New Mexico Environment Department
Ground Water Quality Bureau

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GROUND WATER
QUALITY BUREAU

Produced Water Pilot Project
Notice of Intent to Discharge

For Department Use Only:

Agency Interest Number_____
PRD Assigned _____

November 1, 2024

1. **Name and mailing address of person or group performing research (Responsible Person):**

Company Name and Address:

Canada HQ
MetaFLO Technologies, Inc.
Suite #115 - 16-1375 Southdown Road
Mississauga, ON.
L5J 2Z1
Canada

US HQ
MetaFLO Technologies, Inc.
800 N. State Street, Suite 304
Dover DE 19901

Please direct all mail correspondence to:
Paul Freyermuth
10115 E. Bell Rd, Suite 107, Box 114
Scottsdale, AZ 85260

Individuals performing research (responsible person)

A) Paul Freyermuth
Work Phone/Cell Phone: 480-340-1264
Email: pfreyermuth@metaflotech.com

B) Michael Walker
Work Phone: 1-888-862-4011
Cell Phone: 902-394-7955

- Note this research is conducted for MetaFLO internal purposes and not for a client of MetaFLO.

2. **Name and position of person completing form:**

A) Paul Freyermuth
Position: Advisor
Work Phone/Cell Phone: 480-340-1264
Email: pfreyermuth@metaflotech.com

3. **Research Focus (PWRC Research Category):**

We will be conducting a lab/bench test of MetaFlo's biopolymer "Remtech" applied to samples of produced water totaling approximately 10 gallons of Permian Basin produced water provided by Dr. Mike Hightower of the NMPWRC. The polymer will be dosed and applied to the samples over a period of one to two days and the samples will be tested and compared against the original source water to evaluate the efficacy of the polymer in reducing heavy metals, hydrocarbons, and other elements. The test will be a simple lab test and not require any additional mechanical or electrical equipment other than standard laboratory equipment.

4. **Is the proposed use of the treated produced water to be used inside or outside of the oil and gas industry?**

There will be no use of the treated produced water inside or outside of the oil and gas industry. The 10 gallons of treated produced water and any remaining produced water will be collected at the conclusion of the test and taken back to a SWD for disposal.

5. **Does the location for testing the technology take place inside or outside of the oil and gas field?**

Testing will take place outside of the oil and gas field within the Brackish Groundwater National Desalination Research Facility (BGNDRF).

6. **Physical location of the research site including size and boundaries of site (include, street address, township, range, section, county, distance from closest town or landmark, directions to facility. Provide as an attachment.**

Brackish Groundwater National Desalination Research Facility (BGNDRF)
500 Lavelle Rd.
Alamogordo, NM 88310

7. **Topographic and aerial map(s) showing:**
   - **land status and adjacent land status**
   - **100-year flood plain,**
   - **dwellings and occupied establishments,**
   - **watercourses including irrigation ditches, wetlands, lakes, karst and soils**
   - **water wells (types) or springs**
   - **site security**
   - **site plan showing locations of relevant structures**

Please reference the aerial photo below of the BGNDRF testing facility. The MetaFLO test will be located in a laboratory within the main facility.



8. **List any regulatory, governmental and non-governmental agencies, including municipalities or counties that have authority on the testing location. Provide as an attachment.**

A) The Brackish Groundwater National Desalination Research Facility, 500 Lavelle Rd, Alamogordo, NM 88310.

B) New Mexico Produced Water Research Consortium, 1025 Stewart St. Engineering Complex 1, Las Cruces, NM 88003

9. **Provide a description of your signage plan for the testing site. Provide as an attachment.**

The testing site is within BGNDRF facility, managed by Bureau of Reclamation. BGNDRF hosts testing of produced water treatment systems at bench scale and pilot scale. Given the small size of the sample (10 gallons), the produced water will be supplied in a single or multiple labeled liquid receptacles. Delivery and management of the produced water will be coordinated with Dr. Mike Hightower of the NMPWRC.

10. **Provide a description of your site security plan, including training and site restriction methods.**

The testing site (i.e., BGNDRF) has its own security guard, who will ensure the safety of MetaFLO's system. MetaFLO will also send at least one senior research and development engineer who is well-trained to conduct testing, operate the system, and follow EHS regulations.

11. **List of adjacent landowners and confirmation that adjacent landowners have been notified of the proposed pilot project. Provide as an attachment.**

N/A

12. **List the source(s) of the produced water including basin of origin. Describe how the produced water will be transported to and from the site including origin and disposal locations and onsite storage safety precautionary methods. Provide as an attachment.**

The produced water will be acquired from NMPWRC. The transportation and disposal of produced water be done by following the regulations from NMED, NMPWRC, and BGNDRF. The 10 gallons of treated produced water and any remaining produced water will be collected at the conclusion of the test and taken back to a SWD for disposal.

13. **Provide the disposal and decommissioning plan for the expected byproducts, waste products and other potentially contaminated materials. Plan should include disposition of equipment, soils, plants and piping requiring disposal and the expected disposal locations for each. Provide as an attachment.**

As this project is a simple lab test, any lab equipment utilized in the test will be cleaned or disposed of a per standard laboratory protocol established at BGNDRR. The 10 gallons of treated produced water and any remaining produced water will be collected at the conclusion of the test and taken back to a SWD for disposal. We do not anticipate any additional byproducts or waste that will need to be disposed of.

14. **Describe the expected contaminants in the untreated produced water and the treated produced water (e.g. contaminants being studied, known contaminants, known additives). Include estimated concentrations if known, and copies of laboratory analyses of untreated and treated produced water. Provide as an attachment.**

Following is a sample profile of Permian Basin sampled produced water. RemTech is an algae-based biopolymer that will be applied for treatment.

Table 1
Feed and distillate characteristics through pilot unit operation.

	Feed				Distillate				
Parameter	$\bar{x}$	± SD	Max	Min	$\bar{x}$	± SD	Max	Min	Removal (%)
TDS	103,552	19,916	132,860	75,743	475	198	836	52	99.54
EC	135,987	27,030	170,010	98,136	391	78	600	300	99.71
pH	6.58	0.08	6.72	6.47	8.52	0.40	9.71	7.79	N/A
ρ	1.068	0.013	1.087	1.050	1.002	0.000	1.003	1.001	N/A
TOC	74.39	2.906	76.44	72.33	42.32	0.28	42.5	42.1	43.11
TPH	28.00	6.56	34.00	21.00	11.33	11.33	3.50	15.00	59.52
NH_3-N	611	31.0	642	580	44.93	2.89	46.5	40.6	92.65
Fe	6.90	5.23	15.7	0.896	0.004	0.014	0.064	0.00	99.94
Mn^{2+}	0.63	0.22	1.118	0.361	0.004	0.002	0.009	0.00	99.42
Na^{+}	35,018	12,597	64,024	22,200	63	174	738	0.00	99.84
Ca^{2+}	4491	1284	7424	2977	6.982	5.75	28.73	0.00	99.76
Mg^{2+}	701	136	944	502	1.698	0.819	4.870	1.00	99.76
K^{+}	585	190	977	385.0	4.880	4.681	12.400	0.00	99.17
Ba^{2+}	5.90	2.44	8	1.644	0.014	0.018	0.064	0.00	99.76
Sr^{2+}	1212	263	1580	793.3	0.924	1.199	5.656	0.05	99.92
Al^{3+}	0.268	0.706	1.87	0.00	0.004	0.002	0.01	0.00	98.5
Li^{+}	30.81	10.35	54.3	18.932	0.021	0.033	0.136	0.00	99.93
Zn^{2+}	0.08	0.11	0.337	0.000	0.019	0.015	0.048	0.00	76.67
HCO_3^{-}	116.8	16.8	141.5	79	258	64	448	151	N
SO_4^{2-}	368	173	660	110	18.10	45	210	0.00	95.08
Cl^{-}	63,756	10,438	77,900	48,000	230	293	1300	5.00	99.64
H_3BO_3	305	93.43	515	193.40	2.103	3.408	14.34	0.00	99.31
SiO_2	26.77	15.78	65.0	11.18	0.132	0.268	1.143	0.00	99.51
PO_4^{3-}	2.90	1.78	5.82	0.902	0.094	0.087	0.404	0.00	96.76
Si^{4-}	12.50	7.37	30.4	5.221	0.061	0.125	0.534	0.00	99.51

Concentration units for data are in mg/L, except density (ρ): g/cm^3; electrical conductivity (EC): µS/cm; pH: unitless N/A: no applicable; ^{N}: no removal, higher concentration in distillate.

15. Describe all components of the produced water processing, treatment, storage, secondary containment, and produced water system (e.g., pre-treatment units, above ground storage tanks, etc.). Include sizes, site layout map, closed loop processing plans, and specifications. Provide as an attachment.

This project will simply entail applying a dosage of RemTech polymer to treat several samples of produced water in a lab setting. This testing will involve standard lab equipment including storage receptacles, test beakers and associated tools for stirring or agitating the solution.

16. Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD. Provide as an attachment.

The 10 gallons of treated produced water and any remaining produced water will be collected at the conclusion of the test and taken back to a SWD for disposal. We do not anticipate any additional byproducts or waste that will need to be disposed of.

17. Describe your final closure plan after completion of the pilot project. Provide as an attachment.

Given this is a lab test, closing the pilot out will only entail requisite cleaning of lab equipment and disposal of the treated produced water and any remaining water as per the process described in #15.

18. Estimated depth to ground water (ft):_____ Source of information_____
Direction of groundwater flow: _____ Source of information_____

N/A – This project will not involve the use of groundwater.

19. Current Total Dissolved Solids Concentration in Groundwater_____

N/A – This project will not involve the use of groundwater.

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Signature: _____ **Date:** 11/1/24

Printed name: Lewis Paul Freyermuth **Title:** Advisor

Certification by Responsible Person

I, Lewis Paul Freyermuth**, hereby certify that the information and data submitted in this application are true and accurate as possible, to the best of my knowledge and professional expertise and experience.**

Signed this 1st **day of** November**,** 2024**, upon my oath or affirmation, before a notary of the State of** _____

FRANKLIN WHITAKER
Notary Public - State of Arizona
MARICOPA COUNTY
Commission # 663395
Expires February 7, 2028

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900
Fax: 505-827-2965