air Quality Area
Puerto Rico Environmental Quality Board
P.O. Box 11488
San Juan, Puerto Rico 00910

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Dear Ms. Cintrón:

This is in response to your September 30, 2008 letter to me regarding the open burning variance request for the Portugues Dam Construction, Ponce, Puerto Rico. As you know, the U.S. Army Corp. of Engineers (USACE), which is conducting the operation, seeks a variance from the Puerto Rico regulation prohibiting open burning. The proposed open burn is for the purpose of disposing of vegetation cleared from areas in which the Dam will be constructed. The USACE has indicated that other alternatives have been considered in the removal/burning of the vegetation and that the most viable option is to use a thermal reduction operation/thermal air curtain to burn the vegetation.

Puerto Rico's applicable regulation, Rule 402, prohibits open burning, but Rule 301 provides that Puerto Rico Environmental Quality Board (PREQB) may grant a variance from that prohibition under appropriate circumstances. Rule 301 further provides that "no variance shall be deemed approved until it has been approved by the U.S. EPA." This regulation is part of the federally approved State Implementation Plan (SIP) for Puerto Rico.

We understand that PREQB will be providing an opportunity for public comment, and hold a public hearing about the requested variance. Assuming that PREQB decides to grant the variance and then requests EPA's approval as contemplated by the regulation, I would like to clarify the procedural steps that would be involved in our review and approval/disapproval determination. Our interpretation of the regulation, which is part of the SIP, is that it is not necessary to treat the PREQB-issued variance as if it were a proposed SIP revision requiring notice and comment by EPA. Therefore, the PREQB Chairman should submit the variance request after it is approved by PREQB. Our review would, of course, be a thorough one, with all of the information submitted to EPA, taking into consideration the record compiled by the PREQB, including substantive public comments received by that agency. The decision resulting from our review will then be communicated by letter from the Regional Administrator.

In the meantime, we have completed our review of the technical documents submitted to us by your office regarding the USACE's request for the variance. Attached are our technical comments regarding the thermal reduction operation/burn plan and suggested ways to improve the air monitoring plan. I would like to clarify one point – in the document submitted to us for review, the USACE makes reference to contacting EPA regarding the modeling analysis. I want to clarify, and as stated earlier, Puerto Rico's rules require the EPA Region 2, Regional Administrator to approve the variance. Therefore, we are providing our comprehensive review and comments on the open burn at this time.

If you or your staff has any questions, please contact me at (212) 637-4014 or Mr. Kirk Wieber of my staff at (212) 637-3381.

Sincerely,

Richard Ruvo

Richard Ruvo, Chief
State Implementation Plan Section,

Attachment

cc: Angel O. Berríos Silvestre, PREQB
Ivan Acosta-Vicenty, U.S. Army Corp. of Engineers

Portugues Dam Construction – Rule 301 Variance request
EPA Region 2 Comments
11/18/08

Based on the documents provided to EPA, Region 2 on September 30, 2008.

1. An emissions rate should be determined for all of the scenarios. The total emissions from scenario 1 and 2 take place over a longer timeframe in comparison to scenario 3. This will impact air quality in different ways. Emissions over a long time period could cause minimal change in air quality, while the release of the same amount of pollutants over a shorter timeframe could lead to violations of air quality standards.

2. There are no PM emissions reported with scenario 1 and 2. Please provide this information for comparison with the selected remedy.

3. While PM_{10} emissions are evaluated, $PM_{2.5}$ emissions have not been considered for any of the scenarios. The $PM_{2.5}$ impacts for each scenario should be included in the Thermal Reduction Plan.

4. A monitoring plan for the burn operation should include monitoring for $PM_{2.5}$ (a real-time monitor is recommended such that levels of $PM_{2.5}$ can be monitored on an hourly basis)

5. Total CO_2 calculation on page 5 of the Thermal Reduction Plan- The total CO_2 calculation is incorrect. The calculated diesel emissions are 322 lb CO_2, which should then be added to the material combustion emissions. It appears as though the NO_X diesel emissions have been used instead.

6. The Army Corp. of Engineers should ensure that adequate steps will be taken to consider the following: meteorological conditions prior to the daily burn operations (i.e., strong winds, temperature inversion, air stagnation advisory, or natural events advisory from Sahara dust or volcanic ash) air pollution emergency episodes, the use of emission reduction techniques to minimize the emissions from the fire, such as, but not limited to minimize the areas to be burned, extinguish the smoldering burns, burn before precipitation. The Army Corp. should consult the National weather service to verify the conditions/forecast. These types of considerations are consistent with EPA's Interim Air Quality Policy on Wildland and Prescribed Fires (May 1998).

7. A summary of the modeling results should be included (summary of the Gaussian Plume) and identify the levels of the pollutants modeled compared to the NAAQS. The results should be in units consistent with the NAAQS, i.e., $\mu g/m^3$ for PM. The pollutant levels when compared to the NAAQS should also include background concentrations within the area – not only the levels from the burn operations.

8. Contingency plans should be included. Currently the technical document provided state that "when emissions from a thermal reduction pit are reaching 85% to 90% of the NAAQS, the operator shall slow down the operation of the pit and adjust the process. Should the operation not meet 95% or lower of the NAAQS in a reasonable time period subsequent to the operator adjustments, the thermal pit shall cease operations for the rest of the day." The Army Corp. should provide other contingency actions should the level of emissions begin to reach levels close to violating the NAAQS.

Appropriate short-term (less than 24-hour) contingency actions may, among other things, include:

- Notifying the affected public (especially sensitive populations) of elevated pollutant concentrations,
- Suggesting actions to be taken by sensitive persons to minimize their exposure (e.g., remain indoors, avoid vigorous activity, avoid exposure to tobacco smoke and other respiratory irritants),
- Providing clean-air facilities for sensitive persons,
- Halting ignitions of any new open burning that could impact the same area,
- Consulting Commonwealth/local air quality managers regarding appropriate short-term fire management response to abate verified impacts,
- Implementing management responses that will mitigate the adverse impacts to public health
- Reporting the steps taken to mitigate adverse impacts to the public and appropriate Commonwealth/local agencies after they have been completed.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

Ms. Evelyn Rodriguez, Manager
Air Quality Area
Environmental Quality Board
Post Office Box 11488
San Juan, Puerto Rico 00910

Dear Ms. Rodriguez

This letter is to address EPA Region 2 comments provided on November 18, 2008, in referencing the Portugues Dam Construction – Rule 301 Variance request; for the thermal reduction activities.

1) Scenario 1 & 2 of the Thermal Reduction Plan, will no longer be considered for the following reasons (page 29 of the thermal reduction plan):
   - Cost of loading and transporting the vegetative material from the dam site to the landfill is extremely high to be cost effective and justifiable.
   - General public living among the truck route will be affected by noise and emission generated by the vehicles volume movement.
   - Independent of the emissions calculated for scenarios 1 & 2 using proximate analysis, the emissions from the thermal reduction in the landfill will be able to reach a highly populated area in Ponce, therefore the total emissions will be similar or higher to the thermal reduction emissions in the project site plus the additional emission of trucking the material from the project site to the landfill.
   - Allowing the vegetative material to degrade in the landfill will generate methane gas, according EPA's web site, methane is a greenhouse gas about 21 time's more likely to contribute to global warming than CO_2. The landfill presents an additional fire hazard from the methane gas generated from the decomposition solid waste.

2) PM emission for scenarios 1 & 2 will not be considered due to the reasons stated above.

3) $PM_{2.5}$ emissions were added to the thermal reduction plan, using Emission Factors: AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. From section 1.6 Wood Residue Combustion in Boilers (page 5 of the thermal reduction plan).

4) Monitoring for $PM_{2.5}$ will be added to monitoring plan.

5) Correction for CO_2 was made in the thermal reduction plan (page 8 of the thermal reduction plan).

6) The recommendation provided by EPA will be incorporated in monitoring plan. The Contractor will contact the National Weather Service, to verify if the weather conditions are appropriate to conduct thermal reduction with the purpose of minimizing impacts. The Corps requires continuous monitoring of wind directions, if winds steer towards populated areas, the Corps Contractor personnel will diminish or stop thermal reduction activities.

7) The emission calculations conversions' are included in the NAAQS units, to properly compare the output of the simplified Gaussian Plume model that was prepared in Excel. The background concentrations for the area are assumed to be zero, due to the remoteness of the site and the City of Ponce being in the attainment category. The real time monitoring will be overall, that includes background plus thermal reduction emissions. The only potential problems the Corps foresees are the emissions from heavy equipment working on site interfering with the measurements of the thermal reduction activities.

8) The thermal reduction will be taking place in a remote area, away from populated areas, our contingency plan will be to reduce the rate of feed to the thermal pit, originally we set the specification to be 75% of the NAAQS as an action level, this percentage can be adjusted depending which is the highest contaminant emission at steady state, after start up. A short-term contingency will have it follow the OSHA standards for worker safety.

To further assure acceptable air quality results, the Corps always requires implementation of real time air monitoring during the thermal reduction operations. This was coordinated with EPA and EQB and performed effectively during emergency operations in Puerto Rico following the aftermath of hurricanes, Georges and Jeanne. The Corps is fully committed to protect human health and the environment.

Please feel free to address any matters concerning the above to me or to Mr. Javier Cortes from my staff at telephone number 904-232-1896.

Sincerely,

Kenneth R Grazyk

for Eric P. Summa
Chief, Environmental Branch

Copies Furnished:

Mr. Daniel Galan, Secretary, Department of Natural and Environmental Resources, Post Office Box 366147, San Juan, Puerto Rico 00936

Ms. Mabel C. Rivera-Sanabria, Project Manager, Water and Mineral Resources Area, Department of Natural and Environmental Resources, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Mr. Francisco Claudio, U.S. Environmental Protection Agency Region 2, Caribbean Environmental Protection Division, Centro Europa Building, Suite 417, 1492 Ponce de Leon Avenue, San Juan, Puerto Rico 00907-4127

Mr. Kirk Wieber, U.S. Environmental Protection Agency Region 2, 290 Broadway, New York, New York 10007-1866

Mr. Gavin Lau, U.S. Environmental Protection Agency Region 2, 290 Broadway, New York, New York 10007-1866

Mr. Richard Ruvo, U.S. Environmental Protection Agency Region 2, 290 Broadway, New York, New York 10007-1866

Ms. Maribel López, P.E., Permits and Engineering Division, Air Quality Area, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Ms. Leymaris Delgado, P.E., Chief, Permits & Engineering Division. Air Quality Area, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Ms. Elianeth Rivera Morales, Data Validation and Dispersion Modeling Division Evaluation and Strategic Planning Area, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Mr. Angel Berrios, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Mr. Lucia Fernadez, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

Mr. John Aponte, Environmental Quality Board, 1375 Avenida Ponce de León, San Juan, Puerto Rico 00926

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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JUN - 1 2009

Leimarys Delgado-Medero
Interim Manager, Air Quality Area
Puerto Rico Environmental Quality Board
P.O. Box 11488
San Juan, Puerto Rico 00910

Dear Ms. Delgado-Medero:

This is concerning the March 6, 2009 letter sent from Mr. Eric P. Summa of the U.S. Army Corps of Engineers to Ms. Evelyn Rodriguez Cintrón of the Puerto Rico Environmental Quality Board (PREQB) concerning the variance request for the open burn operations for the Portugues Dam project in Ponce, Puerto Rico. We also received that letter and reviewed the responses that the U.S. Army Corps of Engineers (USACE) included in that letter. In addition, on April 23, 2009, we also received a revised Contingency Plan for Thermal Reduction Activities and Nearest Receptor Figures. The USACE has responded to and addressed most of EPA's concerns, which were raised in our letter to Ms. Cintrón dated November 25, 2008 and during our subsequent conference calls. However, there remain a few concerns and recommendations that have not been fully addressed which are related in part to the Contingency Plan and Nearest Receptor Figures. Attached are those concerns and recommendations. We are also aware that your office provided its own comments to the USACE in response to the March 6th letter.

In addition to the attached comments on the contingency plan, EPA has some concern associated with the thermal reduction plan, specifically in regard to alternative ways of disposing of the biomass other than thermal reduction. Although USACE stated that alternate measures were considered, (i.e., mechanical reduction and hauling to a landfill), EPA is requesting that USACE include a more detailed analysis of alternate measures. This is consistent with Rules 301(B)(1)(b) and (c) of the Regulation for the Control of Atmospheric Pollution of the Commonwealth of Puerto Rico (RCAP) which provide, at Rule 301(B)(1)(b), "Compliance with the rules and regulations would produce practical difficulties or hardships without equal or greater benefits to the public or to the betterment of air quality" and further provide, at Rule 301(B)(1)(c), "The owner or operator of the source for which a variance is sought has made efforts to control or prevent the conditions which may have prompted the variance request."

EPA recommends that the USACE identify and evaluate alternate, more environmentally beneficial ways of disposing all or part of the waste materials. Environmentally beneficial uses of the waste material that may prevent the conditions which have prompted the variance request may include, but are not limited to: mechanical reduction/chipping of the biomass and composting (either on site or hauled to a composting facility); offering the chipped material to local communities/businesses for use as landscaping material; and constructing the reservoir without clearing and grubbing the vegetation (flooding the reservoir pool with the vegetation in place). As part of this evaluation USACE should

perform a comprehensive review of recent literature and practices to determine if more environmentally beneficial approaches have been demonstrated to be available as an alternative to burning the materials. USACE should also inform PREQB and EPA of the current amount of vegetation/biomass that is being considered for removal.

If you or your staff has any questions, please contact Mr. Richard Ruvo of our Air Programs Branch at 212-637-4014.

Sincerely,

Ronald J. Borsellino, Acting Director
Division of Environmental Planning and Protection

Attachment:

cc: Angel O. Berríos Silvestre, PREQB
Maribel Lopez, PREQB

Eric P. Summa, Chief, Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
PO Box 4970
Jacksonville, FL 32232-0019

Attachment

- EPA recommends that a robust analysis of environmentally beneficial uses of all or some of the vegetative plant materials be examined. Other methods of handling the vegetative material could include; mechanical reduction/chipping of the biomass and composting (either on site or hauled to a composting facility); offering the chipped material to local communities/businesses for use as landscaping material; and constructing the reservoir without clearing and grubbing the vegetation (flooding the reservoir pool with the vegetation in place).

<u>EPA's Comments on 4/23/09 version of "Contingency Plan for Thermal Reduction Activities" and Nearest Receptor Figures</u>

- Provide an updated estimate of project length and amount of debris expected to be removed.

- Black carbon should be evaluated as a pollutant of concern. The thermal pit and use of equipment on-site, such as vehicles or blowers, can be sources of the black carbon.

- Below are actions that should be considered as part of a contingency plan. Appropriate short-term (less than 24-hour) contingency actions may, among other things, include:

  - Notifying the affected public (especially sensitive populations) of elevated pollutant concentrations,
  - Suggesting actions to be taken by sensitive persons to minimize their exposure (e.g., remain indoors, avoid vigorous activity, avoid exposure to tobacco smoke and other respiratory irritants),
  - Providing clean-air facilities for sensitive persons,
  - Halting ignitions of any new open burning that could impact the same area,
  - Consulting State/tribal air quality managers regarding appropriate short-term fire management response to abate verified impacts,
  - Implementing management responses that will mitigate the adverse impacts to public health
  - Reporting the steps taken to mitigate adverse impacts to the public and appropriate State/tribal agencies after they have been completed.

- In the Nearest Receptor Figures, it is not clear what pollutant or pollutants are being shown with the rings around the thermal pits. Provide explanation of which pollutants are shown on the figures.

- In the Nearest Receptor Figures, verify that the school that is marked on the map has been acquired by the Commonwealth of Puerto Rico and is no longer in use.

- Additional Contingency Actions #2. It should be made clear that the air monitoring performed as part of the Thermal Reduction Plan is the primary air quality monitor for the work to be performed and the trigger for contingency actions and not the monitor run by EQB in Ponce.

- Under Additional Contingency Actions #3, include a statement about the plan of action to be taken should contractor personnel discover or become notified of external events that could affect air quality.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT
701 SAN MARCO BOULEVARD
JACKSONVILLE, FL 32232-8175

July 8, 2009

Planning Division
Environmental Branch

Mr. Pedro Nieves Miranda
President, Environmental Quality Board
Post Office Box 11488
San Juan, Puerto Rico 00910

Dear Mr. Nieves Miranda:

Reference is made to your meeting of June 22, 2009 and subsequent communications with my Deputy, Lieutenant Colonel Paul Baker and my environmental staff, concerning the Portugués Dam project and the proposal to reduce the biomass at the site via thermo-reduction, a.k.a. air curtain burning. I understand that your office requested specific project information to assure that the proposed Portugués Dam project would not contribute to an unauthorized or adverse impact to the air quality on the island or in areas surrounding the project.

The U.S. Army Corps of Engineers (Corps) appreciates the concerns of the Environmental Quality Board (EQB) and strongly concurs that the project must not adversely impact local air quality. The information you requested, to include a vigorous monitoring program, has been enclosed. As you are aware, the Corps believes that the proposed plan to reduce on-site biomass material via thermo-reduction process, a newer method of controlled burning, does not meet current definitions of regulated activities (prohibited or otherwise approved/exempted) in the EQB's *Regulations for the Control of Atmospheric Pollution.* However, the Corps remains committed to aiding the EQB and ensuring that all new methodologies, to include thermo-reduction, are addressed by local rule or regulation. To that end, we will provide under separate cover, examples of how three separate states (Florida, North Carolina and Colorado) address thermo-reduction, mostly through stipulated exemptions. We also offer our assistance in constructing appropriate/ applicable regulations to cover a thermo-reduction type activity.

In the interim, the Corps requests you review our enclosed information and concur with the above interpretation of your rules, (a thermo-reduction process, as proposed to be implemented at the Portugués project, is not currently regulated). As such, we also ask that you consider this a formal withdrawal of any variance requests associated with your current/existing rules. Should you disagree with our interpretation, we request you provide a response within two-weeks of receipt of this letter. Point of contact for this action is Mr. Ivan Acosta of my environmental staff at (904)232-1693.

The Corps of Engineers considers itself a partner with the EQB in this effort and many others. My staff and I will strive to continue our collaborative working relationship and look forward on helping you assure the continued high standard of environmental quality for the Commonwealth of Puerto Rico.

Sincerely,

Paul L. Grosskruger
Colonel, U.S. Army
District Commander

Enclosures

Copy to:
Byrd/CESAJ-PD-EP/2016
Acosta/CESAJ-PD-EP
Summa/CESAJ-PD-E
Griffith/CESAJ-PD
Pax/CESAJ-OC
Brooks-Hall/CESAJ-DE
Rainey/CESAJ-DD
Grosskruger/CESAJ-DE

L: group/PD-EP/Cortes/Thermal Reduction/Cover letter Thermo 7-6-09

Portugués Dam Construction Project
Ponce, Puerto Rico

A. Project Description:

The construction of the Portugués Dam Flood Control Project is the last phase of the Portugués and Bucaná Rivers canalization and flood control project authorized by Congress in 1970. The project consisted primary of three major features. First the construction of the Cerrillos Dam, northeast of the city of Ponce, completed 1992. Second the canalization of the Bucaná River, southeast of the city of Ponce, completed 1997. The last feature is the construction of the Portugués Dam.

The Portugués Dam project is located north of the city of Ponce, Puerto Rico, on the river channel of the Portugués River. The Portugués Dam reservoir pool will cover approximately 72 acres during normal operation, with a maximum flood pool capacity of 215 acres during an extreme rain event. In order to construct the reservoir, there is a need to clear and grub approximately 150 acres of timber and brush vegetation in the river valley during construction, plus an additional 50 acres for establishment of the reservoir pool. The project length and amount of debris expected to be removed have not been changed. The proposed project consists of clearing and grubbing of approximately 200 acres at 26.2 tons of timber per acre (estimated total 5,240 tons), or approximately 120,000m^3. The field crew estimated there is about 60,000 m^3 of timber material (cut trees from Phase 1) that are sitting on site. In the next phase we will clear and grub the reminder of the project foot print for the establishment of the pool reservoir.

B. Purpose and Need

The Construction of the Portugués Dam and associated reservoir required the removal of a large volume of timber material. Leaving the timber material on site is not an option, due to the dry climate conditions of the south of Puerto Rico, and the heat generated for the natural decay of such large volume of material can generate a wildfire, and leaving the dead trees standing in the pool of the reservoir would affect storage capacity, recreation and water qualityin the reservoir. Other possible problems can be termite infestation, among other pests. These scenarios can present a health threat to the local environment.

C. Alternative Analysis for the Disposal of Timber Material and Emission Calculations

The U.S. Army Corps of Engineers (USACE), Jacksonville District, has analyzed the environmentally and cost-effective alternatives for the disposal of this large amount of

brush and timber material. The analyzed alternatives were: landfill disposal, chipping and mulching, open burning and air curtain thermal reduction.

Alternative 1 – Landfill Disposal: The Ponce Landfill is the closest landfill available for the disposal of solid waste. The process of landfill disposal is straight forward; the debris is loaded into hauling trucks and then transported to the landfill. Landfill disposal would appear to be the most logical and ideal means of debris disposal, however several factors suggest otherwise. Two of the most important factors are that not all landfills allow vegetative material debris and many landfills do not have the capacity for such large amount of debris (PC, 2004). The amount of space available at landfill sites around the World is decreasing at an alarming rate: the amount of human waste produced is gradually surpassing the amount of space available to contain the waste leaving little room for vegetative debris. Also, in general, landfills are one of the most expensive means of disposal, because the cost includes transportation and disposal fees (BSE, 2008). Another factor is that vegetative waste dramatically reduces the overall life of a landfill (BSE, 2008). Finally, the emissions associated with the transportation of the timber material, and the decomposition of the material can be high. Decomposing wood is known to produce high levels of greenhouse gases (BSE, 2008). Other possible problems associated with decomposing vegetative material in landfills can be the potential for naturally occurring fires and insect infestation (SCAQMD, 2003).

The emissions calculations from transportation, allowing natural decay of the vegetative waste in the landfill and incineration immediately after receiving the vegetative material in a landfill were calculated and presented in the Thermal Reduction Plan. As per information received from USACE Field Office (Ponce, Puerto Rico) and hauling companies, the loading and transportation logistics for the green timber and estimated emissions were revised, as follows:

Loading and Transportation logistics for the green timber:

Average dump truck volume = 20 yd^3/truck (~16 m^3)
Typical density of tree trimmings waste (including voids) = 139.7 lb/yd^3

Tree trimming per acre (trees plus voids) = tree mass per acre/density of tree trimmings waste:

$$= (52{,}400 \text{ lb/acre}) / (139.7 \text{ lb/yd}^3) = 375 \text{ yd}^3\text{/acre}$$

Number of trucks hulling needed per acre:

$$= 375 \text{ yd}^3 / (20 \text{ yd}^3\text{/truck}) = 18.75 \text{ trucks/acre}$$

Number of one way truck trips to disposal facility

= 200 acres x 18.75 truck/acre = 3,750 truck trips

Total truck trips = 3,750 x 2 trips/roundtrip = 7,500 truck trips

Travel time from the Portugués Dam to the Ponce landfill is 20 minutes for a car, for a truck we allowing 10 minutes more for the driving inside the sites and trucks are slower than cars.

Time per trip = 30 minutes = 0.5 hr (without traffic)

Truck emissions were calculated from the "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines" EPA420-F-97-014, September 1997. The SO_2 diesel engine emissions were calculated using EPA's Compilation of Air Pollutant Emission Factors: AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, section 3.3 Gasoline and Diesel Industrial Engines. The truck model used to calculate the emission is a Mack 300, 1998+, with capacity of 20 yd^3 and rated at 300 bhp.

CO = (15.5g/bhp-hr) (300bhp) (7,500trips) (0.5hr/trip) = 17,437,500g x lb/454g = 38,408.6lb

HC(VOCs) = (0.5g/bhp-hr) (300bhp) (7,500trips) (0.5hr/trip) = 562,500g x lb/454g = 1,239lb

NO_2 = (4.0g/bhp-hr) (300bhp) (7,500trips) (0.5 hr/trip) = 4,500,000g x lb/454g = 9,912lb

PM_{10} = (0.1g/bhp-hr) (300 bhp) (7,500trips) (0.5 hr/trip) = 112,500g x lb/454g = 247.8lb

SO_2 = (300hp) (0.00205lb/hp-hr) (0.5) (7,500trips) (0.5hr/trip) = 1,153.12lb

The landfill disposal alternative was not considered practicable, for the following reasons:

- The volume of biomass to be generated from the clearing and grubbing of the Portugues Dam construction is too large to be handled and received in the region's sanitary landfills. It is important to highlight that most of Puerto Rico landfills do not allow vegetative material.

- The large amount of vegetative waste could contribute in the reduction of the overall life of the used landfill.

- General public living among the trucking route will be affected by noise, traffic, and emission generated by the vehicles volume movement.

- Allowing the vegetative material to degrade in the landfill will generate methane gas, according to the Environmental Protection Agency (EPA) web site, methane is a greenhouse gas about 21 time's more likely to contribute to global warming than CO_2. The landfill presents an additional fire hazard from the methane gas generated from the decomposition solid waste.

- Cost of loading and transporting the vegetative material from the dam site to the landfill and landfill fees are extremely high to be cost effective and justifiable. It was estimated that this alternative will cost approximately [redacted]. For detailed information, please refer to **Table 1**.

Alternative 2 – Chipping/Mulching: This activity consists of piling the raw-wood waste in an established area and cut the trees. The trees are cut in approximately 2 or 3 feet above the root ball. Then a portable tub grinder will be towed to site where it will be set up to chip stumps and large branches into 1 to 2 inch diameter sized chips/mulch. After chipping, the ground wood residue will be left on site to be loaded on trucks for disposal, since the chipper emits the resulting wood chips/mulch in the immediate area of the raw wood waste pile.

This alternative appears to be the environmentally beneficial alternative for the disposal of timber material, but we have to take into consideration that it is estimated that approximately 5,240 tons of timber material will be generated. Puerto Rico does not have facilities that can handle or receive this volume of material in a timely manner, as required by the project. As described in the Landfill Disposal alternative the transportation cost of the vegetative material from the dam site to an appropriate facility is extremely high to be cost effective. It was estimated that this alternative will cost approximately [redacted]. Also, we have to consider the general public living among the trucking route and the emission generated by the vehicles volume movement.

However, the Corps has identified approximately 5,000 m^3 of wood that can be utilized as mulch or giving other use or application, which is environmentally beneficial for that matter. Furthermore, we will have on site a mulching machine to process wood into mulch, which will be offered to the municipalities, agencies and to the general public. All these efforts will be coordinated with the sponsor, the Department of Natural of Environmental Resources (DNER). Nevertheless, it would be the responsibility of the municipalities, agencies or public thereof to have the necessary equipment and personnel for hauling and/or manage chipping/mulching material.

Alternative 3 – Open Burning: Open burning is a fairly simple process as well. According to the Puerto Rico Environmental Quality Board (EQB) and EPA open burning means, "the combustion of any material without the following characteristics: (1) control of combustion air to maintain adequate temperature for efficient combustion; (2) containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, and; (3) control of emissions of the gaseous combustion products".

Generally, open burning is when all the debris is collected in a pile(s) on site then burned to ash in a manner lacking control of sparks, ash or associated emissions. The resulting insitu ash, (that which did not migrate from the site in the open burning process, may be distributed on site, sold as fertilizer or disposed of at a landfill. The economics, human health and environmental risk associated with this method of debris disposal are significant. Open burning is commonly thought of as producing too many pollutants, because it lacks any type of environmental control (BSE, 2008; PC, 2004). The opacity (cloud of smoke) produced by open thermal reduction averages 60% to 80% (Air Burners, 2008). By increasing air pollution and smoke emissions, open burning negatively impacts the health of area residents (ESE, 2008). In studies examined by Miller and Lemieux (2007), carbon monoxide emissions associated with open burning ranged from 16 to 110 g/kg and particulate matter emissions ranged from 6 to 19 g/kg; levels which greatly exceed those produced by an air curtain thermal reduction operation.

Open burning, as a practice, also increases the opportunity for wildfire as sparks from the open burn pile can not be sequestered and will be distributed in the surrounding environment.

Based on the human health and environmental risk associated, this alternative was not considered safe or practicable.

Alternative 4 – Air Curtain Thermal Reduction: Air curtain thermal reduction technologies' are a commonly used for vegetative debris disposal (Miller and Lemieux, 2007). It is a common practice for disposal amounts of vegetative material associated with forestry management operations where leaving slash material in-place on the ground would exacerbate potential forest fires. Also, this type of operation is preferred by forestry managers over traditional open burning as it significantly limits emissions and dangerous sparks which could ignite other areas. The design of the air curtain technologies may vary, but the operation is fundamentally the same. The traditional setup of an air curtain thermal reduction consists of a pit, air blower, and continuous air monitoring devices (Miller and Lemieux, 2007). The design varies in that the pit may be manufactured and portable or the pit may be dug out on site. The latter requires additional resources and regulations (ie. dimensions, lining, etc.), while a portable air curtain container is less costly and "ideal for areas with high water tables, sandy soils and where opacity must be kept to a minimum." An air curtain pit "operates by burning the

combustible material (trees) in an enclosed space with an open top, over which a high velocity 'curtain' of air is directed to reduce the escape of large particles and to improve air circulation into the burning debris" (Miller and Lemieux, 2007). Essentially, this is an enclosed burning operation, 3 sides enclosed by a pit or a container while the top provides a 4th side of the enclosed operation, a barrier of high velocity air, to allow for greater mixing and enhance combustion.

Thermal reduction can be implemented without compromising the air quality of the region. The emissions of particulate matter (PM) and carbon monoxide (CO) per unit mass of debris produced by thermal reduction in an air curtain incinerator are significantly lower than those of open pile burning (Miller and Lemieux, 2007; CDPHE, 2008). The use of an air curtain incinerator reduces the emission of PM and CO by improving combustion conditions, as compared to open thermal reduction (Miller and Lemieux, 2007). An air curtain incinerator averages 10% opacity –recall 60-80% for traditional open burning- (Air Burner, 2008). The ashes produced via thermal reduction can be recycled as fertilizer or for any other eco-friendly purpose; only after being analyzed and cleared of heavy metal contaminants (BSE, 2008). The remaining ashes can be disposed of properly at a landfill.

Based on the ability to dispose of a large amount of debris economically, it's ability to significantly limit emissions and prevent nearby forest fires, and its value to the local community of reducing truck trips, (app. 7,500 on existing roadways contributing to emissions and traffic), and not contribute to already strained landfill capacity, thermo-reduction of the vegetative material is believed to be the least damaging practicable alternative.

Emissions: Leaning toward the conservative, the emission calculations for thermal reduction in an air curtain burn operation at the Portugués Dam construction project were based on the highest emission value, found from the different tools, used to mimic the extreme highs for this type of operation. The USACE has estimated emissions for an air curtain operation based on the principles of complete combustion and by using emission factors for wood residue combustion in boilers. We compare our numbers with numbers from a technical paper published by the U.S. Department of Agriculture (USDA); the variances in values can be attributed to several factors like, type of vegetative material, parameters of operation, loading frequency, air temperature, and others. For detailed information, please refer to the Thermal Reduction Plan.

In addition, per EQB's request, the USACE re-calculated the values of CO and $PM_{2.5}$ emissions by replacing the 0.5 adjustment factor that we used to correct for the 50% moisture content by weight found in green timber with a factor of 1.0. Both of these radii are less than our estimated potential impact radii of 0.8 km emission calculations. All the emissions of CO, SO_2, NO_2, PM_{10} and $PM_{2.5}$ from the thermal reduction operations are within the NAAQS at a conservative

scenarios radius ("rings") of 0.8 km (see Alternative Thermal Pit Sites and Potential Receptors Figures).

The following NAAQS and conservative scenarios radius distances were used in the Thermal Reduction Plan calculations:

Pollutant	NAAQS	Conservative Scenarios Radius Distance (Kilometers)
CO	10 mg/m^3	0.0265 – 0.049*
SO_2	80 µg/m^3	0.271
NO_2	100 µg/m^3	0.3210
PM_{10}	150 µg/m^3	0.281
$PM_{2.5}$	15 µg/m^3	0.337*- 0.801

*Value using U.S. Forest Service data comparison.

The most stringent pollutant within conservative scenarios is $PM_{2.5}$ with a concentration of 15 µg/m^3 at a radius of approximately 0.8 km. The USACE has used the most stringent NAAQS standards for the above mentioned pollutants.

Based on the calculations presented on the above table, it is expected that most of the emissions will be within less than 0.5 km radius and impacts to human health and the environment are not expected. For detailed information, please refer to the Gaussian Plume, Two-dimension Spreading Model provided on the Thermal Reduction Plan for each pollutant.

This alternative presents the best solution for the disposal of the vegetative material from the public health, environmental and economical point of view. It was estimated that this alternative will cost approximately [redacted], which is significantly less than alternatives 1 and 2.

Table 1. Cost Estimate for the Disposal of approximately 5,240 tons of timber.

FOR OFFICIAL USE ONLY **Cost Estimate Comparison Example for the Disposal of 5,240 Tons of Timber** **Air Curtain Burning vs. Chipping vs. Landfill Disposal**			
	S-220 Air Curtain Thermal Reduction	Chipping and Hauling to Appropriate Facility	Direct Landfill Hauling & Disposal
Cost of Machine Lease-Financing Cost per Month Rental Cost per Month	[redacted]	[redacted]	[redacted]
Contractors	Prime	Prime/Sub	Prime/Sub
Fuel Cost ([redacted])	[redacted]	[redacted]	[redacted]
Maintenance and Repairs [redacted]	[redacted]	[redacted]	[redacted]
Hauling of Residual to Landfill ([redacted]	[redacted]	[redacted]	[redacted]

FOR OFFICIAL USE ONLY **Cost Estimate Comparison Example for the Disposal of 5,240 Tons of Timber Air Curtain Burning vs. Chipping vs. Landfill Disposal**			
	S-220 Air Curtain Thermal Reduction	Chipping and Hauling to Appropriate Facility	Direct Landfill Hauling & Disposal
[redacted] with [redacted] Dump Truck [redacted] Chipping & Landfill Disposal: requires [redacted] loads; Direct Landfill, if allowed, requires [redacted] Loads			
Tipping Fees at Landfill [redacted])	[redacted]	[redacted]	[redacted]
Heavy Equipment Operation Cost	[redacted]	[redacted]	[redacted]
Purchase/Rental of Equipment	[redacted]	[redacted]	[redacted]
Insurance/Profit/Overhead/Management Prime Contractor	[redacted]	[redacted]	[redacted]
Partial Total =	[redacted]	[redacted]	[redacted]
Adjustment Air Curtain	[redacted]	[redacted]	[redacted]
Minimum Grand Total =	[redacted]	[redacted]	[redacted]
Contingency Purchase of Land for Disposal Estimated [redacted]	[redacted]	[redacted]	[redacted]
Management of land and additional heavy equipment	[redacted]	[redacted]	[redacted]
Estimated Grand Total =	[redacted]	[redacted]	[redacted]

Notes:

1. Results may vary.
2. Chipper approx. [redacted], diesel fuel consumption: approx [redacted]. Diesel fuel cost at [redacted] gal.
3. It is assumed that chips/mulch cannot be reasonably sold for beneficial re-use.
4. Chipping process and chip/mulch handling produces large amounts of particulate matter (PM) in the form of wood dust that can cause serious illness in exposed workers. Wood dust is a proven carcinogenic (cancer-causing). Chipping losses, mostly in form of wood dust, are approx. 2%.

D. Interim Control Measures and Contingency Actions

As part of the efforts to minimize and prevent impacts to public health and the environment, the USACE developed the *Contingency Plan for Thermal Reduction Activities* (see Attachments). This Contingency Plan includes detailed information of the actions that shall be performed during air curtain thermal reduction operations and was divided in the following sections:

- Typical Thermal Reduction Setup
- Ambient Air Monitoring
- Air Monitoring Methodologies
- Meteorological Monitoring and Data Acquisition
- Monitoring Locations
- Thermal Pit Operation
- Additional Contingency Actions

On letter dated June 1st, 2009, EPA requested to clarify and include additional information in the Additional Contingency Actions section of the Contingency Plan. This section was modified as follows:

Additional Contingency Actions:

1. Public Notice – If necessary, and in coordination with the P.R. Department of Natural and Environmental Resources (DNER), P.R. Environmental Quality Board (EQB) and the U.S. Environmental Protection Agency (EPA), the public will be informed prior to initiation of the thermal reduction activities. The public notice shall be published in a local newspaper of general circulation.

2. Additional Monitoring Efforts and Notifications – The Corps will install several monitoring stations upwind and downwind of the thermal reduction sites. These stations will be used to determine if contingency actions will be required. In addition, the EQB air quality monitoring network could be used to obtain additional information, as necessary. The monitoring station for the Municipality of Ponce is EQB Station 56. The data obtained by EQB is analyzed and then published at EQB's web site, http://www.gobierno.pr/JCA/Inicio/, to inform the public of the daily air quality index and recommended measures. In order to prevent adverse impacts to public health, the reduction activities will be coordinated with EQB's Ponce Office. The monitoring data from EQB Station 56 could be used to determine if the activities are compromising the air quality. However, the trigger for contingency course of action will be based on data obtained from the Corps monitoring stations. If is determined that the activities are compromising the air quality, the measures to be taken by sensitive persons shall be notified via EQB's web site or local radio. Some of the recommended measures are:
    a. Avoid exposure to tobacco smoke.
    b. Minimize time spent outdoors.
    c. Stay indoors.
    d. Avoid prolonged or heavy exertion activities (indoors and outdoors).
    e. Avoid dusting
    f. Turn air conditioning to recirculation mode in home (if available).
    g. Keep ample supply of respiratory medication available.
    h. If driving is unavoidable, drive with air conditioner on recirculation mode (if possible).
    i. It is recommended that sensitive persons move to clean-air facilities, such as: recreational areas (e.g. beaches, parks) and shopping malls, among others.

3. External emission sources (i.e. Sahara dust, volcano ashes, wildfires, heavy equipment emissions, accidents and spills, among others) – Previous to the commencement of thermal reduction activities, the meteorological conditions (i.e. natural events, strong winds, temperatures) shall be verified to ensure that the

conditions are appropriate. The activities shall not be initiated if it is determined that there are no appropriate conditions. In addition, as part of the monitoring efforts, contractor personnel will have to be aware of any external events that could have an effect on the air quality. If the contractor personnel discovers or its notified of external events or non appropriate meteorological conditions that could affect the air quality, the following actions shall be performed:

a. Weather and monitoring stations readings will be taken and recorded during the operation in interval periods between one hour or 30-minutes intervals thereof.

b. If the emissions from a thermal reduction pit are reaching the 75% of the NAAQS, the operator shall slow down the operation of the pit and adjust the process.

c. Should the operation not meet 90% or lower of the NAAQS in two hours period subsequent to the operator adjustments, the thermal pit shall cease operations for the rest of the day.

4. On-Site Documentation – The thermal reduction activities schedule, technologies information and monitoring data logs shall be available on site and available for the public upon request.

5. P.R. Environmental Index Scale – As part of this Plan, the Air Quality Index (AQI) level for air pollutants established by EPA and EQB for PM_{10}, $PM_{2.5}$, SO_2, CO, and NO_2 will be used as a guidance (table below). For more information, please see table below and/or refer to P.R. Environmental Index Scale and Possible Health Effects at http://www.prtc.net/~jcaaqs/Index.html.

Pollutant	Unhealthy for Sensitive Groups	Unhealthy
PM_{10}	150 µg/m^3	250 µg/m^3
$PM_{2.5}$	35.5 µg/m^3	55.5 µg/m^3
CO	9 ppm (10 mg/m^3)	12 ppm (12 mg/m^3)
NO_2*	0.247 ppm (465 ug/m^3)	0.309 ppm (580 ug/m^3)**
SO_2	0.14 ppm (365 ug/m^3)	0.18 ppm (455 ug/m^3)**

*The NO_2 values were extrapolated using the SO_2 NAAQS.

SO_2 = 0.14 ppm (365 ug/m^3) 24-hour

SO_2 = 0.03 ppm (80 ug/m^3) Annual arithmetic mean

NO_2 = 0.053 ppm (100 ug/m^3) Annual arithmetic mean

NO_2 = (0.14/0.03) x (0.053) = 0.247 ppm ~ (465 ug/m^3)

**The unhealthy values were calculated using a 25% over the values of unhealthy for sensitive groups.

6. Solid Waste Disposal and Pit Closeout: – After thermal reduction activities have been completed, the ashes will be tested for heavy metals content, and offer to the public to be recycled as fertilizer or for any other environmental friendly activity. The remainder ashes will be properly disposed at landfill facility in Ponce, Puerto Rico. Other solid waste like cars, tires, household appliances, construction debris, and garbage, won't be subject to thermal reduction and will be properly disposed at a landfill facility in Ponce, Puerto Rico. The thermal reduction pit, (if used over a container operation), will be backfilled with same dirt that came out the pit.

7. Emergency Contacts – In case of emergency the following agencies, but not limited to, will be contacted:

    a. Firefighters Department of Ponce: (787) 842-2022 / 842-2025 / 842-2005
    b. State Office for Emergency and Disaster Management: (787) 724-0124
    c. Police Department: (787) 343-2020
    d. EQB Ponce Office: (787) 840-4070 / 840-3141
    e. EQB Environmental Emergencies: (787) 767-8181 extensions 3236 / 3248 / 3232
    f. EPA Puerto Rico Office: (787) 977-5870
    g. DNER Ponce Office: (787) 844-4051 / 840-4660

E. Additional Information Requested by EPA and EQB Not Included in the Above Sections:

- Black carbon emissions ("soot" or "particulate matter") from heavy equipment and blowers exhaust pipes – The emissions from the diesel engines found in the blowers were included in the total emissions of the thermal reduction process and are shown on pages 7-33, 8-33 and 13-33 of the Thermal Reduction Plan. Also, emissions from diesel heavy equipment shall meet the Puerto Rico Department of Transportation and Public Works requirements and all heavy equipment shall meet Puerto Rico Public Service Commission and the Corps Safety and Health Requirements Manual (EM 385-1-1 Manual): In addition, the following, but not limited to, best management practices shall be performed during operations:
    - Routine equipment maintenance (e.g. exhaust, filters).
    - Equipment will be operated at optimum conditions.
    - All diesel heavy equipment shall be in good working conditions.
    - Equipment will be turned off when not in use.

- Verify that the school marked on the map has been acquired by the Commonwealth of Puerto Rico – This information was confirmed with Mr. Efrain Reyes, Director of the Infrastructure Area of the Puerto Rico Department of

Education. Also, attached you will find several pictures of the former Julio Collazo School which is located at PR 503, Km. 7.7, Ponce, Puerto Rico.

- Identify the nearest communities that should be notified in the event that the emissions reach the action levels: Using the Puerto Rico Planning Board, *Puerto Rico Interactivo Website*, the following communities (wards) were indentified within approximately one (1) kilometer radii and shall be notified if the emissions reach the action levels (see Attachments – Nearest Communities Figure):
    - Tibes – North
    - Machuelo Arriba – East
    - Portugués – Southeast
    - Magueyes – Southwest

F. EQB's Emission Fees

On November 3, 2008, DNER paid to EQB the required emission fees.

G. Information Sufficient to Demonstrate that the Overall Operations will Neither Cause nor Contribute to Air Pollution in Excess of any NAAQS

The purpose of this section is to provide to EQB the overall air emissions during project operations and list all the emission sources that are part of the project. In order to obtain the requested information the Corps personnel conducted several site visits and requested of the contractor the original emission calculations. Also, all emission sources within the site were inspected.

Based on our evaluation, the emissions calculations were revised, as follow:

Emergency and Temporary Electric Generators (PFE-03-58-0509-0015-II-O):

The diesel engine emissions were calculated using EPA Tier 2 Nonroad Diesel Engine Emission Standards summarize in the table below.

Nonroad Diesel Engine Power (hp)	Effective Year	CO (g/hp-hr)	NMHC+NOX (g/hp-hr)	PM (g/hp-hr)
hp < 11	2005	6	5.6	0.6
11 ≤ hp < 25	2005	4.9	5.6	0.6
25 ≤ hp < 50	2004	4.1	5.6	0.45
50 ≤ hp < 100	2004	3.7	5.6	0.3
100 ≤ hp < 175	2003	3.7	4.9	0.22
175 ≤ hp < 300	2003	2.6	4.9	0.15
600 ≤ hp < 750	2002	2.6	4.8	0.15
hp ≥ 750	2006	2.6	4.8	0.15

The electric generators information was obtained from Dragados USA permit application submitted to EQB and was verified during the site inspections. All electric generators run on diesel fuel and are EPA Tier 2 compliant. It is important to highlight that four of these generators are temporary. The facility will be connected to PR Power Authority (PREPA) power grid.

Generator 1: Temporary use until facility connect to power grid (6 months)
Manufacturer - MQ Power
Model – DCA-300SSK2
Engine Manufacture – KOMATSU
Engine Model – SAA6D125E-2 (EPA Tier 2)
Engine Power – 354 hp @ 1,800 rpm (from generator manufacture specifications)

Estimated emissions are:
Estimated usage: 24 hours/day, 7 days/week, 6 months/year
CO = 354 hp x 4,380 hr x (2.6 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 4.44 tons
NMHC+NO_x = 354 hp x 4,380 hr x (4.8 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 8.20tons
PM = 354 hp x 4,380 hr x (0.15 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.26 tons

Generator 2: Backup/Emergency Use Only
Manufacturer – PRAMAC
Model – GBW30
Engine Manufacturer – Perkins
Engine Model – 1103C-33G1 (EPA Tier 2)
Engine Power – 35 kW/47 hp @ 1,800 rpm (from engine manufacture specifications)

Estimated emissions are:
Estimated usage: 200 hours/year
CO = 47 hp x 200 hr x (4.1 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.04 tons
NMHC+NO_x = 47 hp x 200 hr x (5.6 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.06 tons
PM = 47 hp x 200 hr x (0.45 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.005 tons

Generator 3: Backup/Emergency Use Only
Manufacturer - GENMAC
Model – PMD30
Engine Manufacturer – John Deere
Engine Model – 4024TF270 (EPA Tier 2)
Engine Power – 48 hp @ 1,800 rpm (from engine manufacture specifications)

Estimated emissions are:
Estimated usage: 200 hours/year
CO = 48 hp x 200 hr x (4.1 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.04 tons
NMHC+NO_x = 48 hp x 200 hr x (5.6 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.06 tons
PM = 48 hp x 200 hr x (0.45 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.005 tons

Generator 4: Temporary use until facility connect to power grill (6 months)
Manufacturer - PRAMAC
Model – GBW80
Engine Manufacture – Deutz
Engine Model – BF4M2012C (EPA Tier 2)
Engine Power – 90 kW/121 hp @ 1,800 rpm (from engine manufacture brochure)

Estimated emissions are:
Estimated usage: 24 hours/day, 7 days/week, 6 months/year
CO = 121 hp x 4,380 hr x (3.7 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 2.16 tons
NMHC+NO_x = 121 hp x 4,380 hr x (4.9 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 2.86tons
PM = 121 hp x 4,380 hr x (0.22 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.13 tons

Generator 5: Temporary use until facility connect to power grid (6 months)
Manufacturer - PRAMAC
Model – GBW80
Engine Manufacture – Deutz
Engine Model – BF4M2012C (EPA Tier 2)
Engine Power – 90 kW/121 hp @ 1,800 rpm (from engine manufacture brochure)

Estimated emissions are:
Estimated usage: 24 hours/day, 7 days/week, 6 months/year
CO = 121 hp x 4,380 hr x (3.7 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 2.16 tons
NMHC+NO_x = 121 hp x 4,380 hr x (4.9 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 2.86tons
PM = 121 hp x 4,380 hr x (0.22 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.13 tons

Generator 6: Temporary use until facility connect to power grid (6 months)
Manufacturer - NISSHA
Model – NES25
Engine Manufacture – Isuzu
Engine Model – 4LE1 (EPA Tier 2)
Engine Peak Horse Power – 31.5 hp (from generator manufacture specifications)

Estimated emissions are:
Estimated usage: 24 hours/day, 7 days/week, 6 months/year
CO = 31.5 hp x 4,380 hr x (4.1 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.62 tons
NMHC+NO_x = 31.5 hp x 4,380 hr x (5.6 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.85tons
PM = 31.5 hp x 4,380 hr x (0.45 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.07 tons

Electric Generators (6) Emission Summary							
Emissions (tons)	**4,380 hrs of 354 hp diesel engine generator**	**200 hrs of 47 hp diesel engine generator**	**200 hrs of 48 hp diesel engine generator**	**4,380 hrs of 121 hp diesel engine generator**	**4,380 hrs of 121 hp diesel engine generator**	**4,380 hrs of 31.5 hp diesel engine generator**	**Total (tons)**
CO	4.44	0.04	0.04	2.16	2.16	0.62	9.47
NMHC+NO_x	8.20	0.06	0.06	2.86	2.86	0.85	14.88
PM	0.26	0.005	0.005	0.13	0.13	0.07	0.60
Total emissions calculated are 24.95 tons/year							

Reference: http://www.dieselnet.com/standards/us/nonroad.php. Accessed 06/28/2009

Rock Crusher Operations:

As part of the rock crusher operations it is necessary the installation of two (2) electric generators. The electric generators information was obtained from Dragados USA permit application submitted to EQB. The two electric generators run on diesel fuel and are EPA compliant.

The generator diesel engine emissions were calculated using manufacture technical data, as follows:

Generator 1:
Manufacturer - CATERPILLAR
Model – Standby – 3512C
Engine Manufacture – CATERPILLAR
Engine Model – 3512C (EPA Tier 2)
Estimated Engine Power – 1,360 kW/1,824 hp @ 1,800 rpm (from manufacture specifications)

Manufacture emission data:
NO_x = 4.33 g/hp-hr
CO = 0.41 g/hp-hr
HC = 0.13 g/hp-hr
PM = 0.032 g/hp-hr

Estimated emissions are:
Estimated usage: 8 hours/day, 5 days/week, 52 week/year (2,080 hours/year)
NO_x = 1,824 hp x 2,080 hr x (4.33 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 18.09 tons
CO = 1,824 hp x 2,080 hr x (0.41 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 1.71 tons

HC = 1,824 hp x 2,080 hr x (0.13 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.54 tons
PM = 1,824 hp x 2,080 hr x (0.032 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.13 tons

Generator 2:
Manufacturer - CATERPILLAR
Model – Standby – C9
Engine Manufacture – CATERPILLAR
Engine Model – C9 (EPA Tier 3)
Estimated Engine Power – 225 kW/302 hp @ 1,800 rpm (from manufacture specifications)

Manufacture emission data:
NO_x = 2.72 g/hp-hr
CO = 0.40 g/hp-hr
HC = 0.12 g/hp-hr
PM = 0.091 g/hp-hr

Estimated emissions are:
Estimated usage: 8 hours/day, 5 days/week, 52 week/year (2,080 hours/year)
NO_x = 302 hp x 2,080 hr x (2.72 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 1.88 tons
CO = 302 hp x 2,080 hr x (0.40 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.28 tons
HC = 302 hp x 2,080 hr x (0.12 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.08 tons
PM = 302 hp x 2,080 hr x (0.091 g/hp-hr) x (lb/454 g) x (ton/2,000 lb) = 0.06 tons

Electric Generators Emission Summary			
Emissions (tons)	**2,080 hrs of 1,824 hp diesel engine generator**	**2,080 hrs of 302 hp diesel engine generator**	**Total (tons)**
NO_x	18.09	1.88	19.97
CO	1.71	0.28	1.99
HC	0.54	0.08	0.63
PM	0.13	0.06	0.20
			Total emissions are 22.79 tons/year

Reference: http://www.cat.com/power-generation/generator-sets/diesel-generator-sets. Accessed 07/01/2009

The Corps combined the emissions from the thermal reduction plan and the emission of 8 generators operating at the same time, and modeled the combined emissions. The combine model displayed small changes in the behavior of the pollutant emissions, but emissions did not exceed the established critical radius of 0.8 km. Based on these observations the Corps concludes that the operations will not exceed the NAAQS and does not represent risk to the human health and the environment, for the following reasons:

- The emissions were combined and modeled using the Gaussian Plume Two-dimension Spreading Model and all the pollutants will continue to be inside the 0.8 Km radius conservative scenario (some scientists defined as the worst case scenario). For detailed information, please see Attachments.

- The Corps will have real-time monitoring stations during thermal reduction activities and the Contingency Action Measures will be following in the event that the emissions reach the 90 % of the NAAQS levels. The thermal reduction is expected to operate at 75% or less of the NAAQS.

- The emissions from the electric generators will not likely impact the air quality, because the electric diesel generators on site are EPA compliant non-road minimum of Tier 2.

- All thermal reduction operations will be coordinated before initiation, and follow the contingency plan for safe operation. Our mission in the Corps is safety first.

List of Attachments:

1. Revised Contingency Plan for Thermal Reduction Activities
2. Former Julio Collazo Silva School Pictures
3. Nearest Communities Figure
4. Combine Gaussian Plume Two-dimension Spreading Model
5. Generator Emissions in g/s