Technical Reviewers' Rating Summary

Proposal Number G-55-10 Application Title ADVANCES IN IMPACTSRE Submitted By Stealth Environmental Servic Request For $265,000.00 Total Project Costs $547,660.00

Section A. Scoring

Statement	Weighting Factor	G-55-10A	G-55-10B	G-55-10C	Average Weighted Score
1. Objectives	9	**4**	**5**	**4**	**36**
2. Achievability	7	**4**	**4**	**2**	**21**
3. Methodology	8	**4**	**4**	**4**	**32**
4. Contribution	8	**4**	**4**	**2**	**24**
5. Awareness / Background	5	**5**	**2**	**4**	**15**
6. Project Management	3	**4**	**3**	**2**	**9**
7. Equipment / Facilities	2	**4**	**4**	**4**	**8**
8. Value / Industry - Budget	4	**4**	**4**	**3**	**12**
9. Financial Match - Budget	4	**4**	**5**	**3**	**16**
Average Weighted Score		**205**	**200**	**156**	**187**
	Total: 50				**250 possible points**

OVERALL RECOMMENDATION

FUND	**X**	**X**	
FUNDING TO BE CONSIDERED			**X**
DO NOT FUND			

Section B. Ratings and Comments

1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Oil and Gas Research Council goals are:

   No comment
   - Reviewer: G-55-10A
   - Rating: 4

   to assist in the successful proving of new technology and research in environmental solutions that demonstrate to the general public that the oil and gas industry is committed to wise use of the state's natural resources.
   - Reviewer: G-55-10B
   - Rating: 5

   The efficient remediation of saltwater releases is consistent with the OGRP goals.
   - Reviewer: G-55-10C
   - Rating: 4

2. With the approach suggested and time and budget available, the objectives are:

No comment
- Reviewer: G-55-10A
- Rating: 4

During two summer seasons, the project will collect data on removal of sodium and chloride ions from produced or brine water impacted soils. Areas selected for EK remediation experimentation are already impacted soils that can benefit from remediation treatment.
- Reviewer: G-55-10B
- Rating: 4

While the use of EK has been extensively researched for decades, it remains an esoteric technology that is not widely utilized. This reviewer is sceptical that this effort will somehow catalyze its widespread adoption.
- Reviewer: G-55-10C
- Rating: 2

It is true that EK is new to this application – removal of brine. That said, two successful EK treatments, to address acute brine impacted soil, have been documented in ND. The question is how fast it can be done and where. The second concern around wide spread adoption of the technology is exactly why NDSU is part of this proposal. We need to make the technology easier to use and make stakeholders aware of its use. We plant to use the NDSU Extension infrastructure to help distribute the project data/milestones, and outcome. One of the project deliverables is an open source model – this will make the technology more used friendly. A series of workshops, and potentially at NDSU AES field days, will be conducted in western ND to introduce this model.
- Applicant

3. The quality of the methodology displayed in the proposal is:

No comment
- Reviewer: G-55-10A
- Rating: 4

EK remediation techniques have already been demonstrated as effective, what this project is attempting to demonstrate is an 80% removal of sodium and chloride from brine impacted soils. The ND DEQ (Bill Seuss) in his letter of support said that success of this project will be a game changer for brine remediation in ND.
- Reviewer: G-55-10B
- Rating: 4

Nice to see the engagement of two discrete operating companies, along with an academic enterprise and an environmental services team.
- Reviewer: G-55-10C
- Rating: 4

We are excited about the team and the support we have received from ND DEQ, NW Landowners, Industry peers, and the NDIC. There are many other potential applications of this technology, including but not limited to cutting pits and fence line containment.
- Applicant

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Oil and Gas Research Council goals will likely be:

This project could significantly change and give more options on cleaning up new and historic spills in the state. It will also be great to not have to disturb so much soil and destroy

the original structure as dig and haul does.
- Reviewer: G-55-10A
- Rating: 4

Brine impacted soils have been a bone of contention for landowners, who maintain that they have lost useable farmland due to brine spills, particularly in the 1980s. The letter of support from both ND DEQ and NW Landowners Association indicate the impact a successful demonstration of removal of 80% of the sodium and chloride ions would have on soil use for the future.
- Reviewer: G-55-10B
- Rating: 4

Again, this reviewer believes that the effort is worthwhile, while skeptical that it will move the needle on ND's operating costs.
- Reviewer: G-55-10C
- Rating: 2

There is not enough data to directly compare remediation costs but this could be added to the scope of this project. We feel that the EK technology will be cost competitive but we know that it is the only option is sensitive area near water bodies. This is what attracts us to the technology.
- Applicant

5. The background of the principal investigator and the awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is:

   The referenced skill set behind the project are very knowledgeable.
   - Reviewer: G-55-10A
   - Rating: 5

   The principal investigator did not include any literature references to support this project. However, these is likely publication of similar technologies used in other states that would support their hypotheses.
   - Reviewer: G-55-10B
   - Rating: 2

   No references provided, even though referred to. Applicants appear to be well qualified.
   - Reviewer: G-55-10C
   - Rating: 4

   I. Hassan et al., 2015. Solar powered electrokinetic remediation of Cu polluted soil using a novel anode configuration. Electrochimica Acta 181. pg 58-67. K. Do-Hung et al., 2012. Hexagonal two dimensional electrokinetic system for restoration of saline agriculture land: A pilot study. Chemical Engineering Journal 198-199. pg 110-121. J. Virkutyte et al., 2002. Electorkinetic soil remediation – critical overview. The Science of the Total Environment 289 pg 97-121. Local use: Oasis Connie remediation – used EK to remediate brine impacted prairie-pot hole in Northwester, ND. Not published but data is available upon request or publicly available from the ND DEQ. C. Athmer et al,. 2019. Development of a Solar Powered Electrokinetic Desalinization system. IPEC Conference talk – not published but available upon request.
   - Applicant

6. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is:

No comment
- Reviewer: G-55-10A
- Rating: 4

A list of milestones, Gantt chart were not included. A financial plan and plan for re-occuring communications were included and are adequate.
- Reviewer: G-55-10B
- Rating: 3

Not much detail provided therein.
- Reviewer: G-55-10C
- Rating: 2

1. Prepare and distribute annual reports to the OGRP. 2. NDSU will provide semi-annual updates to public stakeholders, which includes DEQ and NWLA. 3. Provide project update at the North Dakota Reclamation Conference. 4. Participate and share project updates at available NDSU Extension outreach “Cafe Talks” and provide updates to NDSU county/state extension agents
- Applicant

7. The proposed purchase of equipment and the facilities available is:

No comment
- Reviewer: G-55-10A
- Rating: 4

Site prep, Tanks, sampling equipment, installation of equipment, sampling, analyses and labor for these activities comprise the bulk of the budget. NDIC is requested to cover equipment, materials, and monitoring and system design labor. With all other funding coming from industry: Oasis, EOG and Stealth.
- Reviewer: G-55-10B
- Rating: 4

Didn't appear to be much expediture on equipment. Modest and well justified.
- Reviewer: G-55-10C
- Rating: 4

8. The proposed budget “value”1 relative to the outlined work and the commitment from other sources is of:

No comment
- Reviewer: G-55-10A
- Rating: 4

The costs outlined appear to be similar to previous work and efforts. However, this particular project has the capacity to yield much needed new methodology for brine spill remediation with anticipated results being a 80% removal of sodium and chloride ions from impacted soil.
- Reviewer: G-55-10B
- Rating: 4

Proposal meets the stautory goals of 50:50, (52:48 cited).
- Reviewer: G-55-10C
- Rating: 3

9. The “financial commitment”2 from other sources in terms of “match funding” have been identified:

No comment
- Reviewer: G-55-10A
- Rating: 4

The financial commitment from EOG and Oasis is well documented and supported.
- Reviewer: G-55-10B
- Rating: 5

Again, the proposal meets the stautory goals of 50:50, (52:48 cited).
- Reviewer: G-55-10C
- Rating: 3

1 “value” – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar. A commitment of support from industry partners equates to a higher value.

2 “financial commitment” from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Support less than 50% from Industrial Commission sources should be evaluated as favorable to the application; industry partnerships equates to increased favorability.

General Comments

I would highly recommend approving this project. If the proposal has the outcome that is predicted it will add a much needed tool for a more cost effective clean up tool and also one that will be minimally invasive on the land. The time to compete the project is also a benefit to the EK process.
- Reviewer: G-55-10A

The results of this project will further propel methods of salt water remediation beyond scoop and haul, followed by bringing in replacement soils. Any means of in place remediation and restoration of soils back to background is worth supporting and financing. Landowners have complained about scoop, haul and replacement methods due to introduction of new weeds and the soil having different characteristics from the surrounding soil. EK remediation would eliminate this practice and provide a true means of soil restoration. Obviously the kinks to be worked out are indicated within the application: irrigation assist, and areas around the wells becoming full of ions that should have entered the wells to be removed. However, the benefits outweigh the costs involved and can certainly lead to a better understanding in the development of successful EK remediation systems. Use of better technology in soil remediation is far superior to haul away and replace methods currently in use or worse, thermal desorption, which sterilizes the soil in the process.
- Reviewer: G-55-10B

Nice to see the letter of support from ND DEQ. Hope the applicants are successfull, and that the project yields a positive outcome!
- Reviewer: G-55-10C