Technical Evaluation Document

Variance Application
Thermal Reduction Plan
Portugues Dam Flood Control Project
Ponce, PR

Background

The United States Army Corps of Engineers (USACE) is constructing the Portugues Dam Flood Control Project. This dam will be located north of the city of Ponce, PR in the Portugues River Basin. For this, they need to construct a water reservoir pool that will cover approximately 72 acres during normal operation, with a maximum flood capacity of 215 acres during extreme rain events. The USACE needs to clear and grub approximately 150 acres of timber and brush vegetation in the valley, during the construction, plus an additional 50 acres for the establishment of the reservoir pool.

The USACE has analyzed potential alternatives for the disposal of the timber and brush. They concluded that the thermal reduction (consisting of pits equipped with blowers, for the control of open burning emissions) is the most advantageous option for the project, from the environmental and economical point of view, because, among other things they understand that the sanitary landfills would not have the capacity to handle this material. The USACE have previously utilized thermal reduction in Puerto Rico during emergency operations (hurricanes) and during the construction of the Cerrillos Dam.

The construction of the Portugues Dam is the last phase of the Portugues and Bucana rivers canalization, authorized by the United States Congress in 1970. The construction of the Cerrillos Dam, which was part of the project, was completed in 1992. The USACE applied for a variance of the regulatory requirements of Rule 402 of the Regulations for the Control of Atmospheric Pollution (RCAP) for the open burning. This variance is requested according to the provisions of Rule 301 of the RCAP.

Project Summary

Thermal reduction in the project will consist on using up to 3 pits where the timber and brush wastes will be burned, and each pit will be provided with an air curtain, by using a blower. The vegetative material will be accumulated in designated areas, near each pit. The pits will burn only timber and vegetation from the land clearing operations at the site. Other wastes, as cars, tires, household appliances, construction wastes and garbage, will not be thermally reduced, but will be disposed off appropriately in a sanitary landfill. The ashes resulting from the operation of the pits will be sampled for heavy metal content and will be offered to the public as a fertilizer, or for any other activity. The remaining ashes will be disposed in a sanitary landfill.

Principle of Operation of Air Curtain Pits

According to Air Burners, one of the manufacturers of these devices, the primary objective an air curtain machine is to reduce the particulate matter, or smoke, that results from burning clean wood waste. They also indicate that the machine could be looked as a pollution control device for open burning. Mc Pherson Systems, another manufacturer, indicates that the air curtain traps smoke and recirculates it to enhance combustion and reduce smoke. The very large volume of air accelerates combustion and provides for high pit temperature between 1800ºF and 2500ºF. According to other reference that was reviewed[1], the lower PM and CO emissions are consistent with improved conditions that are present in the ACD (Air Curtain Destructor) as compared to open burning – better air flow, containment of heat around the combustion zone, and more controlled introduction of debris. They also indicate that concentrations of PM, as indicated by opacity measurements are lower for ACDs, which produce plumes with very low opacity for the majority of the operating time, and generate visible plumes only during startup and immediately after loading, when properly operated. According to Air Burners, if the unit is generating smoke in excess of 10 or 20 percent (after a one hour start-up period) then it is not being operated correctly.

[1] Emissions from the Burning of Vegetative Debris in Air Curtain Destructors, C. Andrew Miller and Paul Lemieux, J. AWMA, 57, 959-967

Variance Application

On November 15, 2007, the USACE submitted the Thermal Reduction Plan for the Portugues Dam and requested formally that the thermal reduction activities of the Portugues Dam be exempted from complying with the regulatory requirements of Rule 402 of the RCAP. Subsequently, the plan has been amended to include additional information, as requested by EQB and EPA, to satisfy the requirements of Rule 301(D) of the RCAP. For the variance, the USACE has presented an air modeling that was performed using the Gaussian Diffusion model, a diagram with the proposed location of the thermal pits, and an air monitoring plan. Also, the USACE submitted the monitoring reports performed during the waste reduction activities in Salinas, PR in 1999, and in Humacao, Moca, Santa Isabel, and Toa Baja, for the handling of the wastes generated by the Jeanne Storm in 2005. According to the report in 2005, there were no significant emissions during the thermal reduction of the wastes. However, there was a significant increase in the concentration of some of the parameters, like Hg, CO and particulates when dirty debris (a wet mixture of soil and debris) was fed to the incinerators.

The criteria pollutant air emissions presented in the application are not significant, however, the air monitoring is necessary because the information related to the emission factors for the use of air curtain incinerators is limited. The document: *Evaluation of Emissions from the Open Burning of Land Clearing Debris"*, EPA-600/R-96-128, October 1996, concluded that the tests do not provide conclusive evidence of the effectiveness of air curtain blowers in reducing emissions. While the emissions of some pollutants seemed to be decreased slightly others were unchanged or, even in a few cases, appeared to increased". In the document "*Emissions from the Burning of Vegetative Debris in Air Curtain Destructors*", C.A. Miller and P. Lemieux, 2007, J. AWMA, 57, 959-967 is mentioned that the combustion of vegetative waste in air curtain incinerator units results in significantly lower emissions of particulate matter and carbon monoxide per unit mass of debris compared to open pile burning. The document also mentions that the nature of the combustion process in the air curtain incinerator, a minimum degree of operational control, and significant variability in debris properties make prediction of air curtain incinerator emissions impossible in general. The COE estimated the emissions from the operation of the thermal pits with an ultimate analysis[2] to the material that is expected to be thermally reduced in

[2] An *ultimate analysis* gives us the biomass composition in weight percent of carbon, hydrogen and oxygen (the compound in largest amounts), as well as sulfur and nitrogen (if any).

the pits, to which the emissions from the diesel engines that will move the blowers used to create the air curtain were added. Also, they used the emission factors from section 1.6 of the AP-42[3] for wood residue combustion. The air monitoring that will be carried out will help us verify the emissions from the thermal pits and to guarantee that the air quality standards will not be exceeded because of the operation of the pits.

40 CFR Part 60 Subpart CCCC

The thermal pits that will be used to thermally reduce the vegetative waste comply with the air curtain incinerator definition in section 60.2245 of the 40 CFR. According to the section, an air curtain incinerator operates by forcefully projecting a curtain of air across an open chamber or open pit in which combustion occurs. Incinerators of this type can be constructed above or below ground and with or without refractory walls and floor. ACD that only burn 100% wood waste, 100% lumber or 100% mixture of only wood waste, clean lumber and/or yard waste are only required to meet the requirements of ACD in sections 60.2245 through 60.2260 of the 40 CFR. These sections include opacity limitations for the normal operation of the ACD and for startup periods, as well as the realization of opacity tests for the ACD. The requested variance only exempts the COE from complying with the requirements of Rule 402 of the RCAP, for they shall comply with the opacity limitations of the 40 CFR Part 60 Subpart CCCC.

Preparation of the conditions for the preliminary variance

The conditions for the preliminary variance were prepared using the information submitted by the USACE, as well as information about the air curtain incinerators published by EPA, regulations from other states, and other documents. We included conditions requesting a detailed operation and maintenance plan for ACD, an accidental fire prevention plan and fire suppression, and a quality control plan for the monitoring that will be carried out. The emissions from each pit will be monitored for particulates (PM_{10} and $PM_{2.5}$), sulfur dioxides (SO_2), carbon monoxide (CO), nitrogen oxides (NOx), and volatile organic compounds (VOC), to ensure that the National Ambient Air Quality Standards (NAAQS) are not exceeded. Also, the USACE will be required to monitor for mercury (Hg), phosgene ($COCL_2$) and

[3] EPA's Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I: Stationary Point and Area Sources.

hydrogen sulfur (H_2S) once monthly[4]. During the activities, the meteorological conditions will be monitored to ensure that the conditions are optimal for burning. The thermal reduction activities will be closely monitored by EQB, to guarantee that the NAAQS will not be exceeded and the public welfare will not be affected.

Variance approval

According to Rule 301 of the RCAP, the variance shall not be preliminary approved unless a public notice has been issued, pertaining to the variance request, and an opportunity for public hearing has been offered therewith. On the other hand, no variance shall be deemed approved until it has been approved by the Administrator of the Environmental Protection Agency, Region II New York.

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[4] H_2S and $COCL_2$ were identified in the original Thermal Reduction Plan as air contaminants of concern during thermal reduction. Hg was detected during the monitoring of previous thermal reduction activities when a mixture of dirty debris was thermally reduced.