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**An Outline for a Scope of Work/Statement of Work for Cement Kilns**

**I. INTRODUCTION**

This study will be conducted to explore potential NOx emissions reduction strategies for cement kilns in Ellis County and across Texas. This includes assessing new technologies that have not been previously considered by TCEQ and solutions for the specific mix of kilns and limestone present in Ellis County. Identification of deliverable dates should allow for tasks to be worked in parallel where possible. Deliverables which are meeting dates may be combined where feasible to allow for monthly meetings. For high operating cost alternatives, the reports required for each applicable task should provide cost options for the operation of controls only during ozone season, as defined by the U.S. EPA in federal rules .

**II. TASKS**

**Task 1 - Work Plan:**

The contractor shall submit and obtain approval of a Work Plan describing the work to be performed for TCEQ. Requirements for the Contractor’s Work Plan are laid out under “Instructions to Contractor” later in this Work Order. Work Plans must meet all these requirements and all requirements laid out in the Contract.

**Deliverable:** TCEQ approved Work Plan  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**PRIMARY TASKS**

**Task 2 - Composition of Ellis County Limestone**

The contractor shall conduct research to determine the chemical, mineral and elemental composition of limestone used in clinker production in Ellis county including, but not limited to, sulfur, VOCs, calcite, dolomite, aragonite and pyrite. Ranges of percent composition contained in the Ellis County limestone should be included based on a valid statistical sample. This task should include a comparison of limestone composition used in the cement kiln processes in other states and countries.

**Deliverable:** Preliminary draft Report and supporting data  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Analysis meeting  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Final draft report  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

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**Task 3 - Literature Research**

The contractor shall conduct a literature research on NOx emission control technologies in other states and countries as well as any differences and/or similarities in environmental rules that apply to kilns in other states and countries. This search shall include, but not be limited to, reports, studies, articles, information from plant personnel, vendor guarantees, regulatory agencies and publications from other countries. New Source Review permits from other states, federal permits and any findings on Reasonably Available Control Technology, Best Available Control Technology, and Lowest Achievable Emission Rates should be reviewed and summarized.

**Deliverable:** A listing of sources to be used in the report  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Preliminary draft Report and supporting data  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Analysis meeting  
**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Final draft report and supporting data  
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**Task 4 - Chemical Reactivity**

The contractor shall explore the chemical reactions of the chemicals, minerals and elements found in Task 2 with chemical reagents used in NOx reduction control technologies including, but not limited to, ammonia or urea used in Selective Catalytic Reduction (SCR) and Selective Non Catalytic Reduction (SNCR) and ozone used in low temperature oxidation (LoTOx). The report shall contain all products of chemistry associated with the reactivity of Ellis county limestone and reagents used in reduction technologies on high, mid and low ranges of composition. This includes assessing these reactions and their relationship to (1) the formation or increase of any criteria pollutants or precursors to criteria pollutants exiting the stack or from fugitive sources, (2) compounds that may be formed in the catalyst beds, (3) compounds that may cause corrosion of equipment downstream of the reaction, (4) increases in or occurrences of reagent slip from streams, (5) increases in or occurrences of the formation of salts, acids or other compounds; (6) any other possible causes of fouling and/or loss of efficiency; and (7) any other adverse environmental effects. Any findings in this task should be compared to issues with limestone used in the cement kiln processes in other states and countries.

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**Task 5 - Changes to Limestone and Cost Analysis**

Investigate process and/or chemical changes that can be made to Ellis County limestone to improve the effectiveness of NOx reduction applications and determine which NOx applications are viable for Ellis County kilns. This report should include a detailed description of each process and/or chemical modification, how the modification improves the effectiveness of the reduction technology and associated incremental costs or cost savings.

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**Deliverable:** Analysis meeting  
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**Task 6 - Kiln Specific Application**

The contractor should analyze the operational limitations of each kiln in Ellis County. The analysis should include a feasibility study for the application of all reduction technologies such as, but not limited to, LoTOx, SCR and SNCR, including design limitations and structure placement and costs associated. The report should estimate cost per ton of NOx reduction. The report should include whether or not each control technology has the potential of being physically applied to each kiln and a justification for each. A summary table indicating which kilns have the potential to be modified for each technology should be presented.

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**Deliverable:** Analysis meeting  
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**Task 7 - Kiln Feasibility Study**

The contractor shall determine measures necessary to convert a wet process to a dry process for each of the wet kilns in Ellis County and the possible impacts of cement production. The report should illustrate whether or not each kiln has the potential of being physically modified and a justification

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for each. A summary table indicating which wet kilns have the potential to be modified should be presented.

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**Deliverable:** Analysis meeting  
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**Deliverable:** Final draft report  
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**Task 8 - Low Temperature Oxidation**

This study should include an engineering analysis of the application of a LoTOx system for kilns, both with and without existing scrubbers. The analysis should include cost per ton of NOx figures for each kiln including, but not limited to, costs associated with purchase, installation, and operation.

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**Deliverable:** Final draft report  
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**Task 9 -Summary of Reductions Associated with Technologies**

The contractor shall summarize the NOx emission reduction technologies (1) currently being utilized in Ellis county such as low-NOx burners and mid-kiln firing, (2) the technologies that are being utilized in other states and countries that have not been used in Ellis County and (3) NOx reducing technologies that have been successfully applied in full-scale commercial installations on combustion units other than kilns, but have not been applied to kilns. The findings should include percent NOx reductions associated with each existing technology currently in place and operating in conjunction with an existing kiln and the expected NOx reductions from the application to kilns in Ellis County of technologies in other states and countries and other or technologies that have been successfully applied in full-scale commercial installations on combustion units other than kilns in Ellis County. This should also include cost per ton of NOx reduced figures.

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**Deliverable:** Analysis meeting

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**Deliverable:** Final draft report

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**SECONDARY TASKS**

**Task 10 - Kilns Located in Counties Other than Ellis County**

The contractor shall conduct an analysis of the limestone utilized at existing Texas kilns in counties other than Ellis County. The report should discuss whether each NO<sub>x</sub> control technology application requires more operational and/or chemical modifications than Ellis County kilns or if the same modifications can be utilized in counties other than Ellis County. This analysis should include the associated and expected cost differences in the application of each NO<sub>x</sub> control technology.

**Deliverable:** Preliminary draft Report and supporting data

**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Analysis meeting

**Deliverable Date:** Within \_\_\_ days after this Work Order is issued by TCEQ

**Deliverable:** Final draft report

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**III. SUMMARY OF DELIVERABLES**

<b>Deliverable</b>	<b>Deliverable Due Date</b>
Task 1:	No later than ___ days after the work order is issued by TCEQ
Task 2:	No later than ___ days after the work order is issued by TCEQ
Task 3:	No later than ___ days after the work order is issued by TCEQ
Task 4:	No later than ___ days after the work order is issued by TCEQ
Task 5:	No later than ___ days after the work order is issued by TCEQ
Task 6:	No later than ___ days after the work order is issued by TCEQ
Task 7:	No later than ___ days after the work order is issued by TCEQ
Task 8:	No later than ___ days after the work order is issued by TCEQ
Task 9:	No later than ___ days after the work order is issued by TCEQ
Task 10:	No later than ___ days after the work order is issued by TCEQ

**IV. BUDGET**

To be determined

**V. KEY PERSONNEL**

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