

**“Recycled Drill Cuttings Beneficial Reuse Demonstration Projects”**

**Submitted by: Nuverra Environmental Solutions**

**Request for \$759,860; Total Project Costs \$1,523,384**

**Project Duration: 12 months**

**Response to Reviewer’s Comments**

**Prepared by the Nuverra Project Team**

**May 25, 2015**

Comments Made Under Section B, Item 2:

*“Additional time may be needed to properly evaluate the effectiveness and environmental impacts from the demonstration projects especially the road fill and landfill cover projects.”*

- Reviewer: G-35-02B

Response: Nuverra and the project team will work closely with the North Dakota Department of Health (NDDH) on the evaluation of the proposed demonstration efforts. If additional time is needed to evaluate the geotechnical or environmental performance of the beneficial reuse applications, the project team is committed to completing that evaluation in conjunction with the NDDH and/or NDIC-OGRC.

*“The timetable provided in this proposal is not detailed enough.”*

- Reviewer: G-35-02C

Response: Nuverra and the project team are preparing a more detailed timeline. A copy of the detailed timeline that is developed and utilized within the project will be provided in conjunction with the required NDIC-OGRC reports.

Comments Made Under Section B, Item 3:

*“The testing proposed by the EERC and UND will provide significant data on the material characteristics. It would have been helpful to have a description of the Terrafficient process and detailed information on the characteristics of the drill cuttings that have been treated with that process. The presented data indicates that with 60.6% passing the #200 sieve and a PI of 10, that the material is very fine with limited amounts of clay binder present. It will be difficult to increase the PI of the McKenzie County aggregate if the PI of the added material is only 10.”*

- Reviewer: G-35-02B

Response: Due to the proprietary nature of the Terrafficient Process, additional details cannot be provided at this time. Only limited geotechnical testing of the

material has been conducted thus far. One of the goals of this effort will be to conduct additional characterization and geotechnical testing of the processed drill cuttings and of cuttings/aggregate blends to determine PI range of the materials and other relevant parameters. Due to the very low fines (material passing the #200 sieve) content in some regional aggregate that has traditionally been used for gravel road surfacing, the addition of fines, regardless of the PI, is expected to enhance the performance of the surface aggregate.

Comments Made Under Section B, Item 5:

*“In addition to the principal investigator, David Johnson, three principal investigators will be present: two from the EERC and one from UND Civil Engineering. All of them have adequate background to succeed in this project. However, no previously published research relevant to the project was discussed. They mention that “other commercial entities have indicated interest in beneficial reuse of drill cuttings”, but no scientific results are available.”*

- Reviewer: G-35-02C

Response: Previous research results have not yet been published since they were funded by Nuverra and considered confidential. The execution of this effort will result in the generation and dissemination of detailed scientific results.

Comments Made Under “General Comments” Section:

*“In the final analysis the recycled material should exhibit characteristics the same as currently used and accepted materials or exceed durability and environmental impact expectations. The recycled material should also be investigated for physical durability (i.e. does it pulverize quickly under expected road conditions) and use characteristics (i.e. does it exhibit less desirable characteristics when wet etc...).”*

- Reviewer: G-35-02A

Response: Determining the durability of the material is an excellent suggestion. We will include abrasion testing as part of the geotechnical characterization activities to determine durability of the various beneficial reuse products used in the road demonstrations. In addition, we have planned on conducting “fractured face” characterization of the cuttings/aggregate blends and “sand equivalent” testing for both the processed cuttings and cuttings/aggregate blends. These tests will provide information on the degree of traction the material will have as a road surface and its performance when wet.