New Mexico Environment Department
Ground Water Quality Bureau

# Produced Water Pilot Project
# Notice of Intent to Discharge

**For Department Use Only:**

**Agency Interest Number**_____
**PRD Assigned** _____

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

Jason Muniz
Founder
Raindance Treatment Company
202 E Tips St, Three Rivers, TX 78701

**Work Phone:** (361)449-6719
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**Email:** jason@raindanceservices.net

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

John Michael Barron, II
Business Development Consultant
Raindance Treatment Company

**Work Phone:** (432)214-0940
**Cell/Home Phone:** (361)249-1285
**Fax:** N/A
**Email:** jmbarron87@gmail.com

**3. Research Focus (PWRC Research Category):** Please see Attachment A.

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

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

**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.** Please see Attachment D.

**7. Topographic and aerial map(s) showing:** Please see Attachment E.

- **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**

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

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

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

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

**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.** Please see Attachment J.

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.** Please see Attachment K.
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.** Please see Attachment L.
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.** Please see Attachment M.
16. **Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD. Provide as an attachment.** Please see Attachment N.
17. **Describe your final closure plan after completion of the pilot project. Provide as an attachment.** Please see Attachment O.
18. **Estimated depth to ground water (ft):_____ Source of information_____**
    **Direction of groundwater flow: _____ Source of information_____**
    N/A
19. **Current Total Dissolved Solids Concentration in Groundwater_____**
    N/A

**Signature: _____ Date: _____**

**Printed name: _____ Title: _____**

**Certification by Responsible Person**

**I, _____, 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 _____ day of _____, _____, upon my oath or affirmation, before a notary of the State of**

**_____**

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

**Attachment A**

The RainDance pilot project at the Brackish Groundwater National Desalination Research Facility (BGNDRF) is focused on bench-scale demonstration and validation of advanced, chemical-free produced water treatment technologies. The treatment train for this project consists of Cavitation, Plasma Tubes, and filtration units, consistent with the most recent project scope.

Key research objectives include:

- Evaluating the effectiveness of cavitation and plasma tube electrochemical processes, combined with filtration, in removing key contaminants (including bacteria, $H_2S$, iron, suspended solids, TDS, and organics) from Permian Basin produced water supplied by the New Mexico Produced Water Research Consortium (NMPWRC).
- Generating data on water quality improvement, operational performance, and residual stream management, with all brine concentrate converted to chlorine dioxide ($ClO_2$) and no brine concentrate requiring disposal.
- Ensuring the system operates as a fully closed-loop, non-discharging process, with all treated water and residuals managed in accordance with New Mexico Environment Department (NMED), NMPWRC, and BGNDRF requirements.
- Providing Consortium-validated data to inform regulatory, scientific, and industry understanding of advanced produced water treatment options for potential future beneficial reuse.

All water and residual streams will be managed on-site, with no discharge to the environment. The project supports the NMPWRCs mission to advance technology validation, risk/toxicology assessment, and sustainable produced water management practices in New Mexico.

**Attachment B**

The proposed use of the treated produced water for this pilot project is neither inside or outside the oil and gas industry.

- The RainDance pilot project is designed as a closed-loop, non-discharging treatment demonstration at the BGNDRF.
- As stated in the Draft Applicant Summary and supporting documents, all treated water will be recombined with residual streams and disposed of via injection into a Saltwater Disposal Well (SWD), which is a standard practice within oil and gas operations.
- The project's primary focus is to support water management, recycling, and treatment technologies specifically for oil and gas sector applications, and to be considered for direct use outside the industry.
- While the project will generate data to inform potential future beneficial reuse scenarios, the actual use of treated water during this pilot is solely for research purposes and not intended for actual beneficial reuse.

**Attachment C**

The pilot project will be conducted at the BGNDRF, 500 La Velle Road, Alamogordo, NM 88310. BGNDRF is a federal research facility managed by the U.S. Bureau of Reclamation (USBR). Coordination with BGNDRF facility management is required for site access and operational approval. There are no adjacent private landowners; all nearby properties are within the federal facility boundary. Notifications and any required permits will be coordinated with the USBR and the NMED as appropriate.

**Attachment D**

Physical Location:
BGNDRF
500 La Velle Road
Alamogordo, NM 88310
Otero County, New Mexico

The facility is situated within federal land administered by the USBR. No privately-owned adjacent properties are present. Access to the site is controlled by BGNDRF staff.

**Attachment E**

Land Status and Adjacent Land Status

BGNDRF is a federally owned and operated research facility managed by the USBR.

Adjacent Land: Surrounding parcels are privately owned and federal lands, primarily managed by the USBR and the City of Alamogordo. There are few private dwellings and commercial establishments to the South of the facility.

See “Land Status” Map Attached.

100-Year Flood Plain

BGNDRF is located outside the 100-year floodplain as shown on Federal Emergency Management Agency (FEMA) flood hazard maps for the Alamogordo area.

See “FEMA” Map Attached.

Dwellings and Occupied Establishments

There are no private dwellings or occupied establishments within or immediately adjacent to BGNDRF. The nearest occupied buildings are BGNDRF’s own office and laboratory facilities, used exclusively for research and operations.

See “Land Status” Map Attached.

Watercourses, Irrigation Ditches, Wetlands, Lakes, Karst, and Soils

Watercourses: No perennial streams, lakes, or wetlands are present on BGNDRF property. The facility is located in an arid region with no mapped surface water features on site.

Karst: No known karst features are present at BGNDRF, per USGS and New Mexico Bureau of Geology mapping.

Soils: The site is underlain by arid, sandy to silty soils typical of the Tularosa Basin.

Water Wells (Types) or Springs

Facility wells: BGNDRF operates Four Brackish Source Wells for research purposes. These are used for brackish groundwater extraction and monitoring only.

No public or private domestic wells or springs are present within the immediate facility boundary.

See “BGNDRF Testing Site” Map Attached.

Site Security

BGNDRF is a secure federal research facility with perimeter fencing, controlled gate access, video surveillance, and on-site security personnel. All access is restricted to authorized personnel and registered visitors.

See “BGNDRF Testing Site” Map Attached.

Site Plan Showing Locations of Relevant Structures

See “BGNDRF Testing Site” Map Attached.

**Attachment F**

Federal Agencies

U.S. Department of the Interior, USBR

- Facility owner and operator; primary authority over site access, security, and operations at BGNDRF
- BGNDRF Contact:
  500 La Velle Road, Alamogordo, NM 88310
  Phone: 575-443-6540

Email: bgndrf@usbr.gov

State Agencies

NMED

- Ground Water Quality Bureau (GWQB): Primary regulatory authority for produced water pilot permitting, discharge, environmental compliance, and closed-loop system requirements.

New Mexico Office of the State Engineer (OSE)

- Regulates water rights, groundwater extraction, and well permitting at the facility.

New Mexico Energy, Minerals and Natural Resources Department (EMNRD), Oil Conservation Division (OCD)

- Regulates oil and gas produced water management and SWD operations, if applicable to pilot.

Local Government

Otero County, New Mexico

- County jurisdiction for emergency response, public safety, and any applicable county ordinances.

City of Alamogordo

- Municipal authority for fire, emergency services, and local utilities. No direct land use authority at BGNDRF, but may be involved in emergency coordination.

Non-Governmental and Collaborative Entities

NMPWRC

- Collaborative research oversight, sampling protocol, and data management for pilot projects at BGNDRF.

New Mexico Water Resources Research Institute (NMWRRI)

- Academic partner in research and technology development at BGNDRF.

New Mexico State University (NMSU)

- Research partner; supports alternative water research at BGNDRF.

The BGNDRF is a federal facility; no private landowners or adjacent private properties have regulatory authority.

All site activities must comply with the USBRs facility rules and federal security protocols.

State and local agencies retain authority for environmental, water, and emergency regulations as described above.

**Attachment G**

The signage plan is designed to ensure regulatory compliance, site safety, and clear communication of hazards and access restrictions. All signage will be installed prior to pilot operations and maintained in good condition throughout the project duration.

Entry Signage

Main Entry Placard at the facility entrance and project area access point will display:

- Company Name: RainDance Water Technologies
- Project Title: Produced Water Pilot Project
- BGNDRF Facility Name and Address
- Permit Number(s) as issued by NMED and/or USBR
- Emergency Contact Number (24/7)
- “No Unauthorized Entry – Authorized Personnel Only”
- “All Visitors Must Sign In at BGNDRF Main Office”
- Personal Protective Equipment (PPE) Requirements
- Hazard Warnings (i.e. “Chemical/Water Treatment Operations in Progress”)

Operational and Hazard Signage

- Tank and Equipment Placards:
- Clearly label all storage tanks, treatment units, and process areas as “Treated Water,” “Produced Water,” “Brine,” or “Residuals,” as appropriate.
- Indicate any specific chemical or process hazards (i.e. “Chlorine Dioxide Generation Area – Authorized Personnel Only”).

Restricted Area Signs:

- “No Entry – Pilot Test Area”
- “Authorized Personnel Only Beyond This Point”

Hazard and Safety Signs:

- “Caution: Water Treatment Equipment in Operation”
- “Trip Hazard – Uneven Surface”
- “Eye Protection Required”
- “Hearing Protection Required” (if applicable)
- “$H_2S$ Warning” (if process or storage involves hydrogen sulfide risk)

Emergency and Information Signage

Emergency Procedures Placard:

- Posted at the entrance to the pilot area and inside the main control area.

- Includes emergency evacuation routes, assembly points, and contact information for site supervisors and emergency responders.

Spill Response and First Aid:

- Locations of spill kits, fire extinguishers, and first aid stations will be clearly marked with signage.

Site Security and Visitor Management
Visitor Check-In Signs:

- “All Visitors Must Report to Main Office”
- “No Unescorted Visitors Allowed in Pilot Area”

BGNDRF Security Coordination:

- All RainDance signage will be coordinated with BGNDRF facility management to ensure consistency with federal site security protocols.

Signage Specifications

- All signs will be constructed of durable, weather-resistant materials.
- Signs will use clear, legible text and internationally recognized symbols where appropriate.
- Placards will be posted at a height and location to ensure visibility from access roads and walkways.
- Temporary signage will be used for any short-term hazards or construction activities.

| **Sign Type** | **Location(s)** | **Content/Message** |
|---|---|---|
| Main Entry Placard | Facility and pilot area entrance | Company, project, contacts, access/PPE info |
| Tank/Equipment Placards | All tanks, process units | Contents, hazard warnings |
| Restricted Area Signs | Pilot area perimeter, sensitive equipment | No Entry, Authorized Personnel Only |
| Hazard/Safety Signs | Process areas, walkways, equipment | PPE, trip, chemical, or other hazard warnings |
| Emergency Procedures | Control area, entrance | Evacuation, emergency contacts, assembly points |
| Spill/First Aid Locations | Near kits/extinguishers/first aid stations | Spill Kit, First Aid, Fire Extinguisher |

| | | |
|---|---|---|
| Visitor Check-In | Main office, pilot area entrance | Visitor sign-in, escort requirements |

**All signage will be reviewed and approved by BGNDRF management and updated as necessary to reflect any changes in site operations or regulatory requirements.**

**Attachment H**

Physical Security Measures

- Facility Security: BGNDRF is a federally managed research site with controlled access. The facility perimeter is secured by fencing and a main gate, with access restricted to authorized personnel only.
- Access Control: All personnel, contractors, and visitors must check in at the BGNDRF main office upon arrival. Entry to the RainDance pilot test area is further restricted by project-specific signage and, where appropriate, temporary barriers or fencing.
- Surveillance: The facility is monitored by security cameras and on-site staff. Any unusual activity or unauthorized entry is reported immediately to BGNDRF management and, if necessary, to federal security authorities.
- Site Delineation: The designated pilot test area will be clearly marked with signage indicating “Authorized Personnel Only,” emergency contact information, and hazard warnings as outlined in the signage plan.

Site Restriction Methods

- Restricted Zones: Only trained and authorized RainDance and BGNDRF personnel may access the treatment system, storage tanks, and sampling areas. All other areas are off-limits to non-essential personnel.
- Visitor Management: All visitors must be pre-approved, sign in at the main office, and be escorted at all times while on-site. Unescorted access to the pilot area is not permitted.
- Signage: Prominent signs at all entry points and around the pilot system reinforce access restrictions and safety requirements, including PPE and emergency procedures.

Personnel Training

- BGNDRF Orientation: All RainDance staff and contractors must complete BGNDRF’s site-specific safety and security orientation prior to commencing work. This training covers facility rules, emergency procedures, and reporting protocols.
- Project-Specific Training, RainDance personnel receive training on:
    - Safe operation of water treatment equipment
    - Hazard recognition (chemical, electrical, confined space, etc.)
    - Emergency response procedures, including spill containment and evacuation
    - Use of personal protective equipment (PPE)
    - Incident reporting and communication protocols

Emergency Response and Incident Management

- Emergency Contacts: Emergency contact information is posted at the pilot site and provided to all personnel. BGNDRF maintains 24/7 emergency response capability.
- Incident Reporting: All security or safety incidents are reported immediately to the BGNDRF Facility Manager and documented according to federal facility procedures.

Coordination with BGNDRF Management

- Security Oversight: All security measures and site access protocols are coordinated with the BGNDRF Facility Manager and comply with USBR federal security requirements.
- Compliance: RainDance will comply with all additional security directives issued by BGNDRF or the USBR during the project period.

**Attachment I**

There are no private landowners, residential parcels, or commercial establishments directly adjacent to the BGNDRF campus.

**Attachment J**

Source(s) of Produced Water and Basin of Origin

- Source: Produced water for this pilot project will be supplied by the NMPWRC.
- Basin of Origin: The produced water will originate from the Permian Basin, which is the primary unconventional oil and gas basin in southeastern New Mexico and West Texas. NMPWRC coordinates with industry partners to provide representative produced water from this basin for research and pilot testing at BGNDRF.

Transportation of Produced Water

- Delivery to Site: Produced water will be transported to the BGNDRF by a certified water hauler contracted by NMPWRC. All transportation will comply with NMED and NMPWRC regulations, as well as BGNDRF facility protocols.
- Transport Protocols:
    - Only licensed and insured carriers will be used.
    - Transport vehicles will be equipped and operated in accordance with all applicable Department of Transportation (DOT) and hazardous materials regulations.
    - Chain of custody and manifest documentation will be maintained for all shipments.
    - All routes will be pre-approved by BGNDRF management to minimize risk and ensure compliance with local safety and traffic requirements.

Disposal of Produced Water

- Onsite Handling: All produced water used in the pilot will be managed in a closed-loop system. There will be no discharge to the environment. After treatment and sampling, the treated water will be returned to designated storage tanks.

- Final Disposal: All produced water, including treated water, and residuals, will be disposed of via injection into a permitted SWD as coordinated by NMPWRC and in accordance with NMED and BGNDRF requirements. No water will be discharged to surface or ground at the facility.

Onsite Storage and Safety Precautionary Methods

- Primary Storage: NMPWRC has constructed produced water storage and disposal tanks equipped with secondary containment which have been evaluated and approved by NMED.
- Secondary Containment: All produced water storage and disposal tanks used for this project will be located within secondary containment structures (i.e. berms and liners) with a capacity of at least 1.5 times the tank volume, as required by NMED regulations and BGNDRF protocols.
- Contingency Plan: If NMPWRC tanks are unavailable, RainDance will provide its own above-ground storage and disposal tanks. These will be installed with compliant secondary containment (berms/liners) meeting or exceeding the 1.5x volume requirement and will be sited in coordination with BGNDRF staff.
- Inspection and Monitoring:
    - All tanks and containment areas will be inspected prior to use and regularly throughout the project for integrity, leaks, or spills.
    - Spill kits and emergency response equipment will be maintained on-site.
    - Only trained and authorized personnel will handle produced water and access storage areas.

Compliance Statement
All produced water sourcing, transportation, storage, and disposal activities will be conducted in full compliance with:

- NMED regulations
- NMPWRC protocols
- BGNDRF facility requirements

All procedures are designed to ensure environmental protection, public safety, and regulatory compliance throughout the duration of the pilot project.

**Attachment K**

This plan outlines the procedures for the disposal and decommissioning of all byproducts, waste products, and potentially contaminated materials generated during the RainDance produced water treatment pilot, and is designed to ensure compliance with NMED, NMPWRC, and BGNDRF requirements and to protect human health and the environment.

Byproducts and Waste Streams

Expected byproducts and waste materials include:

- Concentrated residuals from the treatment process
- Spent filter media and expendable treatment materials
- Solids and oil separated during pre-treatment
- Potentially contaminated soils (in the event of a spill)
- Used personal protective equipment (PPE) and disposable sampling materials
- Decommissioned piping, hoses, and small ancillary equipment (if not reusable)

Disposition of Equipment

- Treatment System Components: All major treatment equipment (skids, tanks, reactors, control panels) will be cleaned, decontaminated, and retained for reuse in future pilot projects or returned to RainDance's inventory. No permanent disposal of major equipment is anticipated at this stage.
- Ancillary Equipment and Piping: Any piping, hoses, or small ancillary items that cannot be effectively decontaminated will be disposed of at a permitted industrial landfill or hazardous waste facility, as appropriate, following a waste determination in accordance with state and federal regulations.

Disposition of Soils

- Routine Operations: No soil contamination is anticipated due to the closed-loop system design and the use of secondary containment for all tanks and process areas.
- In Case of a Spill or Release: Any soils impacted by produced water or treatment chemicals will be immediately excavated, characterized, and transported to a permitted disposal site (i.e. a Subtitle D landfill or a facility permitted for oilfield waste by NMED). Confirmation sampling will be conducted to verify removal of contamination.

Disposition of Plants

- Vegetation: No intentional planting will occur within the pilot area. If any existing vegetation is impacted by a spill, it will be removed and disposed of in accordance with NMED and BGNDRF protocols at a permitted landfill.

Disposition of Piping

- Reusable Piping: Piping and hoses that can be decontaminated will be cleaned and retained for future use.
- Non-Reusable Piping: Any piping or hoses that are damaged or cannot be adequately cleaned will be disposed of at a permitted solid waste facility.

Disposition of Spent Media, Solids, and Residuals

- Spent Filter Media and Solids: All spent filter media, separated solids, and oil residues will be collected and characterized. If classified as non-hazardous, these materials will be disposed of at a permitted solid waste landfill. If hazardous, they will be managed and disposed of in accordance with Resource Conservation and Recovery Act (RCRA) and NMED hazardous waste regulations.

- Residual Water: All residual water streams will be recombined with treated water and disposed of via injection into a permitted SWD, as coordinated with NMPWRC and BGNDRF.

Expected Disposal Locations
- Water and Residuals: Permitted SWD, as designated by NMPWRC/BGNDRF.
- Spent Media, Solids, and Non-Hazardous Waste: Otero County Solid Waste Landfill or another permitted industrial landfill.
- Hazardous Waste (if any): Permitted hazardous waste facility, as determined by waste characterization.
- Contaminated Soils/Vegetation: Permitted landfill or soil remediation facility, as required by NMED.

Decommissioning Procedures
- System Cleaning and Decontamination: All tanks, piping, and process equipment will be flushed and cleaned in accordance with manufacturer and regulatory requirements. Rinsates will be collected and disposed of as described above.
- Site Restoration: The pilot area will be inspected for any evidence of spills or contamination. Any impacted areas will be remediated, and the site will be restored to its original condition.
- Documentation: All disposal and decommissioning activities will be documented, including waste manifests, disposal receipts, and final site inspection reports. Records will be maintained for regulatory review.

Compliance Statement
All disposal and decommissioning activities will be conducted in accordance with:
- NMED regulations
- NMPWRC protocols
- BGNDRF facility requirements
- All applicable federal, state, and local environmental protection standards

**Attachment L**

Expected Contaminants in Untreated Produced Water

General Characteristics and Known Contaminants
Produced water from the Permian Basin, as supplied by NMPWRC for this project, typically contains:
- Salinity/Total Dissolved Solids (TDS): 80,000–250,000 mg/L (commonly >90,000 mg/L)
- Total Organic Carbon (TOC): 50–200 mg/L
- Total Petroleum Hydrocarbons (TPH): 100–300 mg/L
- Hydrocarbons: Benzene, toluene, ethylbenzene, xylenes (BTEX); naphthalene; PAHs
- Metals: Iron (50–150 mg/L), manganese, strontium, barium, calcium, magnesium, sodium, potassium, boron, bromide, chloride, sulfate

- Sulfides: Hydrogen sulfide ($H_2S$), typically 10–50 mg/L
- Ammonia/Nitrogen: Ammonia-N (up to 50–100 mg/L), total nitrogen (up to 700 mg/L)
- Suspended Solids: Turbidity 100–200 NTU; TSS up to several hundred mg/L
- Microbial Contaminants: Sulfate-reducing bacteria (SRB), total bacteria counts >1,000–10,000 CFU/mL
- Additives: Traces of scale/corrosion inhibitors, biocides, surfactants, and polymers from oilfield operations

Expected Contaminants in Treated Produced Water

RainDance Treatment System Performance (Bench-Scale Pilot Goals)
Based on RainDance's process and prior performance data:

- TDS: Reduced by >95% (i.e. <1,000 mg/L)
- TOC: Reduced by >98% (i.e. <2 mg/L)
- TPH: Reduced to non-detectable or <1 mg/L
- Iron: Reduced to <1 mg/L
- $H_2S$: Reduced to non-detectable
- Ammonia-N: Reduced by >70%
- Turbidity: <1 NTU
- Total Bacteria: <1 CFU/mL
- BTEX/PAHs/Phenols: Reduced to below detection limits or trace levels

Copies of laboratory analyses for untreated and treated produced water will be provided as part of the NMPWRC sampling and analysis plan. RainDance agrees to submit all analytical results, including full laboratory reports, to NMED and NMPWRC as required.

Full laboratory reports will be appended upon completion of pilot sampling and analysis.

**Attachment M**

System Overview

The RainDance pilot system at the BGNDRF is a closed-loop, modular, multi-stage produced water treatment process. The system is designed for bench-scale operation, with all treated and residual water recombined and disposed of via SWD injection, ensuring zero environmental discharge in compliance with NMED and BGNDRF requirements.

Major System Components

A. Pre-Treatment Units

- Cavitation Reactor

    - Function: Hydrodynamic cavitation is used as the exclusive pretreatment step. The reactor generates intense local energy through the rapid formation and collapse of vapor bubbles, resulting in:
        - Breakdown of suspended solids and emulsified oils
        - Disruption and inactivation of microbial contaminants
        - Enhanced removal of organic pollutants and heavy metals through oxidation and radical generation
    - Operation: No chemical additives required; minimal maintenance; energy efficient

B. Advanced Treatment Units

- Plasma Tube Electrochemical Disinfection
    - Advanced electrochemical system designed to generate chlorine dioxide ($ClO_2$) directly from the produced water matrix. This process provides robust disinfection, advanced oxidation, and targeted contaminant removal without the need for hazardous chemical additives.
        - Disinfection: Achieves >99.9% reduction in bacteria, including sulfate-reducing bacteria (SRB), and effective inactivation of viruses and biofilms.
        - $H_2S$ and Iron Removal: Efficiently oxidizes and removes hydrogen sulfide ($H_2S$) and heavy metals such as iron, converting them to forms suitable for filtration and safe disposal.
        - $ClO_2$ Generation: Converts residual brine and chlorides into chlorine dioxide for on-demand, high-efficiency disinfection.
        - Energy Consumption: Approximately 1.6 kW per 50 barrels per hour (bench-scale units sized accordingly).
        - No Chemical Feedstocks: All oxidants are generated in situ, reducing operational hazards and supply chain risk.
        - Environmental Compatibility: Produces environmentally benign byproducts, with no persistent or hazardous chemical residues.
        - Validation: Lab and field testing indicate reduction of bacteria count from 3,650 CFU/mL to <1 CFU/mL and effective elimination of $H_2S$.
- Filtration
    - Provides final polishing of treated water, removing fine suspended solids, residual organics, trace metals, and any remaining oxidized contaminants. This step ensures that the treated water meets stringent quality criteria.

C. Storage and Secondary Containment

- Above-Ground Storage Tanks
    - Used for both untreated and treated produced water.
    - Tanks provided by NMPWRC at BGNDRF or, if unavailable, RainDance will supply compliant tanks.
    - All tanks are within secondary containment with a minimum capacity of 1.5× the largest tank volume, as required by NMED.
- Secondary Containment

    - Berms and liners constructed of impermeable material.
    - Inspected prior to and during use for integrity and freeboard.
    - Rainwater managed to maintain containment capacity.

Closed-Loop Processing Plan

- All produced water entering the system is treated through the above multi-stage process.
- Treated water is collected in a holding tank for sampling and analysis.
- Treated water is then recombined for SWD injection.
- No discharge to ground or surface water; all residuals and byproducts are managed within the closed system and disposed of per regulatory requirements.

Site Layout Map
See “BGNDRF Testing Site” Map Attached.

- Pilot system location within BGNDRF campus.
- Locations of pre-treatment units, advanced treatment skids, storage tanks, and secondary containment areas.
- Access roads, security fencing, and emergency assembly points.
- Utilities and monitoring stations.

System Diagram

See Attached Process Flow Diagram below.

This modular, closed-loop system is designed to maximize contaminant removal, ensure regulatory compliance, and protect site personnel and the environment. All system components, storage, and containment meet or exceed NMED, NMPWRC, and BGNDRF requirements. The process is fully automated, monitored, and designed for safe, efficient operation at the BGNDRF pilot site.

**Attachment N**

Disposal Plan Overview
All produced water, treated produced water, and permeate generated during the RainDance pilot project will be managed in a closed-loop system. There will be no discharge to the environment. All water streams will be disposed of via injection into a permitted SWD, in full compliance with NMED, NMPWRC, and BGNDRF requirements.

Produced Water and Treated Water Handling

- Produced Water Source: Produced water is supplied by the NMPWRC, sourced from the Permian Basin.

- Onsite Storage: All produced water and treated water will be stored in above-ground tanks equipped with secondary containment (minimum 1.5× tank volume), either provided by NMPWRC at BGNDRF or by RainDance if needed.
- Closed-Loop Processing: The treatment process is fully closed-loop. Treated water (including permeate) is collected in a holding tank for sampling and analysis, then sent to final disposal.

Disposal Procedures

- Final Handling: After treatment, the distillate/permeate is sent to a designated holding tank. No water is discharged to the ground or surface waters.
- SWD Injection: Treated Water is transferred from onsite storage tanks to a permitted SWD for injection. The SWD is coordinated by NMPWRC and BGNDRF, and is permitted for produced water disposal under NMED and OCD regulations.
- Residuals and Byproducts: Any residuals or waste generated (i.e. spent filter media, separated solids) will be characterized and disposed of at a permitted solid waste or hazardous waste facility, as required by NMED.

Regulatory Compliance

- No Environmental Discharge:There will be no discharge of produced water, treated water, or permeate to land, surface water, or groundwater at any stage of the project.
- Documentation and Chain of Custody: All transfers to SWD will be documented with manifests and chain-of-custody records in accordance with NMED and BGNDRF protocols.
- Inspection and Monitoring: All tanks, secondary containments, and transfer operations will be regularly inspected for leaks, spills, or operational issues. Any incidents will be reported and remediated per facility and regulatory requirements.

**Appendix O**

Overview

This closure plan outlines the steps that will be taken to safely decommission the RainDance produced water treatment pilot upon completion of operations. The plan ensures compliance with NMED, NMPWRC, and BGNDRF requirements and aims to leave the site in a clean, safe, and regulatory-compliant condition.

Decommissioning of Equipment and Materials

- Treatment System Components: All major treatment system components (i.e. skids, tanks, reactors, control panels) will be thoroughly cleaned and decontaminated in accordance with manufacturer specifications and regulatory requirements. Decontaminated equipment will be removed from the site and retained by RainDance for reuse in future pilot projects or returned to inventory. No permanent disposal of major equipment is anticipated.

- Ancillary Equipment and Piping: Piping, hoses, and small ancillary items that cannot be effectively decontaminated will be characterized and, if necessary, disposed of at a permitted solid waste or hazardous waste facility in accordance with NMED regulations.
- Secondary Containment: Secondary containment berms and liners provided by NMPWRC or RainDance will be inspected. If reusable, they will be cleaned and removed for future use; otherwise, they will be disposed of at an approved landfill.

Disposal of Residuals, Waste, and Byproducts

- Water and Brine Residuals: All remaining produced water, treated water, and residuals will be recombined and disposed of via injection into a permitted SWD as previously described in the disposal plan.
- Spent Media, Solids, and Other Waste: Spent filter media, separated solids, and other expendable materials will be collected, characterized, and disposed of at a permitted solid waste or hazardous waste facility, as appropriate.
- Contaminated Soils or Vegetation: If any soil or vegetation is found to be contaminated as a result of pilot activities, it will be excavated, characterized, and disposed of at a permitted landfill or soil remediation facility. Confirmation sampling will be conducted to ensure removal of contamination.

Site Restoration

- Inspection and Cleaning: The pilot area will be thoroughly inspected for evidence of spills, leaks, or contamination. All surfaces and containment areas will be cleaned. Any temporary structures, signage, or barriers installed for the project will be removed.
- Restoration to Original Condition: The site will be restored to its pre-project condition or as otherwise directed by BGNDRF facility management.

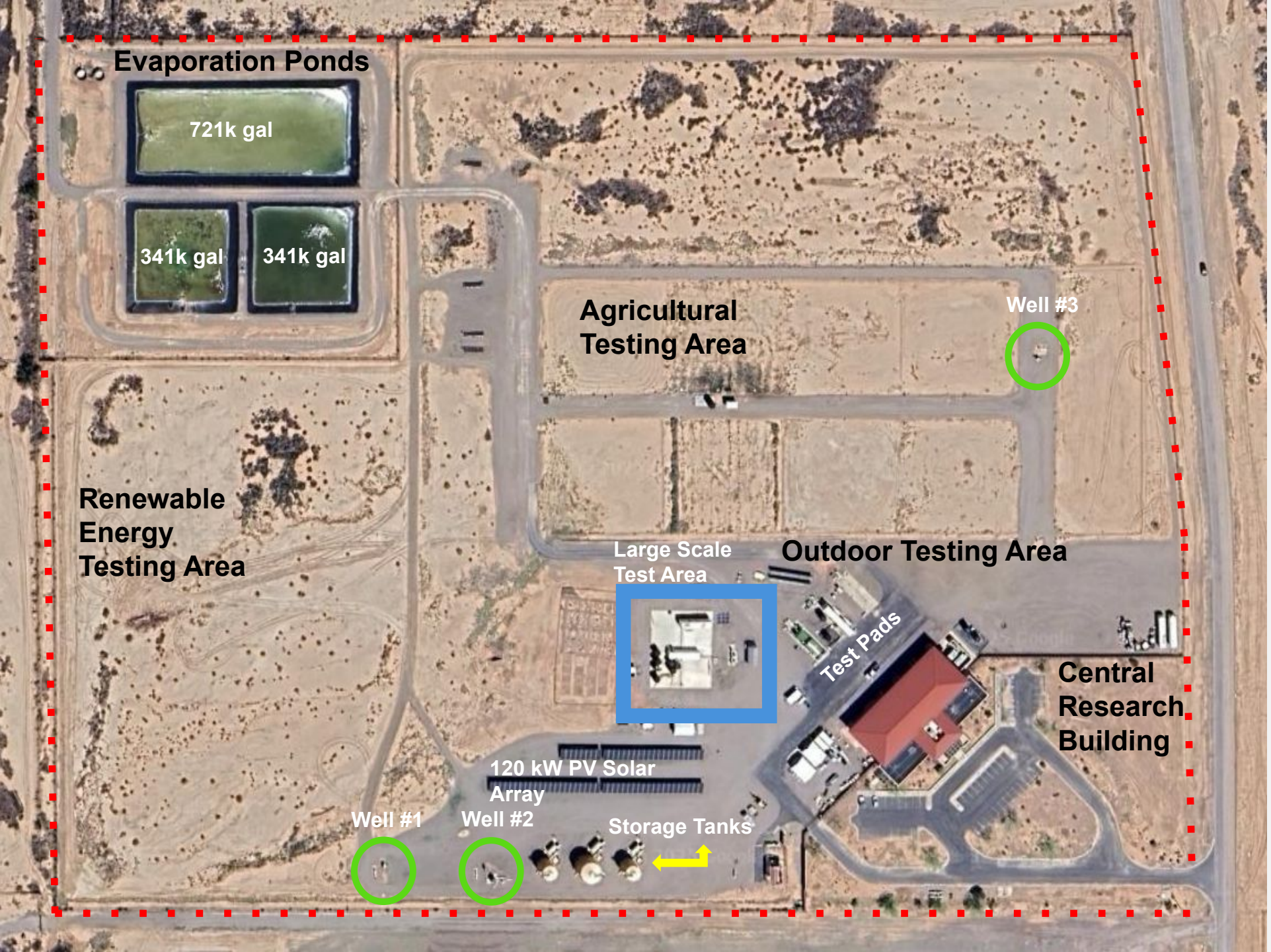
Documentation and Reporting

- Records: All decommissioning, waste disposal, and site restoration activities will be documented. This includes waste manifests, disposal receipts, equipment cleaning logs, and final inspection reports.
- Final Report: A comprehensive closure report will be submitted to NMED, NMPWRC, and BGNDRF, summarizing all closure activities, waste dispositions, and confirmation that the site has been returned to a safe and compliant condition.

Regulatory Compliance

All closure activities will be conducted in accordance with:

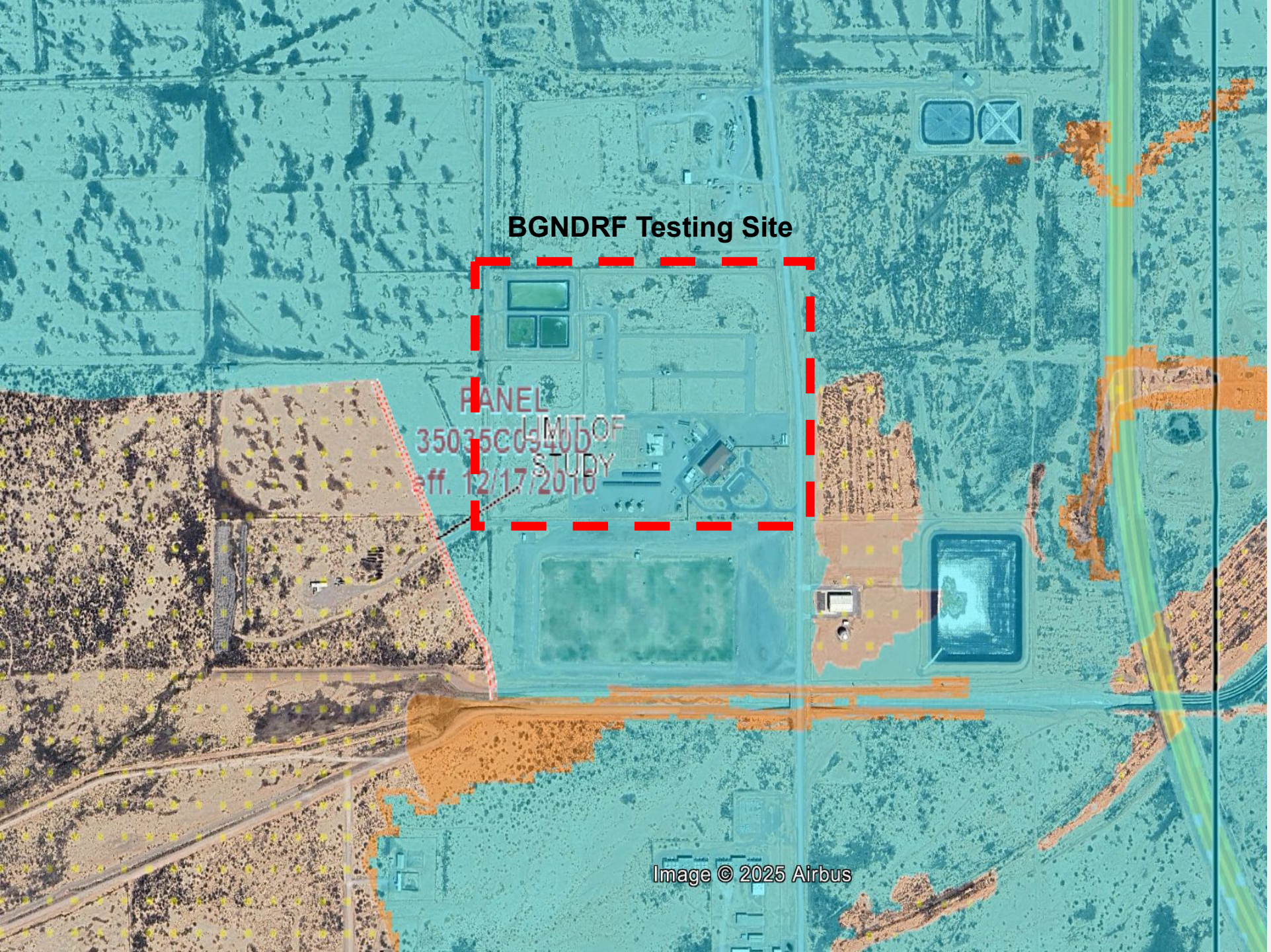
- NMED regulations
- NMPWRC protocols
- BGNDRF facility requirements
- All applicable federal, state, and local environmental protection standards




# BGNDRF Testing Site

500 La Velle Road
Alamogordo, NM 88310

- BGNDRF Boundary
- Brackish Source Wells
- RainDance System Rig Up




# FEMA

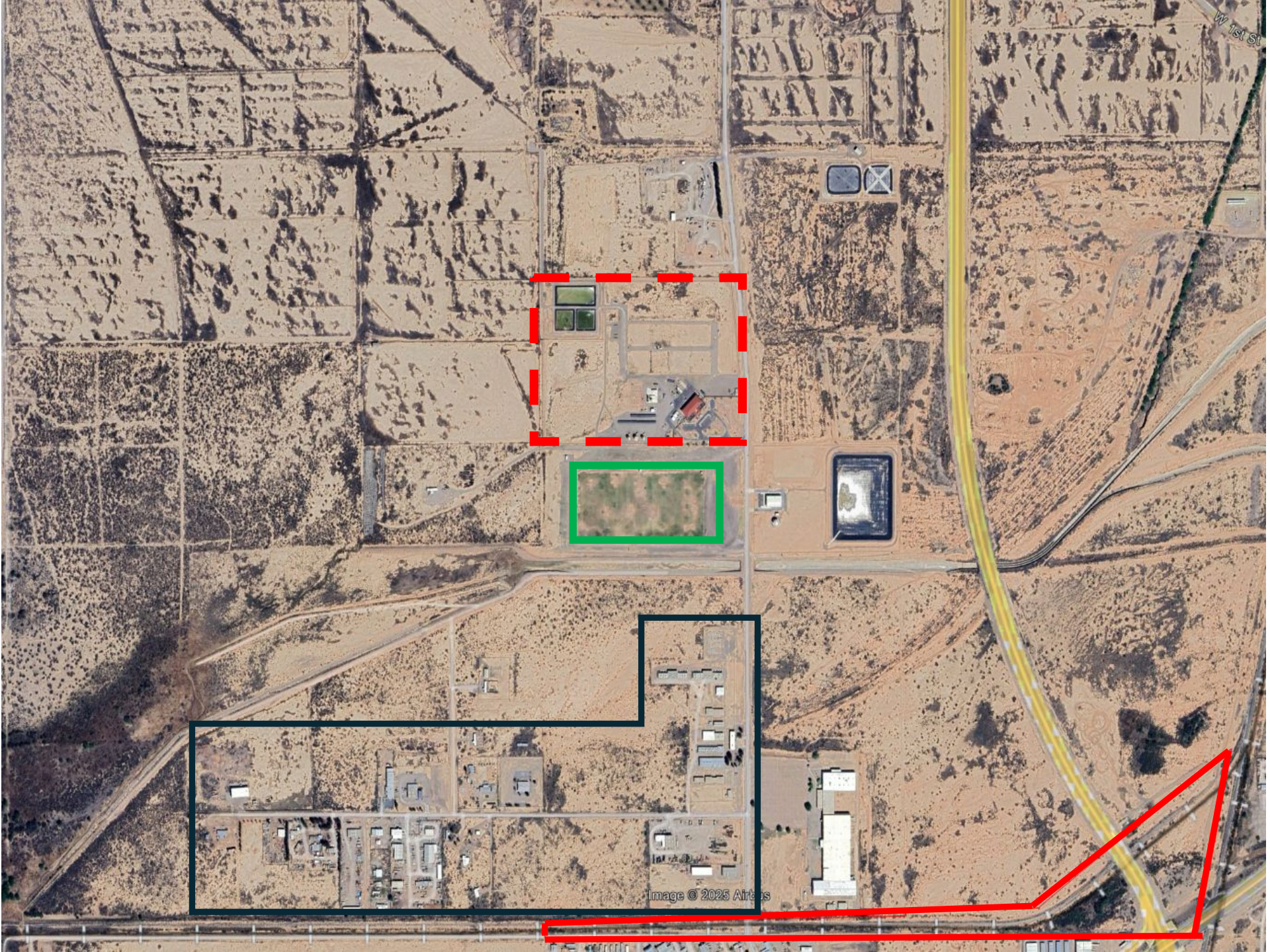
National Flood Hazard Layer Web Map Service

**Reference Layers**

- NFHL Data Available
- FIRM Panel Boundary

**Flood Risk Areas**

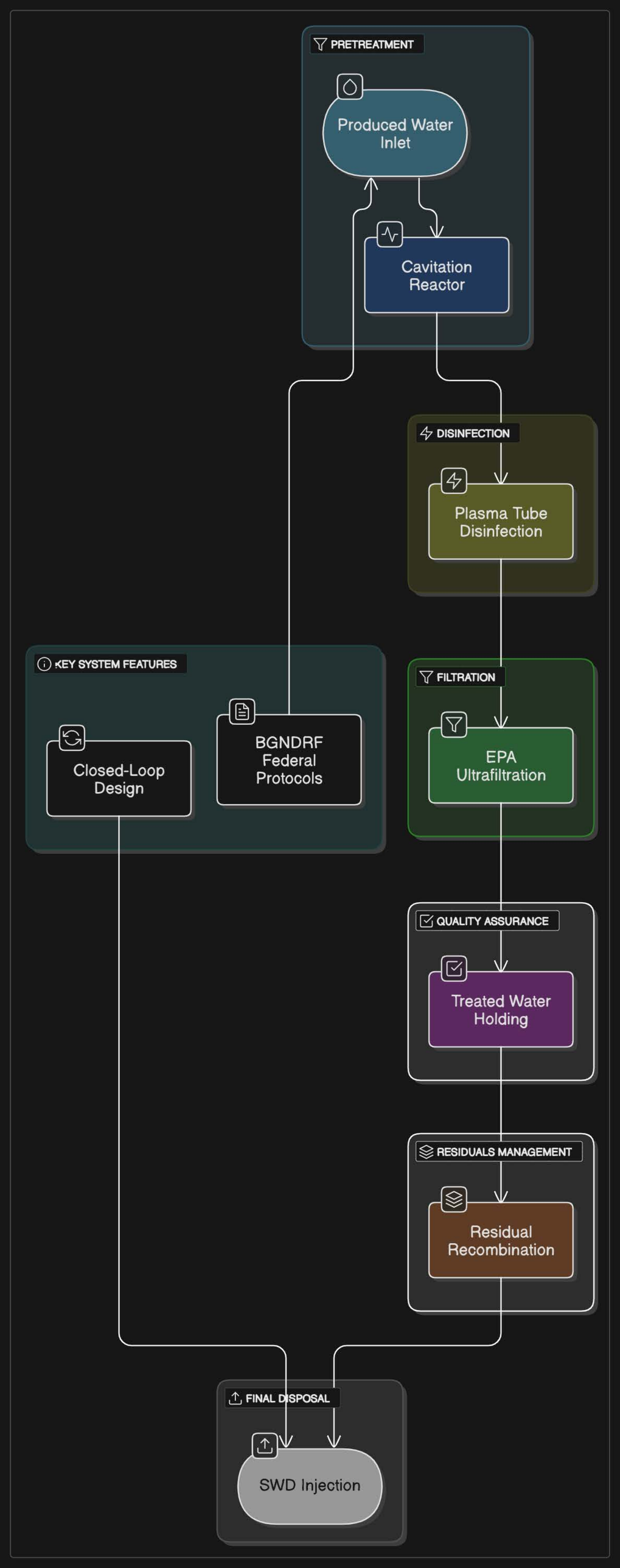
- High Risk Area - Floodway
- High Risk Area
- Moderate Risk Area
- Low to Moderate Risk Area (reduced risk due to levee)
- Low to Moderate Risk Area
- Undetermined Risk Area




# Land Status

Land Ownership, Dwellings, Occupied Establishments

- BGNDRF Boundary
- Park
- Commercial Area
- BLM Land


PRETREATMENT
Produced Water Inlet
Cavitation Reactor
DISINFECTION
Plasma Tube Disinfection
KEY SYSTEM FEATURES
Closed-Loop Design
BGNDRF Federal Protocols
FILTRATION
EPA Ultrafiltration
QUALITY ASSURANCE
Treated Water Holding
RESIDUALS MANAGEMENT
Residual Recombination
FINAL DISPOSAL
SWD Injection

New Mexico Environment Department
Ground Water Quality Bureau

**Produced Water Pilot Project**
**Notice of Intent to Discharge**

**For Department Use Only:**

Agency Interest Number _____
PRD Assigned _____

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.** Please see Attachment K.
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.** Please see Attachment L.
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.** Please see Attachment M.
16. **Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD. Provide as an attachment.** Please see Attachment N.
17. **Describe your final closure plan after completion of the pilot project. Provide as an attachment.** Please see Attachment O.
18. **Estimated depth to ground water (ft):**_____ **Source of information**_____
**Direction of groundwater flow:** _____ **Source of information**_____
N/A
19. **Current Total Dissolved Solids Concentration in Groundwater**_____
N/A

**Signature:** _____ **Date:** June 3, 2025

**Printed name:** Jason Muniz **Title:** President/Founder

**Certification by Responsible Person**

I, Jason S. Muniz, **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** 3 **day of** June 2025**, upon my oath or affirmation, before a notary of the State of** Texas

Myrna Chavarria Guajardo
Notary/Signing Agent

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

MYRNA CHAVARRIA GUAJARDO
Notary ID #130419028
My Commission Expires
June 15, 2028