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STUDY TITLE: The SO_2 and NO_2 Increment Analysis for the Breton National Wilderness Area

REPORT TITLE: A Cumulative Increment Analysis for the Breton National Wilderness Area

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PROJECT MANAGER: N. Wheeler

AFFILIATION: Sonoma Technology, Inc.

ADDRESS: 1455 N. McDowell Blvd., Suite D, Petaluma, California 94954

PRINCIPAL INVESTIGATORS: N. Wheeler, D. Stauffer[1], S. Hanna[2].

KEY WORDS: Breton Island; Wilderness Area; Prevention of Significant Deterioration; Increment Analysis, Sulfur Dioxide; Nitrogen Dioxide; Modeling; MM5; CALPUFF

BACKGROUND: The BNWA is surrounded by onshore sources of oxides of sulfur (SO_x) and oxides of nitrogen (NOx) to the north and west and offshore sources to the south and east. The 1977 Clean Air Act limits the increases in concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter less than 10 microns (PM10) may increase in Class I areas such as the BNWA. These limits are referred to as increments. The magnitude and distribution of the sources introduce the possibility that SO2 or NO2 concentrations in the BNWA may exceed regulatory limits, which could result in regulatory consequences affecting several federal (U.S. Environmental Protection Agency [EPA], U.S. Fish and Wildlife Service [FWS], and MMS) and state agencies and the groups they regulate. As the federal land manager, the FWS expressed concerns that the SO_2 and NO_2 increments may be consumed on a cumulative basis and requested that a cumulative increment analysis be performed.

OBJECTIVES: The overall objective of this study was to evaluate through modeling the contribution of OCS (both platform and non-platform) and onshore emission sources to SO_2 and NO_2 levels over the BNWA and access the relative trends in these concentrations in the BNWA with respect to the appropriate baseline values. This study

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1 Pennsylvania State University, State College, Pennsylvania
2 Hanna Consultants, Kennebunkport, Maine

was conceived as a scientific investigation of the processes affecting trends in SO_2 and NO_2 concentrations near the BNWA and the models used to simulate those processes. While it was an objective of this study to compare the concentration trends with the PSD Class I increments, the analysis was not intended to take the place of a regulatory PSD increment analysis for the BNWA. This study consists of a best attempt to evaluate the relative magnitude of the changes with respect to the available PSD increments in the BNWA.

DESCRIPTION: Episodic meteorological and air quality modeling was performed to assist in selecting the air quality model that would be used for annual simulations on which the increment analysis would be based. Meteorological modeling was performed with the Fifth-Generation Pennsylvania State University (PSU)/National Center for Atmospheric Research (NCAR) Mesoscale Model (MM5). Two air quality models, the California Puff (CALPUFF) model and the Community Multiscale Air Quality (CMAQ) model were applied for the six periods selected for episodic modeling, the results of those applications were evaluated statistically and graphically, and the evaluations were compared to select the model that best replicated the SO_2 and NO_2 observed during those periods. CALPUFF was selected and applied for the entire study year, the SO_2 baseline year (1977), and the NO_2 baseline year (1988). Concentration differences (annual for NO_2 and annual, 24-hr maximum, and 3-hr maximum for SO_2) between the study year and the baseline years (increments) were calculated and summarized.

SIGNIFICANT CONCLUSIONS: Annual modeling with CALPUFF of the study (2000-2001) and baseline (1977 for SO_2 and 1988 for NO_2) years revealed that none of the allowable SO_2 or NO_2 increments had been fully consumed.

STUDY RESULTS: Monthly synoptic patterns during the study year deviated from historical monthly levels. However, the annual average of the monthly synoptic weather patterns from October 2000 to September 2001 agrees well with the 1981 to 1990 average. In summary, synoptic influences during the study year were typical. Both CMAQ and CALPUFF had difficulty replicating observations when paired in time and space. However, when the top 5% of concentrations, unpaired in time and space, both models performed significantly better. While both models meet our performance goals for NO_2, only CALPUFF meet them for SO_2. Three annual simulations were performed with CALPUFF: (1) with emissions for the study year, (2) with emissions for the SO_2 baseline year (1977), and (3) with emissions for the NO_2 baseline year (1988). The effects of emission changes, between the baseline years and study year, on annual concentrations were evident. From 1977 to 2000/2001 the annual SO_2 concentrations declined throughout most of the modeling domain with only one onshore and six offshore receptors showing increases. From 1988 to 2000/2001 the annual NO_2 concentrations declined at most onshore receptors in the modeling domain with only four onshore receptors showing increases. However, there were increases in NO_2 at offshore receptors.

STUDY PRODUCT(S): Wheeler, N.J.M., S.B. Reid, K.J. Craig, J.R. Zielonka, D.R. Stauffer, and S.R Hanna. 2008. A cumulative increment analysis for the Breton

National Wilderness Area. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-058. 334 pp.

*P.I.’s affiliation may be different than that listed for the Project Manager.

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