

Environmental Assessment  
for Sapphire Energy, Inc.'s  
Integrated Algal Biorefinery (IABR) Facility  
In Columbus, New Mexico

Prepared by USDA RD PSS

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USDA Biorefinery Assistance Loan Guarantee

Section 9003

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## **List of Exhibits (Oversized)**

**Exhibit 1: IABR Location Map (Topographic Base)**

**Exhibit 2: IABR Location Map (Aerial Photographic Base)**

**Exhibit 3: Generalized Facilities Layout; IABR**

**Exhibit 4: FEMA FIRM Map, Proposed IABR Facility**

# Attachments

- Attachment F-1 – Form RD 1940-20 and Correspondence with Regulatory Agencies
- Attachment F-2 – Soils Report, including SCS CPA 026 Forms
  - Soil Sampling Field Forms
  - Soil Sampling Photographs
  - Laboratory Report
  - NRCS Custom Soil Resource Reports
  - USDA Highly Erodible Land Determinations
  - Permeability Testing Data
- Attachment F-3 – Groundwater Data (USGS hydrographs and Analytical Results)
  - GW laboratory Data for onsite Wells
  - Hydrographs for onsite Wells
  - Well Map Western Parcel (adjacent site)\_
  - Well Map Eastern Parcel (subject site)
  - Transmissivity Graphs for onsite wells
- Attachment F-4 – T&E Species and Wetlands Report
  - Final Biological Field Survey Report
  - Rare Plant Species List
  - Threatened and Endangered Species - Table 1 Mimbres Basin
  - March 5, 2009 Photograph Log
  - Site Map
  - USACE Jurisdictional Determination Request Submission
- Attachment F-5 – Cultural Resource Survey Report
- Attachment F-6 – Attachment F-8 – Public Notice
  - Preliminary Notice for EA Published for 3 days ending August 21, 2009
  - Public Notice for Wastewater Discharge Permit
  - FONSI Notice for EA Published for 3 days ending September 28, 2009
  - Signed FONSI

## F. Environmental Assessment

This section of the loan application describes the proposed Integrated Algal Biorefinery (IABR) project, the existing environment, and potential impacts to the environment related to the construction of the facility. In accordance with USDA guidance, this environmental evaluation was prepared pursuant to 7 CFR, Part 1940, Subpart G, Exhibit H.

### F.1. Project Description and Need

#### F.1.1. General Project Description and Purpose

The applicant, Sapphire Energy Company (Sapphire), proposes to construct and operate an Integrated Algal Bio-Refinery Facility (IABR) to produce oil from algae, ultimately refining the oil into various types of transportation fuel. Sapphire is proposing to construct the IABR southwest of the community of Columbus in Luna County, New Mexico (Figure 1 and 2 and Exhibits 1 and 2, Oversized).

Figure 1: Map of IABR Project Site and Surrounding Area

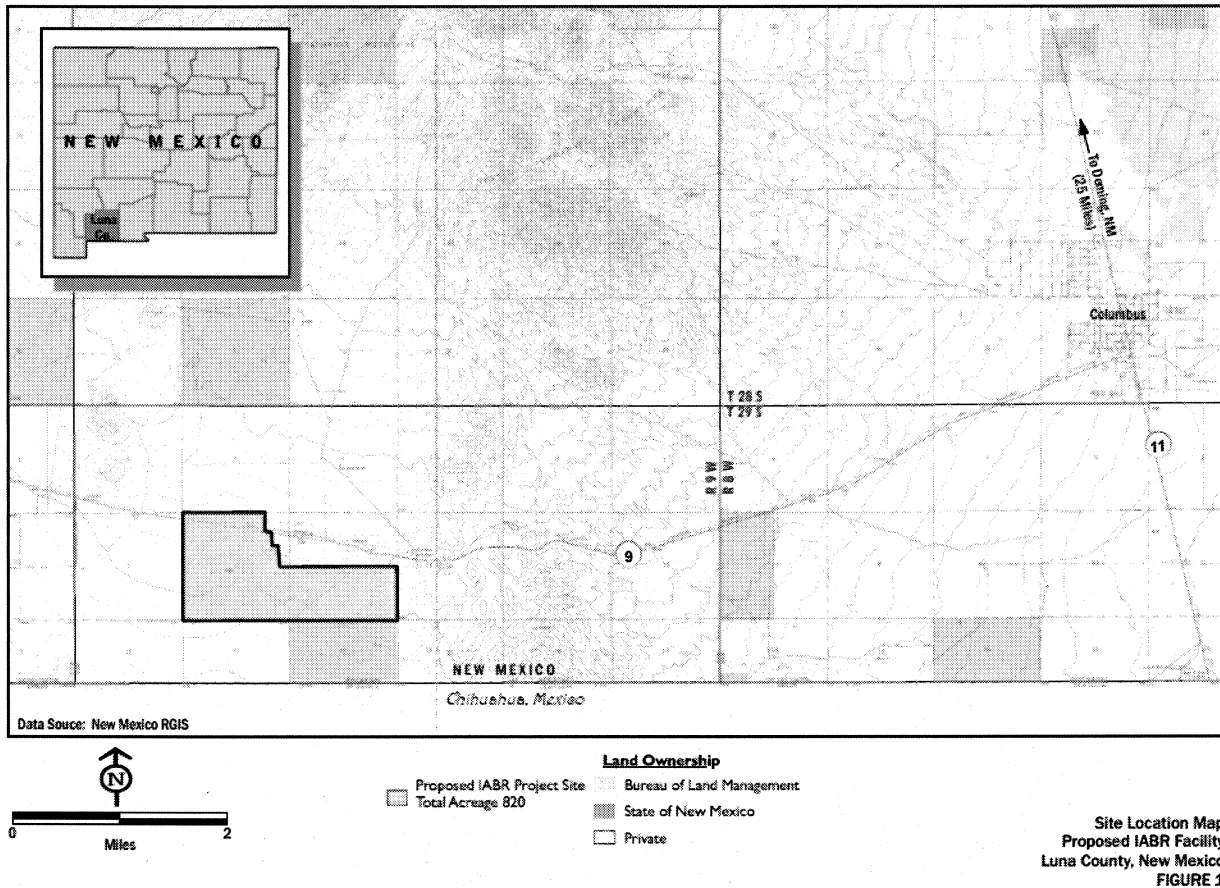
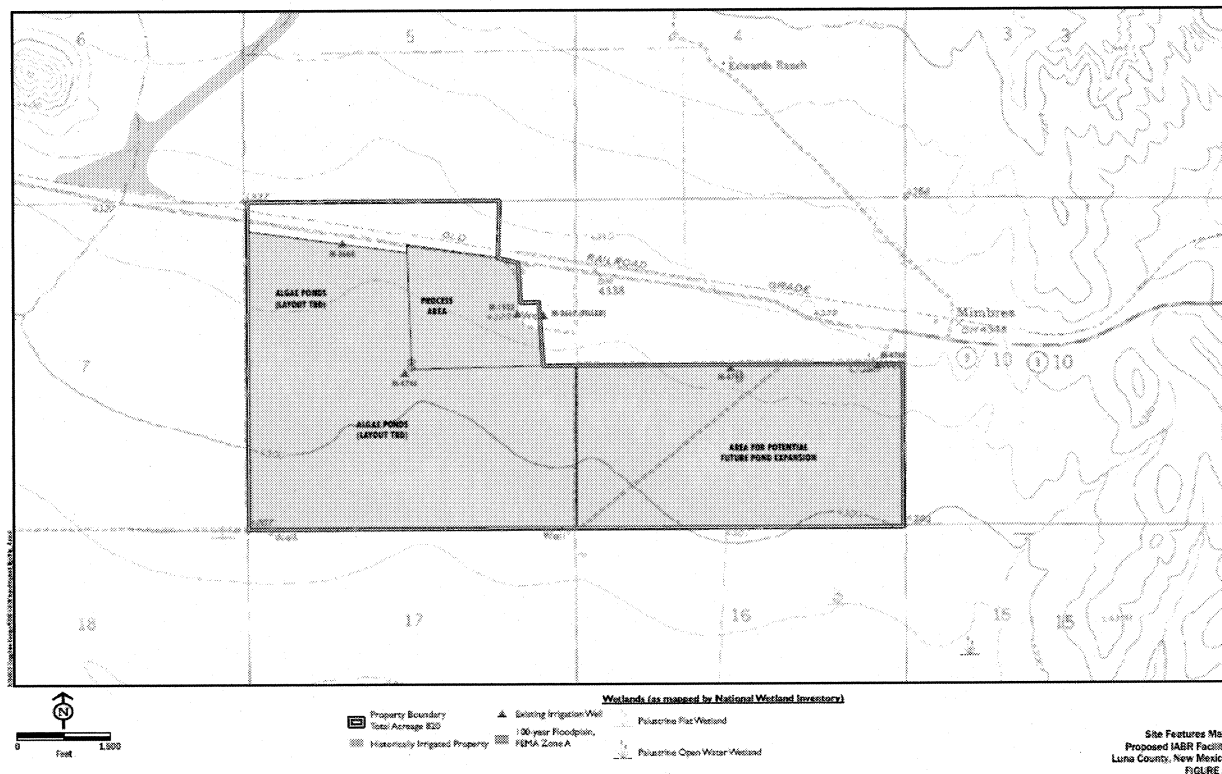


Figure 2: Detailed Map of Western Parcel for IABR Project



The algae to be used in the proposed project, which are various strains of microalgae, do not meet the definition of "genetically modified organisms." The applicant's IABR algae strain development program does not use any recombinant DNA and is therefore not classified as genetic engineering according to the 1986 Coordinated Framework for Regulation of Biotechnology. The applicant's algae strains are not listed as a plant pest and are therefore not subject to regulations on their importation, interstate movement, and field release as administered by USDA's Animal and Plant Health Inspection Service (APHIS).

The IABR will propagate and harvest algal biomass, extract oil from the algae and convert it into liquid fuels. The purpose of the project is to construct and operate a demonstration-scale facility in the United States (US) that produces jet and diesel fuel, derived from renewable algae sources, effectively reducing our country's dependence on foreign oil and fossil fuels. The IABR facility will be capable of producing 100 barrels (bbl) of refined algal oil per day.

Current plans provide for operating the IABR for a three year test period. Should additional time be required to obtain the necessary data to support project decisions, the facility may be operated an additional 2 years.

A generalized layout of key components associated with the proposed IABR facility, including approximately 300 acres of ponds, is illustrated in Figure 2 and Exhibit 3 (oversized). Existing wells on the property will be used to supply the water necessary to fill and maintain the ponds. General specifications for the IABR facility are provided in **Figure 3**.

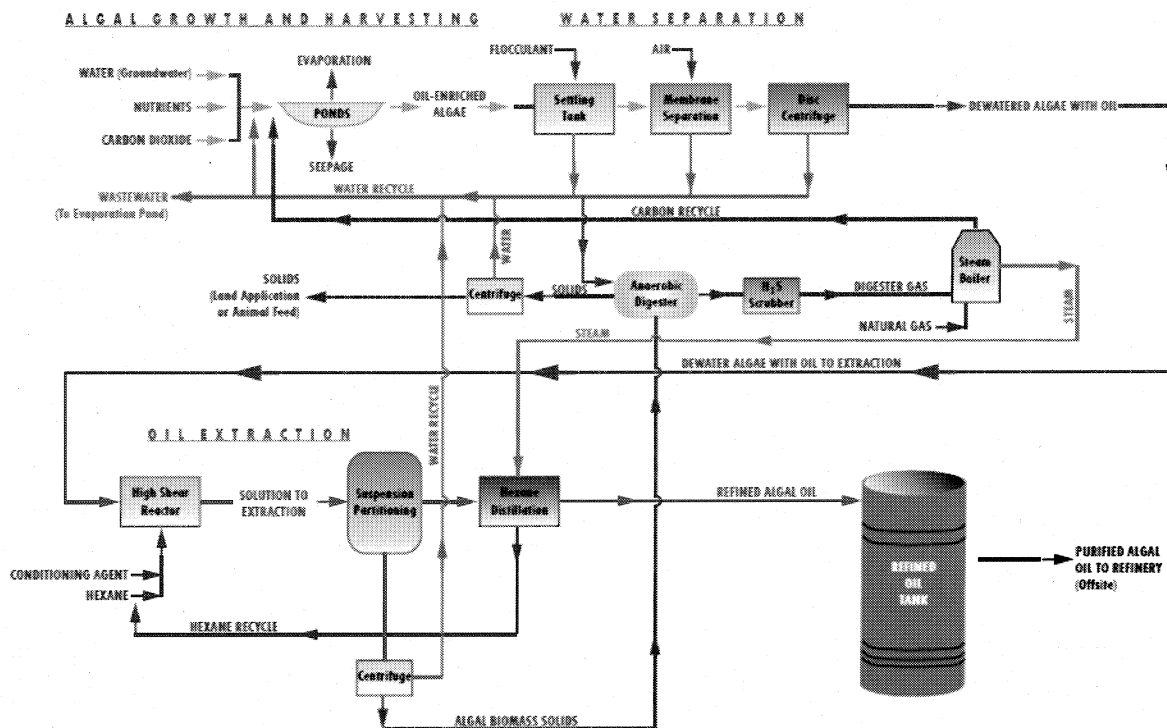
Figure 3: General Design Parameters for Sapphire Energy’s IABR Algae Processing Facility

Parameter	Quantity
Algae Pond Acreage	300
CO <sub>2</sub> Used (metric tonnes/day)	56
CO <sub>2</sub> Utilization	60%
Extractable Liquid Fraction	50%
Refined Oil (bbl/day)	100

### F.1.2. Process Description

Figure 4 is a flow chart of the general process to be used to produce refined fuel from algae at the IABR facility. The oil generation process generally involves four distinct sub-processes: algae growth and harvesting; water separation; oil extraction; and oil refining. At IABR’s demonstration-scale facility, algae will be grown, harvested, separated from the water, and extracted. The extracted oil will then be sent off-site to be refined at the Dynamic Fuels, LLC facility located in Geismar, Louisiana, which will operate under contract to Sapphire. The entire process will be engineered to recapture and reuse solid and aqueous waste streams to the greatest extent possible. Additional details of each sub-process are discussed in more detail below.

Figure 4: IABR Process Flow Chart



#### F.1.2.1. Algal Growth and Harvesting

Algae will be grown in shallow ponds at the IABR to maximize exposure to sunlight. Nutrients and carbon dioxide (CO<sub>2</sub>) will be continually fed to the influent water stream to the ponds. The CO<sub>2</sub> and nutrient-enriched water will be circulated from one end of the ponds to the other to enhance algal growth and keep the algae near the water surface to improve harvesting. Algae-containing water will be constantly removed at the distal end of the pond for harvesting, water separation and oil extraction. CO<sub>2</sub> used in the process will be purchased from off-site sources and hauled by truck to the demonstration facility and stored on-site. Approximately 56 metric tons/day of carbon dioxide will be added to the ponds. Approximately 60 percent of the CO<sub>2</sub> added to the water will be consumed by the algae, the remainder emitted to the atmosphere (**Figure 3**).

#### F.1.2.2. Algae/Water Separation

To produce a fuel, algae from the ponds will be dewatered by settling, membrane separation, and centrifuge separation. A flocculent is added to the settling tank to improve the settling process. The membrane system concentrates the algae. The centrifuge decreases the algal water content and separates the algae from the water. Water captured during settling, membrane, and centrifuge separation will be recycled back to the influent to the ponds (Figure 4), directly reducing the amount of make-up water required from the aquifer at the site. Periodically, a small portion of this recycled water will be directed to a lined evaporation pond to remove excess salt and metals in the water stream. The frequency of diversion and the volume of water diverted to the evaporation pond will be dependent on chemical analysis of samples collected during operation of the IABR; the goal is to not discharge any water to the evaporation pond.

#### F.1.2.3. Oil Extraction

**Algal oil will be extracted using a wet extraction process that utilizes hexane.** Unused hexane will be recovered during the oil extraction process. Any remaining biomass from the oil extraction process will be recycled in the on-site anaerobic digester, where it will be converted to a biogas and reused to generate steam for the hexane distillation process. Algal oil extracted from the biomass will be stored and transported daily off-site for the final refining at the Dynamic Fuels, LLC facility in Geismar, Louisiana.

#### F.1.2.4. Ancillary Components

Beyond the process components described above, several other ancillary components will be necessary to support the IABR facility, including:

- Steam boiler. Steam is needed for the SRS extraction process. Exhaust from the steam boiler is routed back to the influent flow to the ponds to capture CO<sub>2</sub> required for algae growth.
- Compressed air system (air compressor, air dryer and receivers)
- Storage tanks and transfer pumps for products and raw materials. Products to be stored include hexane, flocculating and conditioning agents, propane, CO<sub>2</sub>, and refined algal oil.

#### **F.1.2.5. Dynamic Fuels, LLC Refining (Off-site)**

Algal oil extracted from the biomass at the IABR will be refined at the existing Dynamic Fuels facility in Geismar, Louisiana. Dynamic Fuels is an independent company that operates its Louisiana facility under separate environmental and operating permits. The process used at the Dynamic Fuels facility will produce a green jet fuel in addition to a green diesel with a higher cetane value and lower cloud point than traditional diesel. This component of the proposed project is not part of this environmental assessment because it is considered to have independent utility but is described for completeness purposes.

#### **F.1.3. Site Abandonment and Closure**

Once the decision to permanently discontinue IABR test operations is made, decommissioning activities will commence. Buildings and other permanent structure that can be re-used for general industrial purposes will be left in place once cleaned. All process equipment will be removed and salvaged. The pond system will be closed in-place with permanent infrastructure removed. Piping for carbon dioxide delivery and electrical infrastructure for pond mixing will be removed. Any additional work on the land will be done to return it to a condition similar to the situation before development.

The IABR refinery process will have all working materials removed and equipment cleaned. Removable process equipment will be removed and sold to the secondary equipment market. Permanent structures such as buildings will be left in place once cleaned. The land will be returned to its previous condition. It is expected that the cost of decommissioning will be covered by the salvage value of the equipment by an experienced decommissioning contractor. As salvageable equipment is expected to be worth nearly \$10 million, sufficient value is expected to be available to cover the cost of decommissioning.

### **F.2. Primary Beneficiaries and Related Activities**

Several parties will benefit from the IABR project. In the short-term (project due diligence through construction), the beneficiaries will include local drilling companies, local and regional environmental and engineering firms, local construction and excavation companies, local contractors (welders, steel fabricators), equipment rental companies, supply companies, local restaurants and fuel stations, and the owner of the property that was purchased by the applicant. At an expected development cost of approximately \$80 million, the IABR project will provide a considerable economic boost to these companies and individuals in the short term.

In the longer-term, the primary beneficiaries of development of the IABR will include Luna County and the State of New Mexico through increased tax revenues, a fertilizer manufacturer, a CO<sub>2</sub> supplier, a local security company, local and/or regional trucking companies, and Dynamic Fuels, LLC, who will be retained to refine the algal oil. Based on an estimated 10-11 truck trips per day (2 trucks of CO<sub>2</sub>, six trucks transporting anaerobic digester solids to area farmers, and one truck transporting oil to the Dynamic Fuels refinery), expansion of the capabilities of an existing trucking company or creation of an additional company is anticipated. The IABR facilities will utilize approximately 2 to 3 tons per day of fertilizer and 56 tons per day of CO<sub>2</sub>. The applicant will also hire a local security company to provide full-time protection of the facility due to its proximity to the US/Mexico border.

Other beneficiaries of the proposed project will include realtors, residential home builders, and other service sector businesses that will support the infusion of 30 additional scientists, engineers, and laborers retained to operate the IABR and connected facilities. The economic boost from the facility is expected to have a greater impact on Columbus, New Mexico as compared to that of the larger communities in New Mexico. Increasing the workforce by 30 in a community of 1,600 (Columbus) will have a substantial ripple effect to the economic and social fabric of the community (see further discussion under Human Population).

After approximately 3 years of operation of the IABR, results of the pilot tests will be evaluated by the applicant to assess the feasibility of the process and the financial viability of the project. At that point, a decision will be made on developing a commercial-scale facility. In concept, the commercial-scale facility would include development of a pond system that would cover approximately 25,500 acres, resulting in oil production of approximately 10,000 barrels per day. The economic stimulus anticipated by this development would provide approximately 2,000 jobs and more than \$1 billion in start up investment in the local and regional economy.

The location of such a commercial-scale facility is currently unknown but, should the development proceed, the location will be determined following evaluation of the feasibility of the process implemented at the IABR. Some of the more important criteria to be evaluated in siting of a commercial-scale facility include climate, latitude, water and CO<sub>2</sub> availability, topography, land use, land ownership, socioeconomic and cultural conditions, availability of appropriate labor force, and environmental and cultural sensitivities. Further discussion of the commercial-scale facility as a reasonably foreseeable action is included in Section F.6.2, Cumulative Impacts.

### **F.3. Description of Project Area**

#### **F.3.1. General Description**

The IABR facility will be constructed on land optioned for purchase by the applicant in Luna County approximately two miles southwest of Columbus, New Mexico (Sections 8 and 9 Township 29 South Range 8 and 9 West) (Figure 2 and Exhibit 3). The applicant owns approximately 2,200 acres in this area of southern New Mexico within two parcels, separated by approximately 3 miles of public land administered by the USDI Bureau of Land Management (BLM)(Figure 5). The proposed IABR facility will be located on the western parcel of the property, approximately one-half mile north of the US/Mexico border. The project site is bordered by the State of New Mexico Highway 9 and private land to the north, private land to the west, private and State land to the south, and two private residents (May and Cook properties) and public land (BLM) to the east (Figure 1, Figure 2, and Exhibits 1, 2, and 3). Some of the private land, particularly to the west, is irrigated, while the majority of the adjacent land is non-irrigated desert.

The IABR facility ponds and process equipment will be constructed on approximately 400 acres of land as illustrated in Figure 2 and Exhibit 3. Ponds will be constructed on about 300 acres to grow algae and another 100 acres will be used to house the process equipment required to dry algae and purify algal oil and an evaporation pond. Process equipment will be installed at the IABR facility, including an anaerobic



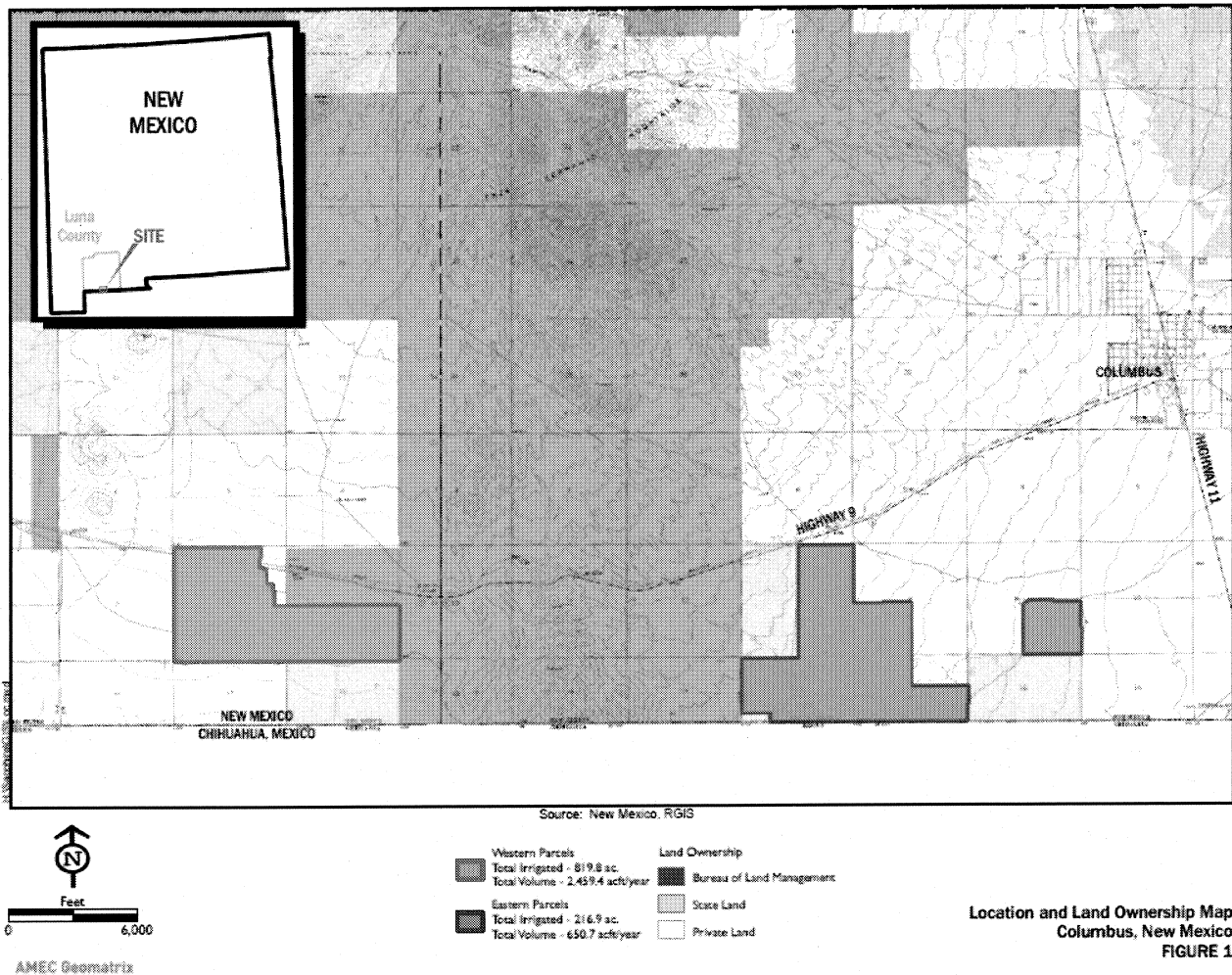
digester, membrane filter system, disc centrifuge, boiler, hexane distiller, several process and holding tanks (recycle water, algae oil and refined oil), and CO<sub>2</sub> storage tanks, and miscellaneous conveyors and pumps.

The IABR facility fronts State of New Mexico Highway 9 to allow for efficient access to the broader commerce area (Figure 2). Existing gravel roads on the property will be used to lessen land disturbance during project development. The property is bordered on the west by a County road that separates Sections 7 and 8. This road ends at the southwest corner of the property. Another gravel road runs east along the southern margin of Section 8 to the center of Section 9. A poorly-maintained gravel road accesses the northeast corner of the property in Section 9 then turns and trends west along the property boundary. These roads will be upgraded, as necessary, to promote efficient construction and operation of the of the IABR facility.

### **F.3.2. Unique and Sensitive Areas**

**The proposed IABR facility in Luna County is located within the Basin and Range physiographic province, which is characterized by low parallel mountain ranges separated by flat desert plains. The terrain is relatively flat, with drainage flowing to the southeast. Field evaluations were performed to assess onsite soil resources, the potential for wetland and waterway resources, and a Level 1 cultural and archaeological survey was also completed on the property in March 2009. Wetland and waterway surveys were conducted in March and June 2009. Results of these surveys are provided in Attachment F-4. In summary, no floodplains, wetlands or other waters of the United States, or unique sensitive areas were identified in the proposed project area.**

Figure 5: Cooper Property Map



## F.4. Environmental Impact

### F.4.1. Air Quality

The potential area of impact to air resources as a result of the IABR project includes areas within the dispersion zone for the project site.

#### F.4.1.1. Existing Air Quality of Project Area

Figure summarizes the air quality status of Luna County, New Mexico, as published in the Code of Federal Regulations (40 CFR §81.332 – New Mexico Southern Border Intrastate Air Quality Control Region). A review of the PM<sub>10</sub> data from the Deming, New Mexico Airport for the calendar year 2007 showed an average 24-hour PM<sub>10</sub> concentration of 27.1 µg/m<sup>3</sup>, based on the raw hourly data. The existing 24-hour PM<sub>10</sub> regulatory standard is 150 µg/m<sup>3</sup>.

A Class 1 air quality airshed is defined as an area in which visibility is protected more stringently than under the national ambient air quality standards. Class I areas include national parks (greater than 6,000 acres), wilderness areas (greater than 5,000 acres), monuments, international areas (trans-boundary

sites) and other areas of special national and cultural significance. The Class I designation provides the most protection to pristine areas.

No Class 1 air quality airsheds are located within 100 miles of the project site. The three closest Class 1 airsheds are the Chiricahua Wilderness (approximately 100 miles from the site), the Chiricahua National Monument (102 miles from the site), and Gila Wilderness (111 miles from the site).

Figure 6: Air Quality Status - Luna County, New Mexico

Pollutant	USEPA Designation
SO <sub>2</sub>	Cannot be classified or better than national standards
CO	Unclassifiable/Attainment
Ozone (1 hr standard)	Unclassifiable/Attainment
Ozone (8 hr standard)	Unclassifiable/Attainment
NO <sub>2</sub>	Cannot be classified or better than national standards
Particulate Matter less than 10 microns (PM <sub>10</sub> )	Unclassifiable

#### F.4.1.2. Air Emissions from Facility and Connected Facilities

Air emissions expected from the IABR facility include:

- **Heat and Hydrocarbons** – From the steam boiler.
- **CO<sub>2</sub>** – Fugitive emissions from the ponds. It's estimated that approximately 20-40 percent of the CO<sub>2</sub> injected into the ponds will be emitted fugitively to the atmosphere; 60-80 percent will be consumed by algae.
- **Particulate** – Fugitive emissions associated with facility construction and with truck traffic on approach or service roads at the facility during operation. It is estimated there will be five truck trips to/from the facility daily and 60 trips weekly.
- **Hexane** – Some fugitive emissions of hexane are expected to occur; however, the IABR is designed to recover hexane. Less than 50 ppm of hexane will remain in the algal solids after the hexane recovery process. This residual hexane will be emitted fugitively from the algal solids to the atmosphere during conveyance to the IABR oil purification process.

CO<sub>2</sub>, the primary green house gas associated with the facility, will be emitted fugitively from the ponds at a rate of approximately 6,720 metric tons annually. This amount represents approximately 0.01138 percent of the carbon dioxide emitted in the State of New Mexico in 2007 (59 million metric tons) and 0.0000112 percent of that emitted in the United States in 2007 (6 billion metric tons) (Energy Information Administration 2009). Currently there is no federal, state, or local regulatory standard for CO<sub>2</sub> emissions. Based on these data, the relative contribution of the IABR facility to the total carbon dioxide load in the State of New Mexico would be minor.

#### F.4.1.3. Consistency with New Mexico's Air Quality Management Plans

Based upon the existing air quality data and air quality status for Luna County, New Mexico, air impacts associated with the IABR will be within guidelines included in New Mexico's air quality implementation plan and will comply with air quality standards within the region, including those administered by the government of Mexico. An air permit for the IABR facility will be required under New Mexico's Air Quality Control Act (N.M. Stat. Ann. §§ 74-2-1).

Approval of any air permit required to operate the IABR will not encounter undue delays due to attainment issues or Class 1 impact issues since the project site is not located within a non-attainment area. Likewise, the site topography will not affect the dispersal of any air emissions from the IABR facility.

Determination of whether the facility will require a New Source Review air quality permit and/or a Clean Air Act (CAA) Title V permit will be completed when final design plans for the IABR are developed in concert with the State of New Mexico Air Quality Bureau (Bureau). Depending on the level of emissions expected from the IABR, emissions may exceed the Potential to Emit (PTE) thresholds discussed in NMAC § 20.2.72.200 and a New Source Review (NSR) air quality permit may be necessary. The procedure for determining the necessity of a NSR permit requires the applicant to file emissions calculations for review by the Bureau.

A No Permit Required (NPR) determination will follow if the facility's potential emissions rate (PER) is less than 10 pounds per hour (pph) and 10 tons per year (tpy) of any regulated contaminant or 1 tpy of lead. If the facility has a PER of less than 10 pph but greater than 10 tpy of a regulated air contaminant, a Notice of Intent to construct (NOI) is required. If the PER is greater than 10 pph and 25 tpy, an air quality permit will be required. Determination of whether the facility will be a CAA Title V source is completed during the Air Quality Bureau's evaluation of the need for an air NSR permit. On March 9, 2009, the applicant solicited comments from the Air Quality Bureau concerning air permitting issues (Attachment F-1). To date, no written comments have been received from the Bureau.

#### F.4.2. Water Quality

The potential area of impact associated with water resources for this project includes the proposed IABR facility site and adjacent areas and groundwater resources underlying the site and adjacent areas. The area of potential impact associated with water rights includes adjacent land tracts and wells.

##### F.4.2.1. IABR Wastewater Effluent

Groundwater at the IABR facility will be used as the source of water to charge and maintain the ponds. The ponds will be continually fed at a rate approximately equal to the amount of water that evaporates (approximately 1,900 ac-ft/year) from the shallow impoundments. Algae harvested from the ponds will contain water; however, this water will be removed from the algae and recycled back to the influent stream to the ponds to limit how much water is pumped from the aquifer (Figure 4). A portion of this recycled water will also serve as influent to the anaerobic digester and be discharged to a lined evaporation pond to remove excess salt and metals. Approximately 97 percent of the water in the cellular make up of the algae removed from the ponds will be recaptured during the water separation

process. The remaining 3 percent will be retained in the membrane filter system of the separation process.

As discussed above, the IABR process generates little wastewater and no wastewater will be discharged to surface water. Wastewater discharges associated the facility include:

- Water leakage from the pond bottoms
- Water leakage from the lined evaporation pond
- Storm water
- Septic waste from an on-site septic system for the office

#### Pond System

Some water will seep from the ponds and infiltrate to underlying soil. Based on the design elements of the pond bottom which will be comprised of an amended soil layer approximately 2-feet thick, such seepage is not anticipated to break through to underlying soil during the 3-year expected life of the IABR. In the event the pond system associated with the IABR continues to exist beyond the projected 3-year life, the amount of seepage and its effects on groundwater beneath the IABR facility are dependent on the infiltration rate from the pond bottom and the quality of water discharged from the pond. The applicant has collected soil samples at the project site and has conducted a preliminary evaluation of the soil infiltration rates of both natural soils and amended soils. Results of soil testing are provided in Appendix F of Attachment F-2 and indicate natural soils at the site exhibit an average permeability of approximately  $1 \times 10^{-6}$  cm/sec. A 94 percent reduction in permeability of the material was achieved through incorporation of an amendment to the soil and subsequent compaction. This phenomenon is discussed further below.

The applicant met with the New Mexico Environmental Department (NMED) to determine the regulatory needs in accordance with NMAC § 20.6.2.1201 of the intention to permit discharge of water from the proposed ponds to the underlying soil and aquifer. Results of this meeting (included in Attachment F-1) were that the agency will require a detailed technical analysis of the pond bottom design to demonstrate that leakage from the ponds would not increase concentrations of constituents of concern (most prominent of which is total dissolved solids) to levels above state standards in groundwater, in order to issue a NMED discharge permit. These results are to be presented in a groundwater management plan, a document that will include liner design performance information, which is to be approved by NMED prior to issuance of a discharge permit. This plan is currently being prepared and will be submitted to NMED later in 2009. Public notice for this discharge permit is also required under state of New Mexico regulations (NMAC § 20.6.2.3108). Public notice was posted according to the regulations (NMAC § 20.6.2.3108) for the proposed discharge permit from July 13, 2009 to August 13, 2009 (Attachment F-8). There were no comments which resulted from this public notice.

The applicant conducted pilot testing of various methods of soil amendment to line the ponds to prevent impacts to the underlying aquifer as well as reduce the amount of groundwater consumed in the process. The preferred design incorporates the use of a proprietary substance to amend the pond bottom soil to reduce the hydraulic conductivity of the material. Results of the pilot testing conducted by the applicant using soil samples obtained from the site indicate a hydraulic conductivity of  $1 \times 10^{-7}$

cm/sec can be consistently achieved using this approach (Attachment F-2 – permeability testing). Using a design configuration incorporating an amended 2-foot layer of pond bottom material and an average hydraulic head of 2-feet maintained in each pond, the time required for breakthrough of water from the amended soil liner system is approximately 19 years. Recycling of water from the processing plant is expected to build up a salt crust in the pond bottom that would further reduce the permeability of the pond base and increase the time until breakthrough is realized. Based on a 300-acre pond footprint, the rate of effluent movement from the base of the amended soil liner following breakthrough would be 3,704 cubic feet/day, resulting in an annual volume of effluent emanating from the pond system of 31 acre-feet.

Depth to the regional groundwater system beneath the ponds is approximately 400 feet. The unsaturated zone beneath the proposed ponds and the water table consists of layers of mostly fine-grained material with a few gravel lenses. The estimated vertical hydraulic conductivity of the stratigraphic units above the regional groundwater system is  $1 \times 10^{-5}$  cm/sec. Based on a vertical hydraulic gradient of 0.9, the travel time for water to move through the amended soil liner to the regional groundwater system is 55 years.

Based on sampling conducted on existing irrigation wells at the site and in adjacent areas, the concentration of total dissolved solids (TDS), the primary constituent of concern relative to the proposed project, ranges from 526 to 794 milligrams per liter (mg/L) in the regional aquifer (Attachment F-3). Based on lab-scale testing of the process to be used in the IABR (data not included in this EA) and the expected increased residence time of the water in the ponds as a result of recycling, the TDS concentration in the effluent that would leak from the ponds is estimated to be 1,400 mg/L. In consideration of conversations held with NMED regulators, the upper 15 feet of the regional aquifer can be considered as a mixing zone relative to determining impacts of the addition of effluent and compliance with state water quality standards. Using the volume of effluent that would enter the groundwater system from the pond system of 3,704 cubic feet/day and the calculated flux of groundwater movement in the upper 15 feet of the regional aquifer of 10,485 cubic feet/day as well as the estimated TDS concentrations in the effluent and concentrations measured in receiving groundwater of 1,400 and 700 mg/L, respectively, the net effect on water quality in the groundwater system would be the addition of 180 mg/L to the existing TDS concentration in the aquifer. The resultant water quality condition would achieve compliance with the New Mexico standards, which allows for an increase of TDS up to 1,000 mg/L.

#### Evaporation Pond

Periodically, a portion of this recycled water from the IABR process would be directed to a lined evaporation pond to remove excess salt and metals in the water stream (Figure 4). The frequency of diversion and the volume of water diverted to the evaporation pond is dependent on chemical analysis of samples collected during operation of the IABR. No wastewater would be discharged to the environment with the exception of the small amount that may leach through the liner to the underlying soil. Over time, it is anticipated that the bottom of the ponds would seal as salt precipitates in the pond. A discharge permit from the NMED would be obtained for the lined evaporation pond, and the applicant will demonstrate to the satisfaction of the NMED that underlying groundwater would not be affected.

### Stormwater

A 2-year, 24-hour storm event would result in approximately 1.57 inches of precipitation at the project site. During such a storm event, runoff prior to development of the IABR would be approximately 0.47 inches/acre and following development of the site the runoff would be reduced to approximately 0.38 inches/acre. The difference in stormwater runoff volume would be contained in the pond system at the IABR facility. Stormwater generated from paved parking lots and the approach road will be discharged to swales via sheet flow and will be infiltrated. A National Pollution Discharge Elimination System (NPDES) stormwater permit from USEPA Region VI, which includes a Storm Water Pollution Prevention Plan (SWPPP,) will be required for the project, particularly during IABR construction. Owners of sites where construction activities will disturb more than one acre must develop and implement construction site erosion control and storm water management plans, SWPPP, to obtain a Construction General Permit (CGP) from USEPA Region VI. The CGP can be converted into an operating General Permit. New Mexico reviews and certifies all EPA permits issued in the state per CWA Section 401. In addition, a Spill Prevention, Control, and Countermeasure Plan will also be required for the IABR facility due to storage of oil and other chemicals to prevent releases of hazardous substance at the IABR facility.

### Septic Effluent

A septic system will be installed to treat wastewater from bathrooms at the IABR facility. The bathrooms will be designed to accommodate workers at the site. A liquid waste (septic tank) permit (NMAC § 20.7.3) will be obtained from the NMED's District III office in Las Cruces. No local or Luna County permitting requirements for septic system installation have been identified.

### **F.4.2.2. Water Rights**

The applicant has worked directly with the New Mexico Office of the State Engineer (OSE) to evaluate water rights in the Mimbres Basin and to secure water necessary for the project. The project will require water rights of approximately 3,000 ac-ft per year. These rights will be comprised of a combination of existing water rights of the site (approximately 1,658 ac-ft per year of consumptive right) and the long-term leasing of water rights from adjacent properties within the basin (a minimum addition of approximately 1,342 ac-ft per year of consumptive right). Allocation of these water rights is under the jurisdiction of the OSE. The applicant will fulfill requirements of the OSE to secure the necessary water to support the project. Status of the water rights and communication with the OSE are described in this section.

#### ***F.4.2.2.1. Legal Considerations***

Article XVI of the New Mexico Constitution establishes the basic principles underlying New Mexico water law, including prior appropriation and beneficial use -- until appropriated, all water belongs to the State of New Mexico. Thus, the State has the sole authority to grant or recognize rights to use water. Water rights which "are subject to appropriation for beneficial use, in accordance with the laws of the state" and "priority of appropriation shall give the better right" are two tenets arising out of the Constitution (N.M. Constitution, Article XVI, Section 2).

The concept underlying the *principle of prior appropriation* is that the first person to use water for a beneficial purpose has a prior right to use that water against subsequent appropriators. "First in time, first in right" is the phrase often used to describe prior appropriation. Water rights acquired through this system of prior appropriation are a type of property right and may be sold or leased. In all cases, however, the essential basis of water right ownership is "beneficial use".

The *principle of beneficial use* is that a water right arises out of a use that is productive or beneficial, such as agricultural, municipal, industrial, and domestic uses, among others. "Beneficial use shall be the basis, the measure, and the limit of a water right" (N.M. Constitution, Article XVI, Section 3). This provision has also been incorporated into case law, which is the law developed by New Mexico courts. As recognized in *State ex rel.*

To actively manage groundwater resources in New Mexico, the Office of the State Engineer (OSE) has the authority, as set forth in the Water Code, to delineate groundwater basins that require a permit for groundwater withdrawals, referred to as "declared underground water basins," such as the Mimbres Basin which hosts the Cooper Property in which the IABR site is located. To withdraw water from these declared basins, a user must have put water to beneficial use prior to the declaration of the basin or must obtain a water permit from the OSE that specifies (1) how much water a user can withdraw within any given year, (2) the location and type of well that will be used to withdraw the water, and (3) the use to which the water will be put. Many water right permits have special conditions that further define the use and quantity of water allowed under the permit.

Transfers of valid water rights must not be "contrary to the conservation of water within the state and not detrimental to public welfare of the state" (NMSA 72-5-23, 72-12-3(D)). Further, any transfers may not impair existing rights.

Water rights transactions include transfers to other users, through sales or leases, and changes in point of diversion or in purpose or place of use. These transactions must follow an administrative procedure similar to the one used for appropriating a new water right. An application is filed, and notice is published within a certain time limit within which a protest must be submitted. The standards for reviewing these applications are impairment, public welfare, and conservation.

Other legal considerations specific to the Cooper Property (IABR site) include the following:

- In the Mimbres Basin, points of diversion (POD - in this case wells) can be changed within the same administrative block as the original well but cannot be moved to other administrative blocks.
- Points of diversion (POD - in this case wells) can be changed within the same "administrative block" as the original well. Each block is comprised of four sections of land. The Cooper Property (IABR site) spans several administrative blocks. A POD cannot be moved from one administrative block to another.
- Diversion rights in the Mimbres Basin for the purposes of irrigation are granted at 3 ac-ft/acre; groundwater rights for all other beneficial uses are consumptive rights and are granted 1.6 ac-ft/acre.
- Exempt wells can be installed for domestic (1 ac-ft) and stock (3 ac-ft) purposes.



- Well repair/replacement requires a permit from the OSE but does not require public notification.
- Supplemental well permits are available from the OSE that allow drilling of a well to meet full appropriation.
- According to Mr. Tom Whatley (Water Resource Specialist – Water Resource Allocation Program; Water Rights Unit – Office of the State Engineer), the unconsolidated aquifer in the Mimbres Basin is fully appropriated and new appropriations will not be granted in the basin.
- The adjudication is listed in a nine-volume publication; no water rights summary is available for the Mimbres Basin (DBSA, 2005).

**F.4.2.2.2. Water Rights Appurtenant to the Cooper Property (IABR Site)**

Water rights appurtenant to the Cooper Property (IABR site) being considered in the transaction are summarized in **Figure 7**. The Cooper Property water rights are contained in seven sub files that constitute separate “farms”, five on the western parcels and two on the eastern parcels. Nine wells supply water to the 7 farms. Irrigated acres total 819.8 on the five western farms and 216.9 acres on the eastern farms, resulting in a total of 1,036.7 irrigated acres associated with the property.

The original water right for the farm contained in Sub File 29.9.8C was for 46.6 irrigated acres. When Mr. Robert Cook purchased his property, 4.2 irrigated acres of the original right were appurtenant to his property. As the IABR is considered a non-irrigation consumptive beneficial use, water rights are granted at 1.6 ac-ft/acre per year.

**Figure 7. Summary of Cooper Property Water Rights**

OSE Subfile Number	Use	Irrigated Area (acres)	Wells Supplying Right	Consumption Volume (ac-ft)
East Parcels				
S.F. 29.8.17	Irrigation	70.0	M-1621	112.0
S.F.29.8.9	Irrigation	146.9	M-1598, M-1598-S	235.0
West Parcels				
S.F. 29.9.9	Irrigation	313.3	M4747, M-4748	501.3
S.F. 29.9.8	Irrigation	150.1	M-3367, M-3668	240.2
S.F. 29.9.8B	Irrigation	159.2	M-1933	254.7
S.F. 29.9.8C	Irrigation	42.2	M-1933, M-3667, M-3668	67.5
S.F. 29.9.8D	Irrigation	155.0	M-4746	248.0
Total		1,036.7		1,658.7

**F.4.2.2.3. Cooper Water Rights Issues**

Water rights associated with the Cooper Property are for irrigation purposes, allocated at 3 ac-ft/acre. The OSE considers the IABR's proposed use of water as a beneficial use for purposes other than irrigation. Therefore, this project has a "consumptive" right of 1.6 ac-ft/acre according to the OSE. When the applicant purchases the property, the water rights can be used without having to file any changes if the water from each well is used within the boundaries of the farm (sub file) which it supplies. At 1.6 ac-ft/acre, the total volume of consumptive water rights appurtenant to the property would be 1,658.7 ac-feet (Figure 7). This volume of water applied to 300 acres of ponds would equate to 5.5 ac-ft/acre. To meet the 3,000 ac-ft needed for the IABR project, additional water will be obtained from an outside leased source, as described below.

#### *F.4.2.2.4. Additional Water Rights Leases*

In addition to the water rights associated with the Cooper Property (IABR site), the applicant is in late-stage negotiations with an adjacent property owner to acquire water rights by leasing additional property. The targeted property is 1,050 acres, located west of Columbus, New Mexico adjacent to the Cooper Property. The "consumptive" water right applies to this property as well, yielding an additional 1.6 ac-ft/acre per year which equates to approximately 1,342 ac-ft per year of consumptive right or use by the IABR facility. These water rights would be used on the Cooper Property for the IABR facility in order to make the total volume of consumptive rights approximately 3,000 ac-ft per year. The OSE has verified that these water rights are transferable to the project.

According to discussions with the OSE, the State of New Mexico will allow the applicant to use leased water rights. The OSE will require the applicant to conform to the overall basin management policies and fulfill all other requirements of the OSE to use the leased water for the project. These items were confirmed via personal communication on August 19, 2009 with John D'Antonio, the State Engineer at OSE.

#### *F.4.2.3. Aquifer Characteristics*

##### *F.4.2.3.1. General Aquifer Data*

Groundwater occurrence in the Mimbres Basin is limited to near-surface basin-fill sediment. The thickness, character, and extent of the basin-fill sediment within the basin is controlled by the subsurface structural history (Hanson et al., 1994). The basin contains consolidated and unconsolidated alluvium and Bolson deposits that can be as much as 5,000 feet thick depending on local structure and depositional history (Harsharger, 1978). Groundwater predominantly occurs within basin-fill materials consisting of Quaternary-age alluvium and the Tertiary Gila Group (DBSA, 2005). Basin-fill deposits contain sand, gravel, and clay deposits that are stratigraphically and lithologically undefined. Quaternary-age basaltic volcanics are interbedded with basin-fill materials in some locations and can be locally important aquifers near the village of Columbus, New Mexico (Hanson et al., 1994).

Groundwater in the Mimbres Basin occurs in confined, unconfined and semi-confined aquifers, depending on location. In general, groundwater flows from north to south, across the US/Mexico international boundary. Hanson et al., (1994) estimated the pre-development groundwater discharge at

the border to be 6,500 acre-feet/year. Recent groundwater development near Columbus, New Mexico has resulted in a reversal of groundwater flow across the border from south to north (DBSA, 2005).

Hanson et al. (1994) calculated the transmissivity of the Mimbres Basin basin-fill aquifer using aquifer test data, specific capacities of wells, and lithologic logs of wells within the basin. Using these data, the transmissivity of the basin was estimated to range from 54 to 50,000 ft<sup>2</sup>/d. The transmissivity computed from well specific capacities had a similar range with values of 10 to 50,000 ft<sup>2</sup>/d and a mean of 4,050 ft<sup>2</sup>/d. The broad range of transmissivity values indicates variability in transmissivity and hydraulic conductivity with depth (Hanson et al., 1994). The average hydraulic conductivity of the Mimbres Basin aquifer was calculated from the transmissivity estimates. In the area around Deming, the median hydraulic conductivity was found to be 18 feet/day. In areas of the basin, excluding Deming, the median hydraulic conductivity was found to be 6 feet/day (Hanson et al., 1994).

#### *F.4.2.3.2. Site-Specific Aquifer Data*

In March 2009, the applicant completed an evaluation of aquifer and well characteristics at the project site and surrounding property (Attachment F-3). These studies determined that depth to groundwater at the site where the IABR will be located is about 400 feet below surface. The combined capacity of the three wells on the IABR property (M-3668, M-4667, M-4668) is greater than 8,000 gallons per minute. Aquifer tests performed on the three wells on the IABR property indicate the transmissivity of the aquifer beneath the project site ranges from 960 ft<sup>2</sup>/day to 19,500 ft<sup>2</sup>/day. Based on the well testing results and assuming no major drawdown of groundwater levels in the area occurs through external means, the aquifer and the existing wells at the project site are capable of providing the full diversion volume (as allowed by secured and leased water rights – see Section F.4.2.2.2 above) necessary to support the project.

A Phase I Environmental Site Assessment was completed on a 938- acre project area which encompasses the 400-acre IABR site. The search of several environmental data bases showed no evidence of groundwater contamination within the 938-acre project area. Samples were collected from wells on the facility in March 2009 (Attachment F-3). The results indicate that groundwater beneath the facility meets New Mexico Water Quality Standards.

#### *F.4.2.3.3. Potential Impacts to Groundwater Aquifer and Water Right Holders*

In an effort to evaluate the degree of potential impact from the proposed IABR project on groundwater quantity in the area, groundwater table elevation trends were evaluated by reviewing U.S. Geological Survey (USGS) data and data collected by AMEC Geomatrix, from wells on the proposed project site and surrounding area (Attachment F-3). The USGS measured depth to groundwater in well M-4748 located on the project site (Figure 2 and Exhibit 3 between 1972 and 2002 and in well M-1598, located about 4 miles east of the project site, between 1955 and 1997 is presented in Attachment F-3. Hydrographs for well M-4748) indicate water levels in the aquifer at the proposed project site declined about 60 feet from the early 1970s to the early 1980s but have since stabilized (Attachment F-3). Depth to water measured by AMEC Geomatrix in well M-4748 in March 2009 was similar to that measured in 2002, indicating that water levels in that area have remained stable since that time (Attachment F-3). The hydrograph for well M-1598 indicates that water levels in the aquifer 4 miles east of the site declined

about 70 feet from the mid 1950s to the late 1990s. The water level measured by AMEC Geomatrix in well M-1598 during March 2009 was similar to that measured by the USGS in 1997, also indicating that water levels in this area have stabilized.

Estimates of the sustainable yield of the portion of the aquifer within and near the proposed IABR site are not available to definitively determine if pumping of groundwater at the site will result in additional long-term groundwater drawdown and/or impacts to other users of the groundwater resource. In New Mexico, this determination is made by the Office of the State Engineer (OSE). A request has been made to the OSE to make this sustainable yield determination in response to the applicant's proposal to transfer water rights to the project site. For the State Engineer to approve the transfer of water rights to the project site, a determination must be made that the transfer will not be "contrary to the conservation of water within the state and not detrimental to public welfare of the state", as required by NMSA 72-5-23, 72-12-3(D), and that such use of groundwater at the site for the IABR will not impair existing water rights. While this determination has not been formally made as of the date of this submittal, the OSE has indicated that there are sufficient water rights within the basin that can be leased and transferred to the project site, indirectly indicating the degree of impact caused by the proposed withdrawal of water to support the IABR is acceptable (Personal Communication on August 19, 2009 with John D'Antonio, the State Engineer, at OSE). In consideration of this, it is not anticipated that impacts to the rights of neighbors to the project site (including adjacent public land and Mexico) to draw groundwater from the local aquifer at the site will result through development of the IABR project.

#### **F.4.2.4. Waters of the US and Floodplain**

According to a review of the National Wetland Inventory (NWI) Maps, review of the soil map, previously-completed Highly Erodible Land and Wetland Conservation Forms (SCS CPA 026) completed by NRCS, and a visual survey of the project site completed by AMEC Geomatrix, the proposed IABR site does not appear to contain swales or depressions that will retain water, nor are there areas containing hydric soil and/or hydrophytic vegetation (Attachment F-4 and Figure 2). Surface water drains primarily via overland flow, although two ephemeral washes cross the northern boundary of Section 9. These washes have no defined bed or bank and do not contain parameters that warrant U.S. Army Corps of Engineers (ACOE) jurisdiction. In the extreme southeast corner of Section 9, a drainage empties into a roadside ditch and a bed and bank has formed. However, this does not represent a nexus to a navigable water of the US and therefore is not expected to be considered jurisdictional by the ACOE. The ACOE has been contacted to obtain an official jurisdictional determination from ACOE for the IABR project site (see Attachment F-4). There are no 100-year or 500-year floodplains mapped within the IABR project area according to the FEMA Flood Insurance Rate Maps (Exhibit 4).

#### **F.4.3. Solid Waste Management**

With exception of a small volume of solid waste generated from the new on-site office, the IABR facility will generate only one solid waste stream that is disposed of off site – solid wastes from the anaerobic digester. The anaerobic digester will generate solid waste that will be applied as fertilizer at nearby agriculture properties. Preliminary testing confirms the suitability for use as fertilizer. Additionally, no hazardous wastes are anticipated to be generated by the IABR facility.

#### F.4.4. Land Use

The area of potential impact that could result from implementation of the IABR project on land use includes the project site, adjacent public land tracts administered by BLM and the state of New Mexico, adjacent private property owners, and Mexico.

##### F.4.4.1. Existing Land Use

In general, property ownership adjacent to the IABR and throughout Luna County consists of privately held land, public land managed by the USDI Bureau of Land Management (BLM) and State of New Mexico trust land (Figure 1). Several state trust properties adjacent to the project are held in agricultural leases.

In 2007, Luna County reported having 206 farms consisting of 653,558 combined acres with an average farm size of 3,173 acres. Depending on location and soil type, land in this area of New Mexico is irrigated to grow crops or left as non-irrigated desert scrubland. Information from the US Department of Agriculture (USDA) indicates that wheat, upland cotton, grain sorghum, and barley are the typical crops grown in the basin. The market value of land and buildings in Luna County in 2007 was estimated at \$350 dollars per acre (USDA, 2007).

The proposed IABR project site consists of land held in the conservation reserve program (CRP) and historically irrigated land. It is not known when irrigation on the land ceased, but current vegetation on the project site consists primarily of grasses and noxious weeds, with few shrubs. In addition, several irrigation wells and concrete conveyance structures are present on the site attesting to historical use of the site for agriculture (Figure 2). Photographs of typical landscapes within the IABR site are included in Attachment F-4.

The Natural Resources Conservation Service and Farm Service Agency have been contacted (see Attachment F-1) to seek their concurrence that the property does not qualify as being designated "Farmland of Statewide Importance." The IABR project site (Sect 9-T29S R8W) is comprised of two farms identified by the Farm Service Agency (FSA) as farm number 540 and Tract 248. Although FSA has designated this area as having both Prime Farmland and Additional Farmland status (Attachment F-1), the NRCS State Soil Scientist has verified that there are no prime farmland, unique, statewide or locally designated cropland located within the 400-acre project area ( NRSC Form 1006-Attachment F-1).

##### F.4.4.2. Land Use Planning Documents

Luna County has adopted (as revised in December of 2006) Ordinance Number 37 Luna County Building, Land Use, Development and Performance Standards, and Ground Water Protection. This ordinance grants the County jurisdiction to govern all buildings, structures, manufactured homes, mobile homes, recreational vehicles, salvage yards, properties, and generally all use and development within the County, but not within the boundaries of municipalities. Therefore, the IABR facility will be required to comply with this ordinance and obtain a permit to construct the facility from Luna County. A building permit from Luna County will be obtained prior to construction. No other formal land use plan for Luna County is known to exist.

#### F.4.4.3. Highly Erodible Soil and Wetlands

NRCS has mapped two soil units on the property (Attachment F-2) including the Stellar silty clay loam (SU), which comprises the vast majority of the project area, and a smaller percentage of the relatively coarse-grained Nickel-Tres Hermanas complex (NT). A field survey of soil types at the project site was completed in March 2009 to evaluate soil critical to the construction of the proposed algal ponds. Results of the field survey are included in Attachment F-2. The observed soil conditions in the NT soil unit were consistent with the general NRCS description for that unit as a gravelly loam. By contrast, the SU map unit was more coarse-grained when compared to the NRCS description. Sandy silt was the primary texture class observed in the SU, with gravel layers near the western end of the property. Potential soil changes within the SU map unit were indicated by areas dominated by thistle vegetation, in contrast to the majority of the SU map unit that was covered with bentgrass, cheatgrass, and minor amounts of yucca.

Through review of previously-completed Highly Erodible Land and Wetland Conservation Forms (SCS CPA 026) by NRCS for the property, erodible soil is located on the project site. In fact, nearly all soil in Luna County is considered highly erodible by the NRCS. A completed SCS CPA 026 form is included in Attachment F-2. These conditions will be taken into account when finalizing designs for surface facilities associated with the project. The Natural Resources Conservation Service and Farm Service Agency have been contacted to seek their concurrence that the property associated with the IABR is classified as Highly Erodible (Attachment F-1).

To evaluate potential for wetlands on the proposed project site, the following was completed:

- Review of National Wetland Inventory (NWI) Maps.
- Review of soil maps and previously-completed Highly Erodible Land and Wetland Conservation Forms (SCS CPA 026) by NRCS for the property.
- Visual surveys of the project site in June and September 2009.

The USFWS National Wetland Inventory (NWI) online database (Wetlands Mapper) was reviewed to determine potential for the presence of wetlands in the project area. The National Wetland Inventory (NWI) maps indicate that one palustrine open water (POW) wetland was mapped outside of the 400 acre IABR project area on the east central portion of Section 9 (Figure 2 and Exhibit 3), in an area of land not proposed for IABR development. NRCS soil maps and previously completed SCS CPA 026 Forms of the area were also reviewed. These forms indicate that no delineated hydric soil types or wetlands are present on the 400-acre IABR facility site (Attachment F-2).

To complement the literature and database search, a field survey of the proposed IABR property was conducted on March 5 and 6 and June 2 through 5, 2009. Natural drainage patterns within the project area have been modified by construction of concrete irrigation ditches, paved highway, access roads, irrigated crop fields, and a railroad right-of-way (abandoned). Topographically, the land slopes gently to the south and overland flow paths are largely determined by openings in the railroad embankment or under the concrete irrigation ditches and in roadside ditches. Incised, eroded drainages are present where overland flows are concentrated by the railroad embankment, highway, and concrete irrigation

ditches. These eroded, incised drainages are most prominent at the northern part of the IABR site, becoming barely discernable at the southern edge of the property.

Wetlands and other waters of the U.S. were surveyed along 100-meter transects within the property boundaries. Special attention was directed towards drainages and areas identified as low spots on the topographic maps or indicated as a National Wetland Inventory (NWI) wetland.

As indicated previously, one POW wetland was indicated on NWI maps for the area. This wetland was investigated and assessed for Clean Water Act applicability. The POW was determined to be a man-made pond associated with a historical windmill and stock tank located immediately north and outside of the property boundaries. Neither the windmill or stock tank is currently functional, nor did the POW contain water. A Routine Wetland Determination form was not completed because the POW was determined to be outside of the property.

One palustrine emergent wetland (PEM) was observed within the 400-acre IABR property, north of Highway 9, abutting the north side of the proposed project. The PEM is present along parts of the abandoned railroad grade within the northwestern portion of the Cooper Property, outside of the proposed area for development but within the 400-acre project site (Figure 2). A Routine Wetland Determination Form was completed for this wetland and is included in Attachment F-4. The wetland is presumed to be a result of man-made conditions in which overland surface flow is intercepted and collected by the railroad grade. The wetland has a hydrologic connection to areas down-slope through a wash that has truncated the railroad grade and currently flows north to south, through the property. This wash continues south through the property, where it has breached the historical irrigation canal running east to west (Figure 2). Rainwater is collected within the canal and upslope of the canal and is funneled to various breaks in the structure, where the soil becomes saturated creating a large sink upslope of the break, and eroding channels down-slope. This wash eventually adjoins a roadside ditch along the central-southern border of the proposed project site. Flow in the roadside ditch eventually discharges through four culverts emerging as overland flow, dispersed into a large field. The water is not discharged into a channel containing defined bed or banks. Therefore, this wash and the associated upstream wetland were determined not to contain a significant nexus to navigable waters of the United States, and therefore would not be considered jurisdictional by the ACOE or the NMED (New Mexico Environment Department). A Jurisdictional Determination request was submitted to the USACE to verify this determination and is pending approval (Attachment F-4).

#### F.4.4.4. Potential Impacts to Land Use

Construction or operation of the IABR facility will require site clearing necessary to accommodate approximately 300 acres of ponds and approximately 100 acres of related facilities. Soil will be disturbed and vegetation destroyed within the footprint of the facility. While soil at the facility is highly erodible, construction of the ponds is not expected to increase soil erosion and appropriate measures will be taken to manage surface runoff to control erosion at the site. Potential impacts common to ground disturbance, including dust generation, increased erosion, and stream sedimentation will be effectively managed through the implementation of best management practices. Site surveying and historical

NRCS mapping indicate that there are no jurisdictional wetlands or waterways where the facility will be constructed. Historical use of the site for agriculture as well as the current vegetated cover is reflective of a previous land disturbance to support crop production. Concurrence as to the status of jurisdictional wetlands/waterways located on the property has been solicited from the USACOE (see Attachment F-4).

#### **F.4.5. Transportation**

The area of potential impact that could result from implementation of the IABR on transportation systems is described under Section F.4.5.1 below.

##### **F.4.5.1. Existing Highways and Rail Lines**

Luna County is bisected by Interstate 10, which runs east and west connecting the City of Deming with Las Cruces to the east (Dona Ana County) and Lordsburg to the west (Hidalgo County). This route is generally paralleled by State Highway 549 to the east of Deming and State Highway 418 to the west. State Highway 11 connects Deming with Sunshine and Columbus to the south (Figure 1). State Highway 9 passes east-west along the border with Mexico (NMDOT 2005), and acts as the northern boundary of the proposed IABR facility.

In addition to Highway 9, several unpaved roads are located on the site (Figure 2). The project site is bordered on the west by a County road that separates Sections 7 and 8. This road ends at the southwest corner of the property. Another gravel road runs east along the southern margin of Section 8 to the center of Section 9. A poorly-maintained gravel road accesses the northeast corner of the property in Section 9 then turns and trends west along the property boundary. A two-track road runs from northeast to southwest across the SW  $\frac{1}{4}$  of Section 9. There is a "drag" road adjacent to and south of Highway 9 that is reportedly used by the border patrol to detect illegal foot traffic crossing from Mexico.

The closest rail line to the IABR facility is located in Deming, New Mexico (Figure 1) approximately 40 miles from the facility. Deming represents the convergence of several rail lines, including a Union Pacific route running east-west through the central portion of Luna County. This route also represents the Amtrak Southern Route through the region. Two additional active railroad lines are also present in the county. The first (Southwestern RR) extends from Deming to the northwest through the community of Whitewater and beyond. The second (Burlington Northern/Santa Fe) extends to the northeast from Deming to the community of Hatch and beyond. Other routes extend from Deming to the south and another passes along the border with Mexico but these routes either are dismantled or abandoned (NMDOT 2005).

##### **F.4.5.2. Existing Transportation Plans**

The New Mexico Department of Transportation prepared the Statewide Transportation Improvement Program FY 2008 - FY 2011, Amendment 9, as approved on March 11, 2009. This plan indicated proposed or planned route improvements through 2011. In addition, the State also prepared the New Mexico 2025 Statewide Multimodal Transportation Plan. Both of these plans address the public road and transportation systems for the state. No other transportation plans are known to exist in Luna County or at a local level.



According to the New Mexico Department of Transportation Statewide Transportation Improvement Plan (STIP) Amendment 9, as prepared for fiscal years 2008-2011, planned route improvements in Luna County for the period include the following:

- Bridge Replacement – 23.9 Miles East of Loop-22/Deming – Programmed Funds 2011
- Bridge Replacement – 1.8 Miles East of NM 549 – Programmed Funds 2008
- Pavement Preservation – I-10, MP 78 to 86.5 (8.5 miles) – Programmed Funds 2008
- New Construction – Cedar Street Extension – City of Deming – Programmed Funds 2008
- Reconstruction – Pearl Street to, 1st Street to Pine Street – City of Deming – Programmed Funds 2009
- Reconstruction – (Boarder Patrol Checkpoint) – NM 11, MP 12.5 to 12.8 (0.3 miles) – Village of Columbus – Programmed Funds 2009
- Pavement Preservation and Reconstruction – NM 26, MP 25.9 to 45.3 and MP 26 to MP 45.3 (19.4 miles) – Programmed Funds 2008
- New Construction – Village of Columbus Truck Bypass – Programmed Funds 2009
- Safe Routes to Schools – City of Deming – Programmed Funds 2008

With the exceptions of improvements to county infrastructure as planned for the town of Columbus, no improvements are planned for routes near the project at the state level.

#### F.4.5.3. Potential Transportation – Related Impacts

Motor vehicle traffic will increase at the project site as a result of construction and operation of the IABR. The construction phase of the project will initially require workers, supplies, and equipment to mobilize to the site for site clearing, pond construction, and the construction of ancillary facilities. During project operation, an estimated 30 workers will commute to the project from surrounding communities, the majority of them likely from Columbus.

In addition to the new commuter traffic, up to 12 round trips per day for trucks will be required from the site to facilities supporting the IABR (see discussion below). Transportation to and from the project site is expected to take place along existing roads and infrastructure. Transport of the biomass, CO<sub>2</sub> and other inputs to the facility and outputs generated by the facility will occur at varying frequencies. With the exception of occasionally heavier loads during construction, transport equipment will generally be of tractor/trailer type. Loaded gross vehicle weight (GVW) is not expected to exceed 25 tons, Process input/output travel will generally entail travel along the following routes:

- **Algal Oil from IABR to Refinery:** Transport to follow a route initiating from the project site to State Highway 9, continuing on to State Highway 11 terminating at a rail loading facility in Deming, New Mexico, then railed to Dynamic Fuels processing facility in Geismar, Louisiana. Frequency to the rail loading facility is estimated to be 6 round trips per week. One train carrying products produced by the IABR will travel to Louisiana per month.
- **Anaerobic Digester Solid Waste:** Transport to follow a route initiating from site to State Highway 9, continuing to nearby farms within Luna County. Frequency is estimated to be 20 - 30 round trips per week.

- **CO<sub>2</sub>**: Transport to follow a route initiating from Praxair's CO<sub>2</sub> production facility, entering the region on State Highway 9 and terminating at the project site. Frequency is estimated to be 12 round trips per week.

Possible impacts associated with increased traffic associated with the IABR development include:

- Increased atmospheric loading of particulate associated with tractor trailer and smaller vehicle travel on roads to and within the facility (if unpaved).
- Increased emissions of hydrocarbons to the air associated with diesel-fueled tractor trailer engines and rail locomotives.
- Increased wear of roadways, in particular New Mexico Highway 9.

The New Mexico Department of Transportation (NMDOT) has been contacted (see Attachment F-1) to solicit any input regarding potential impacts that may affect transportation systems or plans as a result of the development of the IABR. No comments have been received from NMDOT to date.

#### F.4.6. Natural Environment

The area of potential impact for the natural environment as a result of the Proposed Action varies by resource or resource uses described in this section. In general, potential impacts to existing flora communities is limited to the disturbance area associated with the IABR. Potential effects to fauna that were considered include areas within the IABR site and on adjacent areas and are dependent on the species being evaluated.

##### F.4.6.1. Existing Natural Environment

The proposed project area lies within the Basin and Range physiographic province, which is characterized by low parallel mountain ranges separated by flat desert plains. The general terrain exhibits low relief with drainage flowing to the southeast. The site occurs within the Chihuahuan Desert Ecoregion (New Mexico Department of Game and Fish, 2006), and habitat is ecotonal between Chihuahuan semi-desert grassland and Chihuahuan desertscrub.

A biological field Survey Report was prepared on the IABR property in September of 2009 (Attachment F-4). This report summarized the vegetation and wildlife field surveys of the project site which were performed in June and September of 2009. Ecological conditions of the project area have been altered by past land uses that have removed the original cover of native vegetation from the site. Nearly all of the property was used to produce irrigated crops until 1971, when farming was discontinued and the site was allowed to colonize with invasive plants typical of soil that has been tilled. Much of the property contains dense stands of invasive species with low densities of native plants.

The species composition and canopy structure of vegetation on the property differs from native plant communities on adjacent state and federally managed public land. Native vegetation on adjacent land is typical of the Semidesert Grassland and Chihuahuan Desertscrub (Brown 1982). Dominant native species include soap tree yucca (*Yucca elata*), creosote bush (*Larrea tridentata*), honey mesquite (*Prosopis glandulosa*), tarbush (*Flourenzia cernua*), Mormon tea (*Ephedra trifurca*), tobosa (*Hilaria*

*mutica*), vine mesquite (*Panicum obtusum*), and a diversity of other forbs, grasses, and cacti. The canopy structure of the native plant communities, with an upper tier of shrubs and a lower tier of herbaceous species, supports much higher levels of biodiversity than the project area, which is dominated by herbaceous invasive species interspersed with patches of bare ground (see photos in Attachment F-4).

Based on the June and September 2009 onsite surveys, it can be assumed that diversity of wildlife in the project area is low, reflecting degraded habitat conditions with limited breeding and foraging capacity for many species. Birds observed in the Project Area include the loggerhead shrike (*Lanius ludovicianus*), mourning dove (*Zenaida macroura*), horned lark (*Eremophila alpestris strigata*), cactus wren (*Campylorhynchus brunneicapillus*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), long-billed curlew (*Numenius americanus*), white-winged dove (*Zenaida asiatica*), ash-throated flycatcher (*Myiarchus cinerascens*), western kingbird (*Tyrannus verticalis*), Gambel's quail (*Callipepla gambelii*) and roadrunner (*Geococcyx californianus*). Raptors including Swainson's hawk, northern harriers (*Circus cyaneus*), American kestrels (*Falco sparverius*), prairie falcons (*Falco mexicanus*), and red-tailed hawks (*Buteo jamaicensis*) were observed roosting and hunting within or near the project area.

Mammals or their signs were observed including coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), and burrowing rodents, including wood rats (*Neotoma* sp.) pocket gophers (*Geomys arenarius*), and banner-tailed kangaroo rat (*Dipodomys spectabilis*).

Other species of wildlife or their sign encountered during the site visit include the roundtail horned lizard (*Phrynosoma modestum*), Texas horned lizard (*Phrynosoma cornutum*), prairie rattlesnake (*Crotalus viridis*), green cicada (*Sphecius grandis*), tarantula wasp (*Pepsis* sp.), grasshoppers, harvester ants, northern earless lizard (*Holbrookia maculata maculata*), and tarantulas (*Aphonopelma* sp.).

#### F.4.6.2. Endangered or Threatened Fauna

A biological field Survey Report was prepared on the IABR property in September of 2009 (Attachment F-4). As stated in this report, USFWS published 56 federally listed species of animals in New Mexico with 12 of these being present in the Mimbres Basin (Dona Ana, Hidalgo, and Luna Counties). Of these 12 species, five are endangered, five are threatened, and two are experimental, non-essential population listings by the US Fish & Wildlife Service (USFWS). As stated in the report, based on current distribution and habitat characteristics, only one of these species, the Northern aplomado falcon (*Falco femoralis septentrionalis*), has the potential to utilize habitat in the project area.

During the June and September 2009 survey biologists searched for suitable northern aplomado falcon habitat within the project area and adjacent state and federal land within visual and aural range of proposed project activities. The area surveyed included a one-mile radius from the Property. Suitable habitat includes semi-desert grassland habitat interspersed with large yuccas and/or trees containing raptor and/or corvid nests (aplomado falcons do not build their own nests). Typically, yuccas and trees suitable as nesting substrates are over six-feet tall and have a platform formed by branches or flowering stalks. Potential nesting habitat was assessed by driving roads and surveying the area with binoculars and/or a spotting scope.

Potentially suitable nests for the northern aplomado falcon were identified within the Property and on BLM and state-administered public land adjacent to the Property (Attachment F-4 – Biological Field Survey Report **Figure 1**). Raptor and/or corvid nests observed during the June and September 2009 surveys are depicted in Attachment F-4's **Figure 1**. A small patch of suitable habitat consisting of large yuccas also occurs approximately 0.8 miles southwest of the southwest Property boundary on private land.

The aplomado falcon (endangered, non-essential, experimental population) has the potential to use habitat in the Project Area. The northern aplomado falcon has been re-introduced into New Mexico and may use habitat on or near the Property; however field studies performed in June and September of 2009 did not detect its presence. One active aplomado falcon nest is known in New Mexico.

Habitat for the state endangered Great Plains narrowmouth toad is limited within the project area. Suitable habitat includes grassland and desert grassland habitats, principally those containing tobosa grass and aquatic habitat in spring and summer for reproduction. Aquatic habitat for reproduction may consist of swales and/or roadside ditches. Tobosa grass was sparse on the Property, although other grasses that occur on site may provide the same type of refuge, such as blue panic grass. Tobosa grass and other suitable grasses occur north of Highway 9 within the Property boundaries. Rodent burrows which may also be used as refuges by this toad are extensive throughout the Property. Aquatic habitat was not observed during the site visit, but several swales and roadside ditches may be suitable for breeding. It is unlikely that this species would occur in the project area due to the limited amount of suitable habitat.

#### F.4.6.3. Endangered or Threatened Flora

Based on site surveys and published flora lists, there are no plant species protected under the Endangered Species Act likely to inhabit the Project Area. Federally designated critical habitat does not occur in the project area.

Twenty-two species are listed by the state of New Mexico as endangered and 37 species are classified as threatened (Department of Game and Fish, 2009). Attachment F-4 lists federal and state species of conservation concern. Of these, 54 have been identified as species of greatest conservation need by New Mexico (New Mexico Department of Game and Fish, 2006).

According to the New Mexico Rare Plant Technical Council (NMRPTC), five special status species are known to occur within the project vicinity. Three of these species are considered *Species of Concern* by the USFWS and the State of New Mexico. Species that have been confirmed to be present in the northeast portion of the Mimbres Basin (NMRPTC, 2009) are the grayish-white giant hyssop (*Agastache cana*), Orcutt pincushion cactus (*Escobaria orcuttii*), Chihuahua scurf pea (*Pediomelum pentaphyllum*), and Griffith's saltbush (*Atriplex griffithsii*). The dune prickly pear (*Opuntia arenaria*) and night-blooming cereus (*Peniocereus greggii* var. *greggii*), have documented occurrences near the Cooper Property and are considered *Species of Concern* by the USFWS and *Endangered* by the State of New Mexico.

Surveys for federal and state-listed plant species potentially occurring on the Property were conducted in June and September of 2009 along transects 100 meters apart. No federal or state plant species of conservation concern were found.

#### F.4.6.4. Potential Impacts to the Natural Environment

Direct effects to wildlife and wildlife habitat would result from habitat alteration and displacement of species sensitive to human activities as a result of the proposed action. Approximately, 300 acres of degraded upland habitats would be converted to ponds to grow and harvest algae and 100 acres would be disturbed to support ancillary facilities. Adjacent state and federally managed public land supports native plant communities and wildlife habitats typical of the Chihuahuan Desert. Although there would be no direct disturbance to these habitats from the proposed project, indirect effects from nearby human activities could displace species sensitive to human presence and project activities.

Of the animal species identified above, none were observed during field surveys. Figure 8 describes the general habitat and possibility of occurrence in the project area for each of these animal species. Biologists found limited potential for the presence of threatened and or endangered (T&E) animal species (other than potential Aplomado falcon nesting and foraging habitat) or their prime habitats at the project site during the field survey.

Three suitable Aplomado falcon nests (two are located on one yucca) occur immediately north of the highway in the northwestern-most portion of the Property between the old railroad grade and Highway 9 (Figure 1). The other nest is located in the northeastern-most portion of the east half of the Cooper Property, adjacent to the eastern property fence line. Additional potentially suitable nesting habitat on adjacent public land could be indirectly affected by increased levels of human activity in the project area.

Removal of yuccas and associated nests may be avoidable due to their location on the periphery of the property (although noise and visual disturbance would not be avoidable). Due to the presence of suitable Aplomado falcon nesting habitat nests on the periphery of and/or adjacent to the Property, field surveys for the Aplomado falcon were performed on the property in June and September of 2009. Since no Aplomado falcons were identified during the survey, Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) was not initiated. The Biological Surveys completed in June and September of 2009 found no adverse effect to T&E species. The USDA made a determination the project proposed no adverse effect on T&E species in a letter to USFWS dated August 17, 2009. The USFWS concurred with USDA's determination of no adverse effect to threatened and endangered species, by sending no response within the 30 day comment period.

Figure 8-. Federal and State Species of Concern Known or with the Potential to be Present in the Mimbres Basin

Species	Status*	Habitat	Possible Occurrence in the Project Area	Reason for yes/no occurrence in Project Area
<b>Amphibians</b>				
Chiricahua leopard frog	FT	Permanent aquatic habitats between 2,800 and 7,300 ft. amsl	No	No habitat
Great Plains narrowmouth toad	SE	Grassland and desert grassland, tobosa grass, requires wet habitat in summer	Yes	Small amounts of suitable upland habitat may be present
New Mexico ridge-nose rattlesnake	FW	Montane woodlands and Madrean evergreen woodlands	No	No habitat
<b>Fish</b>				
Loach minnow	FT	Streams with riffle habitat	No	No habitat
Spikedace	FT	Streams with riffle habitat	No	No habitat
Beautiful shiner	FT	Rivers and streams	No	No habitat
<b>Birds</b>				
Bald eagle	BGEPA	Large trees or cliffs within one mile of foraging habitat.	No	No habitat

Species	Status*	Habitat	Possible Occurrence in the Project Area	Reason for yes/no occurrence in Project Area
Golden eagle	BGEPA	Grassland habitats	Yes	Foraging habitat present, no nesting habitat
Northern aplomado falcon	NEXP, SE	Grassy plains interspersed with mesquite, cactus, and yucca	Yes	Foraging habitat present limited nesting habitat
Common black-hawk	ST	Riparian woodlands	No	No habitat
Peregrine falcon	ST	Forages in desert, shrubland, chaparral, and woodlands; nests in rocky cliffs.	Yes, resident and summer migrants	Foraging habitat present, no nesting habitat
Southwestern willow flycatcher	FE, SE	Riparian woodlands, tamarisk stands	No	No habitat
Broad-billed hummingbird	ST	Varied habitat, including riparian woodlands and Chihuahuan desert scrub	No	Suitable nesting habitat not present
Costa's hummingbird	ST	Desertscrub, chaparral, deciduous forests	No	Suitable nesting habitat not present
Lucifer hummingbird	ST	Arid deserts with preferred nectaring plants	No	Suitable nesting habitat not present

Species	Status*	Habitat	Possible Occurrence in the Project Area	Reason for yes/no occurrence in Project Area
Violet-crowned hummingbird	ST	Riparian woodlands, forests, scrub-oak adjacent to xeric habitats	No	No habitat; there are no riparian woodlands
White-eared hummingbird	ST	Montane habitats, woodlands, forests	No	No habitat
Yellow-eyed junco	ST	High-elevation mixed coniferous and Ponderosa pine forests	No	No habitat
Thick-billed kingbird	SE	Riparian canyons, deciduous forests, thornscrub, woodlands.	No	Known to forage in desert scrub adjacent to habitat; however, no nesting habitat
Buff-collared nightjar	SE	In New Mexico, generally in canyons and washes with mesquite and other small trees	No	Preferred habitat absent, will likely occur only as a transient
Whiskered screech-owl	ST	Dense oak and pine-oak woodlands in canyon bottoms	No	No habitat
Mexican spotted owl	FE	Montane forests	No	No habitat
Arizona grasshopper sparrow	SE	Typically well-developed grasslands lacking woody vegetation	Unlikely	Marginal habitat, project area is invaded by shrubs or contains weeds.
<b>Mammals</b>				



Species	Status*	Habitat	Possible Occurrence in the Project Area	Reason for yes/no occurrence in Project Area
Spotted bat	ST	Roost in cliffs, found in higher elevation habitats during summer, lower elevations in winter	No	No habitat
Mexican long-nosed bat	FE	Desert scrub vegetation with century plants, creosotebush, and cacti. Roosts in mines, caves, and old buildings	No	No habitat
Lesser long-nosed bat	FE	Requires mines and caves for roost sites and saguaro cactus and paniculate agave for foraging	No	No habitat
Western yellow bat	ST	Wooded riparian habitats	No	No habitat
Southern pocket gopher	ST	Typically occur in 5,800 to 8,000 feet in rabbitbrush riparian, oak savanna, oak woodland, pinon-juniper, chapparal, and coniferous forest habitats	No	Site below elevational range; no habitat
Jaguar	FE	Chihuahuan desert scrub and semi-desert grassland within 10 square miles of water	No	No hiding or escape cover

Species	Status*	Habitat	Possible Occurrence in the Project Area	Reason for yes/no occurrence in Project Area
Gray wolf	NEXP	Variety of habitats with abundant prey populations	No	No hiding cover and prey base very limited
Arizona shrew	SE	Mesic wooded habitats	No	Site is not mesic, no trees
<b>Molluscs</b>				
Hacheta Grande Woodlandsnail	ST	Rock outcrops and talus slopes, typically montane	No	No habitat

\*FE = federally endangered; FT = federally threatened; NEXP = federally endangered/non-essential experimental; SE = state endangered; ST = state threatened; BGEPA – Bald and Golden Eagle Protection Act  
Source: USFWS Website <http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm>

In order to minimize impact to all birds protected under the Migratory Bird Treaty Act (MBTA), in their April 1, 2009 letter, the USFWS recommended the following mitigation measures. Ground clearing activities would be conducted prior to the breeding season ( March through August ) to avoid egg destruction and bird deaths. The potential for the presence of nesting burrowing owls, within the project area, may require mitigation measures be employed by the applicant, as these owls are protected under the MBTA. Burrowing owls could occur throughout the property during the breeding and non-breeding seasons and could be killed during construction activities at any time of the year. The New Mexico Department of Game and Fish (NMDGF), in coordination with the New Mexico Burrowing Owl Working Group, California Burrowing Owl Consortium, and the California Department of Fish and Game, developed “Guidelines and Recommendations for Burrowing Owl Surveys and Mitigation” (July 2007). These guidelines were established to provide direction for conducting burrowing owl surveys and designing mitigation during the preparation of environmental assessment reports and environmental impact statements. When burrowing owls are confirmed on a project site, these guidelines outline three general approaches to mitigation:

- Design and implement project activities to spatially avoid negative impacts and disturbance to burrowing owls and their habitat;
- Design and implement project activities to seasonally avoid negative impacts and disturbances to burrowing owls (although confirmation of unoccupied burrows will still be required); and/or,
- Relocate burrowing owls that will be negatively impacted to protected areas.

It is possible that the creation of ponds on the project site may alter the behavior of some birds and bats that may be attracted to the water and insects that may use the ponds. Non-threatened and endangered bird species may also be attracted to the ponds.

Correspondence with the State Forester (New Mexico Division of Energy, Minerals, Forestry, and Resources Conservation), the USFWS, and the New Mexico Department of Game and Fish regarding the site is included in Attachment F-1. . Based on the Biological Surveys which were completed in June and September of 2009, on August 17, 2009 the USDA determined the project proposed no adverse effect on threatened and endangered species. USFWS concurred with this determination on September 17, 2009 by not responding within the 30 day comment period to USDA's finding of no adverse effect. The USDA recommends that the applicant coordinate with the USFWS and New Mexico Department of Game and Fish (NMDGF) in order to coordinate mitigation measures for potential impact to MBTA species.

#### **F.4.7. Human Population**

The area of potential impact with regards to the human population (social and economic values) includes the local communities, county level government, state level government, and Mexico.

##### **F.4.7.1. Existing Population**

The IABR facility will be constructed on land owned by the applicant in Luna County approximately two miles southwest of Columbus, New Mexico (Sections 8 and 9 Township 29 South Range 8 and 9 West) and one-half mile north of the US-Mexico border (Figure 2). Luna County shares borders with Dona Ana County to the east, Sierra County to the northeast, Grant County to the northwest and west, and small portion of Hidalgo County to the southwest. The US – Mexico border is located along the southern end of the county. Collectively, these counties represent the Human Population Study Area (HPSA) or area of potential impact for the IABR project.

Major communities within Luna County include Deming, located in the central portion of the county and the town of Columbus, located near the border with Mexico along State Highway 11 approximately three miles northeast of the project area. The community of Sunshine is located south of Deming approximately 23 miles from Columbus. Waterloo is just off State Highway 11 situated between Sunshine and Columbus. The community of Hermanas is situated east of Columbus and approximately 10 miles to the west of the project site along State Highway 9.

Communities across the US-Mexico border include Puerto Palomas (approximately four miles south of Columbus), the community of Guadalupe Victoria (approximately 19 miles due south of the project) and Ascension, the capital of Chihuahua (approximately 50 miles south southwest of the project). In 2005, Puerto Palomas has an estimated population of 5,748 and the communities of Guadalupe Victoria and Ascension were 1,345 and 10,961 respectively (Wikipedia, 2009).

General social and demographic information for the HPSA Area is presented in Figures 9 and 10. The data show that the populations of Sierra, Grant and Hidalgo counties have decreased during the period 2000 to 2007. Dona Ana County exhibited the highest rate of growth for the period of 13.8 percent followed by the State of New Mexico at 8.3 percent and Luna County at 7.9 percent. For nearly every

economic indicator, economic conditions within the Study Area are poorer than the average conditions of the State of New Mexico. For example, the unemployment rate for the State of New Mexico was 4.2 percent in 2006, while in Luna County it was 10.6 percent.

**F.4.7.2. Schools**

Luna County hosts 13 public schools in Deming and one elementary school in Columbus. Specific schools within the county include the following:

- Bell Elementary
- Chaparral Elementary
- Columbus Elementary
- Deming Detention Center
- Deming High School
- Deming Middle School
- Deming Secure School
- Hofacket High School
- Martin Elementary
- Memorial Elementary
- My Little School
- Smith Elementary
- Sunshine Elementary

**Figure 9. Social Characteristics for the Multi-County Area and New Mexico**

Social Attribute	Luna County	Dona Ana County	Sierra County	Grant County	Hidalgo County	State of New Mexico
<b>Population</b>						
Population, 2007 estimate	26,996	198,791	12,316	29,699	4,945	1,969,915
Population, 2000 Census	25,016	174,682	13,270	31,002	5,932	1,819,046
Population, percent change, April 1, 2000 to July 1, 2007	7.9	13.8	-7.2	-4.2	-16.6	8.3
<b>Demographics</b>						
Female persons, percent, 2006	51.2	50.5	50.8	51.3	50.1	50.6
Persons under 18 years old, percent, 2006	28.0	28.4	18.8	23.2	27.4	26.0
Persons 65 years old and over, percent, 2006	19.4	11.6	28.1	18.9	15.7	12.4
White persons not Hispanic, percent, 2006	37.7	31.0	67.3	48.9	41.5	84.6
Persons of Hispanic or Latino origin, percent 2006	59.7	65.0	29.5	48.1	57.0	44.0
Black persons, percent, 2006	1.6	2.6	0.6	1.0	0.6	2.5

Foreign born persons, percent, 2000	19.5	18.7	6.6	3.3	11.1	8.2
Language other than English spoken at home, percent age 5+, 2000	49.5	54.4	21.6	36.7	43.6	36.5
High school graduates, percent of persons age 25+, 2000	59.8	70.0	76.1	79.4	68.8	78.9
Bachelor's degree or higher, percent of persons age 25+, 2000	10.4	22.3	13.1	20.5	9.9	23.5

<b>Housing</b>						
Housing units, 2006	11,840	9,444	9,151	14,521	3,072	850,095
Housing units, percent change, April 1, 2000 to July, 2006	4.9	14.5	4.9	3.2	7.9	8.9

Source: U.S. Census Bureau, 2008 and New Mexico Economic Development 2009

#### F.4.7.3. Fire Protection

Three volunteer fire departments (VFD) serve Luna County: Cookes Peak, Sunshine and Florida Mountain. The Cookes Peak VFD is located just north of Deming. Sunshine VFD is located approximately 9 miles south of Deming and the Florida Mountain VFD is approximately 12 miles east of Deming. The closest VFD responding to the proposed IABR site in the event of an emergency will be the Sunshine VFD, which is approximately 25 miles from the project site.

Figure 10. Economic Characteristics for the Multi-County Study Area and State of New Mexico

Social Attribute	Luna County	Dona Ana County	Sierra County	Grant County	Hidalgo County	State of New Mexico
Personal income per capita, 2005	\$19,165	\$23,070	\$20,786	\$22,983	\$20,589	\$27,889
Median household income, 2004	\$22,888	\$30,740	\$23,821	\$29,926	\$23,702	\$37,838
Median value of owner-occupied housing units, 2000	\$66,000	\$90,900	\$77,800	\$87,900	\$53,900	\$108,100
Persons below poverty, percent, 2004	24.3	23.0	20.4	17.9	21.2	16.7
Average earnings per job, 2005	\$28,881	\$33,086	\$23,073	\$27,418	\$25,106	\$37,387
Unemployment rate, percent, 2006	10.6	4.7	4.6	4.4	3.4	4.2
Civilian labor force, 2006	12,960	86,216	5,524	12,455	2,768	935,350

Source: U.S. Census Bureau, 2008.

#### F.4.7.4. Police Protection

The Village of Columbus represents the closest community to the IABR project area. With a population of approximately 1,600, Columbus recently disbanded its five member police force and is now under the jurisdiction of the Luna County Sheriff based in Deming, approximately 31 miles north of Columbus.

Minutes from the January 8, 2009 meeting of the Luna County Board of County Commissioners indicate a Joint Protection Agreement (JPA) was agreed to by the County Attorney and the County Sheriff for a six month period that provides Sheriff jurisdictional coverage of Columbus. However, Columbus has not formally adopted the JPA and is researching the possibility of reforming a police force. Columbus also agreed to fund over \$26,000 for the construction of a Sheriff substation in the community.

Based on recent field visits to the site, the US Border Patrol is known to have agents operating near and within the project area (including an observation station). These agents are responsible for monitoring human movement across the border as well as maintaining safe conditions.

#### F.4.7.5. Health Care

Medical centers in Luna County include the Ben Archer Health Center located in the community of Hatch, the Gila Regional Medical Center located in Silver City and the Mimbres Medical Center located in Deming. The Mimbres Medical Center specializes in family practice with ability to perform surgeries on-site. The hospital has an average patient volume of approximately 25 per day with one physician (Health Grades, 2009).

Ambulance services in Deming and the surrounding area are secured through expenditures from the City of Deming and supplemented by Luna County (Luna County Commissioners, 2007).

#### F.4.7.6. Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The purpose of the order was to avoid disproportionate placement of adverse environmental, economic, social, or health effects from federal actions and policies on minority and low-income populations. The first step in analyzing this issue is to identify minority and low-income populations that might be affected by implementation of the proposed project.

The Council on Environmental Quality identifies groups of people as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis (EPA, Council on Environmental Quality, 1997). In order to be classified as *meaningfully greater*, a formula describing the environmental justice threshold as being 10 percent above the State of Mexico rate is applied to local minority and low-income rates. For purposes of this section, minority and low-income populations are defined as follows:

- **Minority populations** are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders.
- **Low-income populations** are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four in the United States was \$17,603 and \$8,794 for an unrelated individual (US Census Bureau, 2000).

As shown in Figure 9 above, the relative size of the Hispanic or Latino populations in Luna, Dona Ana and Hidalgo counties in 2006 will be considered environmental justice populations based on the minority population criteria. Figure 10, above, indicates that the estimated number of persons below the poverty rate in Luna County in 2004 was 24.3 percent, the highest in the Study Area. Dona Ana County had the next highest rate at 23.0 percent followed by Hidalgo County at 21.2 percent, Sierra County at 20.4 percent, and Grant County at 17.9 percent. The State of New Mexico had the lowest rate overall of 16.7 percent. No county in the Study Area had a sufficient percentage of persons living below the poverty line to establish the county as an environmental justice population based on the low income criteria. However, the high percentage of minority populations in multiple counties in the region indicates that the Project Area, in general, is economically depressed as compared to Grant County and the State of New Mexico and will qualify as an environmental justice population based on the minority population criteria.

#### **F.4.7.7. Potential Impacts to Population and Services**

Luna County will be positively impacted directly and indirectly by the project primarily through development of many relatively high-salary jobs. Positive impacts to the rest of the region will also be realized through employment of people and purchase of goods and services from regional markets.

The IABR project is expected to employ up to 120 workers during the construction phase of the project for an extended period, providing a significant boost to the local economy. During the operational phase, the IABR is anticipated to employ 30 workers at the facility for the test period. Relocation of microbiologists and engineers who will reside in the area is anticipated to support the IABR project.

Indirect positive impacts to the surrounding populations will be realized through an increase in direct and indirect employment resulting from new jobs generated as a result of the project. Luna County will benefit by receipt of additional county and local taxes, benefiting schools, road users, and other functions provided by government.

Increased employment associated with the IABR is not anticipated to increase school enrollment or place unacceptable demands on health care facilities in Luna County. Fire and police protection may not be adequate for the IABR facility, due to considerable distance of these services to the site or lack of human resources. The applicant is considering several options to overcome this shortfall in emergency services including retaining a private security company who would coordinate with local and federal law enforcement agencies.

#### **F.4.8. Construction**

The construction of the IABR facility will result in a temporary increase in emissions of dust, increased potential for soil erosion and siltation, and increased noise. All of these impacts will be lowered to non-significant levels through implementation of best management practices. Dust generation will be reduced by application of water during land disturbance activities. The frequency of water application will be dictated by level of disturbance and wind speeds.

Erosion control will be achieved through controlling escarpments and slopes, avoidance of wash areas, and implementation of concurrent re-vegetation practices. A storm water management plan will be

prepared outlining the best management practices to be followed during construction of the IABR. Noise-related impacts will be controlled by limiting equipment delivery trips and management of work hours to reduce impacts on neighbors. The use of “jake brakes” by trucks will be prohibited to lower noise levels. In addition, noise reduction mufflers for trucks hauling equipment to the site could be employed, if necessary.

#### **F.4.9. Energy Impacts**

Area of potential impact associated with energy requirements of the project is limited to current electrical service to the site.

##### **F.4.9.1. Existing Energy supplies to the Facility**

Columbus Electrical Cooperative located in Deming serves the IABR project area. Above-ground power lines are present at the IABR site. A power line runs north-south along the western side of the County road bordering the IABR site. Two sets of power lines also run parallel to Highway 9 just south of the highway.

A fiber optic line runs south of Highway 9 along the IABR site. No other utilities are present at the site. The closest natural gas line is located approximately 30 miles north of the site in Deming. New Mexico Gas Co-operative has indicated their plans to extend service to the area of the IABR Facility along public right of way along Highway 9.

##### **F.4.9.2. Project Energy Requirements**

Preliminary estimates indicate the required power for the IABR facility will be approximately 3.4 Megawatts (Mw) at a delivery voltage of 480 volts (V). Natural gas will be required for algal biomass drying and other heated operations at the IABR site. It is estimated approximately 7.5 tones/day of natural gas will be required daily. Natural gas produced from anaerobic digestion of algal solids will be utilized at the facility. In addition, fuel (diesel and gasoline) will be required to fuel tractor trailers and commuter vehicles necessary for the construction and operation of the facility.

##### **F.4.9.3. Potential Impacts to Energy Supplies**

It is not anticipated that there will be significant impact to the energy supplies required to operate the IABR facility. Columbus Electrical Cooperative has indicated that current service lines to the facility can accommodate the power required.

##### **F.4.9.4. Energy Conservation**

The applicant is committed to incorporating energy conservation best management practices and best engineering controls at the IABR facility to the greatest extent possible. The applicant intends to hire energy conservation specialists that will be intricately involved in the facility design. Several design elements (see discussions in the Primary Beneficiaries and Project Description sections) involve innovative resource recovery in an effort to reduce energy consumption.



#### F.4.10. Other Potential Impacts (Noise, Vibrations, Safety, Radiation, Aesthetics)

The applicant does not anticipate impacts associated with the IABR and connected facilities with respect to noise, vibration, radiation, or aesthetics. With the exceptions of increased truck traffic during construction and operation, the IABR process is not noisy and vibration is limited to that associated with periodic truck traffic. Radiation is not a component of the project. In addition, while the equipment associated with the facility may be visible from Highway 9, much of the site will be comprised of shallow ponds which will only be visible from the air.

Safety is an important aspect of the IABR and connected facilities, particularly with respect to increased fire risks associated with processing of combustible oils. These fire risks will be managed by the applicant, adopting proper and sufficient fire controls and coordination with fire protection personnel. Construction of the facility near the US-Mexico border is an added security risk that the applicant is addressing in its planning, considering options including retaining a private security company who would coordinate with local and federal law enforcement agencies.

#### F.5. Compliance with Various Environmental Regulations

**Figure 11** summarizes the various permit requirements associated with the IABR and the status of efforts to secure such permits. The applicant intends to secure all necessary permits prior to commencing activities associated with development of the IABR.

Figure 11. Permit Requirement Summary (Updated 29 July 2009)

WATER RIGHTS	
<b>Existing Well Repair Permit</b>	
Issuing Agency:	Office of the State Engineer
Requirement:	Applies to any repair performed on existing well
Public Notice Req:	None
Status:	No Application: Expected turn around time by agency - 5 days
<b>New Well Permit</b>	
Issuing Agency:	Office of the State Engineer
Requirement:	Applies to installation of any new commercial well
Public Notice Req:	Yes: 60 - 90 day public notice period
Status:	No Application: Expected turn around time by agency - 90 days

**Change in Water Right Authorization**

Issuing Agency:	Office of the State Engineer
Requirement:	Applies to any change in the type of use, place of use, or point of diversion for water rights purchased
Public Notice Req:	Yes: 10 days
Status:	No Application: Time period can be 2-3 years, State Engineer will expedite to 2-3 months.

**WATER QUALITY****Stormwater Discharge Permit (includes Construction General Permit [CGP], General Permit [GP], and Stormwater Pollution Prevention Plan [SWPPP]).**

Issuing Agency:	US EPA Region 6 / Clean Water Act (CWA) §402(p) Part 122.26
Requirement:	Applies to construction activities which disturb more than one acre
Public Notice Req:	None
Status:	No Application: CGP data must be submitted to the USEPA Region 6, a SWPPP must be prepared and kept on site for review if required.

**Spill Prevention, Control, and Countermeasure (SPCC) Plan**

Issuing Agency:	US EPA Region 6 / 40 CFR § 112.7
Requirement:	Facilities that could reasonably be expected to discharge oil in quantities that may be harmful into navigable waters of the United States and adjoining shorelines to develop and implement SPCC Plans.
Public Notice Req:	None
Status:	No Application: SPCC Plan required of any commercial enterprise that has potential to discharge oil into Navigable Waters of the US.

**404 (Wetlands) Permit**

Issuing Agency:	U.S. Army Corps of Engineers El Paso District. The State of New Mexico's New Mexico Environmental Department (NMED) reviews and certifies all EPA permits issued in the state per CWA Section 401 / Clean Water Act (CWA) §404.
Requirement:	Required if wetlands are present and impacted
Public Notice Req:	Possible. Likely a month.
Status:	An official Jurisdictional Determination request for the property was submitted to the COE on September 18, 2009.

**Groundwater Discharge Permit**

Issuing Agency:	New Mexico Environmental Department (NMED) / New Mexico Water Quality Act (WQA) NMAC 20.6.2.3103 and NMAC 20.6.2.3104.
Requirement:	A discharge permit will be required for expected seepage from the production ponds and the evaporation pond(s) at the IABR.
Public Notice Req:	Yes: Public notice is required (NMAC § 20.6.2.3108).
Status:	No Application: A discharge permit will be required for expected seepage from the production ponds and the evaporation pond(s) at the IABR. If TDS of the first intercepting (receiving) groundwater is greater than 10,000 mg/L, no permit required. If the receiving groundwater is <1,000 mg/L TDS, applicant can get a groundwater discharge permit. If the receiving groundwater is >1,000 TDS, New Mexico's non-degradation statute (NMAC 20.6.2.3101) requires no degradation of that groundwater can occur. Presently awaiting final engineering data to submit to NMED for analysis; preliminary calculations have been completed indicating project would comply with non-degradation statute.

**Septic System Permit**

Issuing Agency:	New Mexico Environmental Department (NMED) - District III Office in Las Cruces / NMAC § 20.7.3.
Requirement:	If a septic system is planned for the IABR facility, a liquid waste (septic tank) permit must be obtained.
Public Notice Req:	None
Status:	No Application: Expected less than one week turnaround by regulators

<b>AIR QUALITY</b>	
<b>Air Quality Permit</b>	
Issuing Agency:	New Mexico Environmental Department - Air Quality Bureau / NM. Stat. Ann. §§ 74-2-1
Requirement:	Operation of certain equipment presently planned for use at the IABR facility will require the facility to obtain an air quality permit.
Public Notice Req:	30 days after NSR; 30 days after department' analysis.
Status:	No Application: Need to quantify emissions in a Potential Emissions Rate (PER). Determination of permit requirement will be made by AQB. Permit must be in place before start of construction.
<b>SPECIAL STATUS SPECIES</b>	
<b>New Mexico Protect Wildlife Species</b>	
Issuing Agency:	New Mexico Game and Fish Department / NM. Wildlife Conservation Act (WCA) NMAC § 17.2.37 through 46
Requirement:	None unless there are known Threatened or Endangered Species effected.
Public Notice Req:	None
Status:	No Application: USDA concluded no adverse effect to Threatened or Endangered Species. USFWS concurred with this determination on September 17, 2009.
<b>US Fish and Wildlife Service Consultation</b>	
Issuing Agency:	US Fish and Wildlife Service / Endangered Species Act (ESA) (7 USC §136 and 16 USC §1531 et. seq.)
Requirement:	If federally listed fauna species are determined to be present and takings are unavoidable, or if these species are present and activities proposed at the IABR site are determined to be an action requiring a federal decision, consultation with the U.S. Fish and Wildlife Service will be required.
Public Notice Req:	None if informal consultation is allowed.

Status:	No Application: USDA concluded no adverse effect to Threatened or Endangered Species. USFWS concurred with this determination on September 17, 2009.
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**Migratory Bird Treaty Act (MBTA) / Bald and Golden Eagle Protection Act (BGEPA)**

Issuing Agency:	US Fish and Wildlife Service / Migratory Bird Treaty Act / Bald and Golden Eagle Protection Act
Requirement:	If there is potential for golden eagles to occur on site. Surveys should be conducted during breeding season.
Public Notice Req:	None: No formal permit issued
Status:	No Application: USDA concluded no adverse effect to Threatened or Endangered Species. USFWS concurred with this determination on September 17, 2009.

**Endangered Plants Act (EPA)**

Issuing Agency:	New Mexico Energy, Minerals and Natural Resources Department / NM Stat. Ann. §§ 75-6-1 et. Seq. and NMAC Part 21
Requirement:	Applies if any Special Status flora species are affected by the Project.
Public Notice Req:	None if informal consultation is allowed.
Status:	No Application: There are no special status flora or fauna species affected by the project. USDA concluded no effect to Threatened or Endangered Species. USFWS concurred with this determination on September 17, 2009.

**HISTORIC PRESERVATION**

**Eligibility for Listing on the National Register of Historic Places (National Register)**

Issuing Agency:	New Mexico State Historic Preservation Officer (SHPO) / Section 106 of the National Historic Preservation Act of 1966 as amended (PL 89-665) the Archaeological Resource Protection Act of 1979 (PL 96-95), and Executive Order 11593.
Requirement:	The "lead agency" is the federal or state entity responsible for consulting with the SHPO to make sure that appropriate cultural resource laws and regulations are followed for the project.
Public Notice Req:	Yes. If NHPA Section 106 consultation is required.

Status:	SHPO concurs proposed project will have no effect as long as project is constructed in Area 1. If Area 2 is used consultation required. SHPO notified USDA that Section 106 consultation with 5 tribes was required. These tribes were notified and no comments were received within 30 day comment period.
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**SOLID AND HAZARDOUS WASTE**

**Hazardous Waste Permit**

Issuing Agency:	New Mexico Environmental Department / US Department of Agriculture / New Mexico's Hazardous Waste Act (HWA) and associated regulation (NMAC § 20.4.1) - based on US EPA Resource Conservation and Recovery Act (RCRA) definitions and requirements.
Requirement:	Applies if any hazardous solid waste is generated at the Site or if solid waste is disposed at the Site.
Public Notice Req:	None
Status:	No Application: Solid waste will be disposed off site. Must do a determination to see if the process will generate hazardous waste.

**NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) ANALYSIS**

**Environmental Assessment or Environmental Impact Statement**

Issuing Agency:	US Department of Agriculture, Rural Development / Council on Environmental Quality Regulations (40 CFR Parts §§ 1500-1508)
Requirement:	A NEPA analysis will be required if there is a federal decision associated with the proposed action or if one of the following occurs: (a) federal money is being used to fund a portion or all of the project; (b) an individual CWA §404 permit is required; or (c) a linear connected action is required (e.g., a pipeline corridor that will traverse federally managed land). Applicable since the Project will use Federal funds.
Public Notice Req:	Yes.
Status:	This requirement is met through the completion of the USDA's Class II Environmental Assessment and issuance of a FONSI.

**LOCAL AND COUNTY PERMITS**

Issuing Agency:	Luna County / Ordinance No. 37
Requirement:	If a substantial building of any is constructed within Luna County, a building permit is required. Periodic inspection by county required during construction.
Public Notice Req:	None.
Status:	No Application: Turnaround time for building permits is approximately 1 week.

**PERMITS CONSIDERED BUT NOT REQUIRED**

***NPDES (National Pollution Discharge Elimination System) Permit***

Issuing Agency:	US EPA (State of New Mexico does not have primacy) / Clean Water Act (CWA) §402 NPDES (USC title 33, §1251)
Requirement:	Required for any planned discharge to surface water
Public Notice Req:	None
Status:	No Application: Because the applicant does not expect any discharge of wastewater to a surface water course, this permit will not be required.

***Clean Air Act (CAA) Title V Determination***

Issuing Agency:	US EPA/Clean Air Act (CAA) CFR Parts 50-99
Requirement:	Review Title V threshold limits
Public Notice Req:	Yes
Status:	Determination of whether the facility will require a New Source Review air quality permit and/or a Clean Air Act (CAA) Title V permit will be completed when final design plans for the IABR are developed in concert with the State of New Mexico Air Quality Bureau.

***Solid Waste Permit***

Issuing Agency:	
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Requirement:	
Public Notice Req:	
Status:	This permit will be unnecessary as all solid waste will be transported and disposed of by licensed vendors and facilities as long as the applicant does not produce more than 220 pounds of non-acute hazardous wastes per month.

### F.5.1. Coastal Zone Management Act

This act is not applicable to the proposed project since the IABR facility will not be constructed in coastal areas or a Great Lakes State.

### F.5.2. Compliance with Advisory Council on Historic Preservation's Regulations

Impacts to cultural or historical resources are not anticipated with the project. On August 31, 2009, the SHPO concurred that the project will have no effect on cultural or historic resources, as long as the project is constructed in Area 1 (400-acre Project Area - eastern parcel). If there is any change in plans and Area 2 (adjacent property - western parcel) will be used, then consultation with SHPO will be required.

A Cultural Resource Survey was completed at the proposed IABR facility by a qualified New Mexico-certified archaeological firm. The property identified for the Cultural Resource Survey included two parcels of land; a western parcel identified in the Survey as Project Area 1 and an eastern parcel identified in the Survey report as Project Area 2 (Attachment F-5). As part of this assessment, archaeological records maintained at the Archaeological Records Management Section (ARMS) of the New Mexico Historic Preservation Division were consulted and a field survey of the property was completed. The records revealed four previously recorded sites within a 500 meter radius around the perimeter of the Project Areas; however, none of the sites occur on the IABR property (identified as Project Area 1 in the Cultural Resources Survey report). A review of the State Register of Cultural Properties and the National Register of Historic Properties (NRHP) also revealed that no properties on either register are located near the project area.

An Area of Potential Effect (APE) was designated for the project that corresponds to Project Area 1 (green shaded area in Figure 2). The archaeological field survey of the proposed APE identified a series of agricultural ditches and associated features and materials (Attachment F-5). Artifacts were observed associated with the ditch system. Materials observed included cement, metal pipe, and railroad tailing. These artifacts are believed to be part of a mid-twentieth century irrigation system. Although local informants date the concrete lined ditch to the early 1950s, an inscription indicates that at least a portion of the ditches may have been constructed in 1935. Based on date of construction, the site (ditches and affiliated materials) has a New Mexico Statehood-World War II to recent (AD 1935 to 1985) affiliation. The Phase I archaeological report stated that the site does not appear to be associated with significant historical events or people, doesn't retain any characteristic workmanship, and is not likely to



yield any additional information concerning the mid-twentieth century development of the area and its therefore recommended ineligible for nomination to the National Record of Historic Places (NRHP) under any of the four criteria.

In addition to consultation with SHPO, letters were issued to governors of the Pueblo of Nambe and Pueblo of Zuni seeking input regarding any cultural or other issues of concern (see Attachment F-1). To date, no responses have been issued by these entities. USDA also contacted the SHPO-designated tribal contacts for Luna County, (Fort Sill Apache, Hopi, White Mountain Apache, Mescalero Apache, Ysleta del Sur Pueblo) notifying them of the project and requesting comment within 30 days. One response was received from the Hopi Tribe indicating concurrence there would be no adverse effect. No other responses were received therefore we can assume that no adverse effect determination were made by these tribes.

### **F.5.3. Compliance with the Wild and Scenic Rivers Act**

The IABR project will not affect a river or portion of it which is either included in the National Wild and Scenic Rivers Systems or designated for potential additional to the system. Waters of the US are not present on the IABR facility.

### **F.5.4. Compliance with the Endangered Species Act**

The IABR project is not projected to affect listed endangered or threatened species. A listing of T&E species for the project area is provided in Attachment F-4. Of the animal species listed, nearly all are unlikely to occur within the IABR project site. Figure 8 provides a description of the general habitat and possibility of occurrence in the project area for each of these animal species. Little to no indication of the presence of threatened and or endangered (T&E) animal species or their prime habitats were identified at the project site during a field survey.

Due to the historic agricultural disturbance of the project site, there is limited potential for plants listed as endangered by the state of New Mexico and as a federal Species of Concern to occur on the proposed IABR site. These include the night blooming cereus (*Peniocereus greggii* var. *greggii*) and dune prickly pear (*Opuntia arenaria*). The New Mexico Rare Plant Council and New Mexico Energy, Minerals and Natural Resources Department were contacted for information concerning the location of these species within the Mimbres Basin. Based on the field surveys completed on the site USDA determined that the project proposed no adverse effect to threatened or endangered species. The USFWS concurred with this determination on September 17, 2009 (see Attachment F-1).

### **F.5.5. Compliance with Farmland Protection Policy Act and Departmental Regulation 9500–3, Land Use Policy**

The IABR project will not either directly or indirectly convert an important land resource identified in the Farmland Protection Policy Act and Department Regulation 9500-3, Land Use Policy. Additional information about the proposed location of the IABR is presented in Project Description section of this document. Information concerning land use and soils are presented in the Land Use section of this document. The Natural Resources Conservation Service and Farm Service Agency have been contacted (see Attachment F-1). The IABR site is not exceptional farmland worthy of land management restrictions.

Specifically, the NRCS Web Soil Survey database (found at <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>) does not include the site as an area shown to be “prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland”. Based on communication with the NRCS, prior to construction, the applicant will register as the new owner with the Deming Field Office of FSA/NRCS, and either have NRCS create a new Conservation Plan applicable to the proposed future land use (IABR and surroundings), or obtain from NRCS documentation that the proposed future land use would not need a Conservation Plan.

#### **F.5.6. Compliance with Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands**

The proposed IABR project is not located within a 100-year flood plain (500-year floodplain for a critical action) or a wetland, and the project will not impact a floodplain or wetland. The floodplain map for the project area can be seen in Figure 2. Additional discussion of wetlands is included in the Natural Environment section and in Attachment F-4.

#### **F.5.7. Compliance with Coastal Barrier Resources Act**

The IABR Project is not located within the Coastal Barrier Resources System.

#### **F.5.8. State Environmental Policy Act**

New Mexico does not have a State Environmental Policy Act, and therefore, the project is not subject to a New Mexico Environmental Policy Act review. Because of the possibility of federal funding being secured to support costs associated with the IABR, USDA’s decision regarding the project is subject to conformance with the National Environmental Policy Act.

#### **F.5.9. Consultation Requirements of Executive Order 12372, Intergovernmental Review of Federal Programs**

On March 10, 2009, the applicant submitted Form RD 1940-20 to Mr. Mike McDow, USDA Rural Development in Albuquerque, New Mexico of their intent to submit a loan application (Attachment F-1). In addition, the applicant sent letters notifying several agencies requesting their advice as to whether the project will affect any regulations under their jurisdiction. A list of the agencies that were sent a request letter is included in Attachment F-1. The applicant requested a response from the agencies by no later than April 10, 2009.

To date, the applicant has received only three responses from the agencies. One comment was from the US Fish Wildlife Service (USFWS) concerning protection of threatened and endangered species, received April 1, 2009. The Natural Environment section and the Compliance with Endangered Species section of this application describe what has been done with respect to the evaluation of threatened and endangered species. USFWS concurred with USDA’s determination that the project will have no adverse effect on threatened and endangered species on September 17, 2009. The second comment was from the New Mexico State Historic Preservation Office (SHPO). SHPO’s March 16, 2009 response indicated that consultation with the agency is required under Section 106 of National Historic Preservation Act if federal funding was being sought. Subsequently, SHPO sent in a response dated

August 31, 2009, where SHPO concurred that the project will have no effect on cultural or historic resources, as long as the project is constructed in Area 1 (400-acre Project Area - western parcel). If there is any change in plans and Area 2 (adjacent property - eastern parcel) will be used, then consultation with SHPO will be required (Attachment F-1). The third comment was from New Mexico Environmental Department (NWED) outlining the requirements of the Ground Water Quality Bureau and the Surface Water Quality Bureau with respect to obtaining approved discharge permits, NPDES compliance, and public notice requirements. All of these items have been addressed by the applicant and are documented in this Environmental Assessment.

In addition to the initial solicitation of input from the various regulatory and governmental agencies described above, contacts have been made via telephone and through face-to-face meetings with these agencies as described in Attachment F-1 Environmental Assessment Contact Information Table. This table summarizes all contacts made to various agencies and the resulting correspondence, meeting notes, and phone logs. Copies of electronic mail and other contact sheets are also included in Attachment F-1.

BLM administers public land which borders the project area and the applicant has submitted an application for development grant with the DOE for the IABR. The applicant has been in contact with both agencies and intends to maintain active dialogue with these agencies as well as the USDA to ensure all parties are informed as to the status of project activities. The USDA is the agency completing this environmental assessment and will provide copies to the BLM and DOE, upon request.

#### **F.5.10. Environmental Analysis of Participating Federal Agency**

The applicant received a congressional earmark of \$951,000 in March 2009 for the IABR project. Currently, no other federal agency besides USDA is participating in the project by providing funds or serving as a companion, although the applicant has applied for a grant from the US Department of Energy (DOE). Federal agencies having possible review authority of portions of this project include:

- US Army Corps of Engineers: filling or modification of waters of the US, including wetlands
- US Fish Wildlife Service: threatened or endangered species
- US Environmental Protection Agency: New Source Review and Title V Air permit review (although they have delegated this authority to the State of New Mexico) and storm water permit

### **F.6. Reactions to and Impacts of IABR Project**

#### **F.6.1. Reaction to Project**

Comments from state, regional, and local agencies received at the time of this submittal are included in Attachment F-1. Comments were requested from several agencies on March 10, 2009. Written comments were received from the USFWS and SHPO on May 7, 2009 and March 16, 2009 respectively.

A preliminary public notice of the Environmental Assessment was published on August 19, 20 and 21, 2009 (Attachment F-6). No comments were received at the conclusion of the 30-day review period which ended on September 21, 2009. A public hearing or public information meeting concerning the

project has not been held to date. Public awareness of the project has grown considerably since due diligence of the proposed IABR site was initiated by the applicant and regulatory agencies were made aware of the prospect of this enterprise in March 2009. This awareness has increased interest in the project with local residents learning of the potential job opportunities. The applicant's field staff conducting various studies within the project area are continually asked about the project. News sources have an increased awareness of the applicants other activities and articles have been recently published in periodicals, including the following:

- Algae Startup Sapphire Energy Eyes New Mexico Facility After \$50 Million Capital Raise (Biofuels Digest 2008)
- Sapphire Energy Aims For 1.5 Billion Gallons Of Algae Fuel By 2020; 150 Million By 2013 (Biofuels Digest 2009)
- Sapphire Energy Algae to Fuel Demonstration Project - \$951,000 (Udall, 2009)

### F.6.2. Cumulative Impacts

Cumulative impacts associated with the construction of the IABR include two main areas: transportation and socioeconomics. The project will cumulatively impact roads in the area, particularly New Mexico Highway 9. Increased heavy truck traffic on Highway 9 will cause a cumulative increase in traffic regionally and may degrade the roadway.

The cumulative impact associated with socioeconomics will generally be positive, as the IABR will increase jobs and tax revenues for local counties and the State of New Mexico and provide greater economic stability for the region by increasing the demand on goods and services needed to support the project.

Cumulative impacts to other resource areas will be minimal. Discharges associated with the IABR will not cumulatively result in adverse impacts to water and air resources. The air shed in southern New Mexico is not a Class 1 area (not a non-attainment area), and the process necessary to permit the air emissions will not allow for impacts to exceed regulatory standards. Discharge of water associated with the leakage from the ponds will also require a permit from the New Mexico Environmental Department (NMED). To obtain the discharge permit from the NMED, the applicant will demonstrate that the discharge will not result in exceedance of water quality standards in groundwater beneath the site therefore eliminating the potential for cumulative impacts. Impacts to threatened and endangered species are not anticipated due to lack of species of concern and/or suitable habitat at the facility. Waters of the US, including wetlands, will also not be impacted because they are not present on the proposed site. The IABR will remove 400 acres of land previously used for traditional agriculture and replace it with non-traditional agriculture. Sufficient agricultural land is available in Luna County, however, such that the loss of this relatively small area is not anticipated to result in a cumulative impact. Likewise, impacts to cultural and archeological sites are not anticipated because National Register-eligible sites were not discovered at the facility during a field survey.

The past and current land use in the region around the project area is primarily agricultural, including grazing and irrigated cropland. These activities will likely continue into the future as no industrial, recreational, or other developments are being considered for the area.

The location of a commercial-scale facility is currently unknown but will be determined following evaluation of the feasibility of the process implemented at the IABR, assumed to require approximately 3 years to complete. The findings of the IABR project will largely dictate the size, nature, and location of a commercial enterprise. Some of the more important criteria to be evaluated in siting of a commercial-scale facility include climate, latitude, availability of sufficient water, topography, land use, land ownership, socioeconomic and cultural conditions, availability of appropriate labor force, and environmental sensitivities. Areas proximal to the IABR will be considered in such a siting analysis but it is premature to evaluate potential impacts associated with a commercial-scale facility until the technology has been proven at a pilot-scale and the feasibility of the process has been proven.

The degree of governmental review and analysis of any commercial-scale facility developed will depend largely on the location of the site with respect to public land. The types of permits and impact analyses to be completed to support a commercial-scale facility are expected to be similar to that completed for the IABR, although the scale of the project may require a greater depth and breadth of analysis. In addition, it is probable that such a facility would have connected actions associated with it that would require further regulatory scrutiny, such as construction of pipeline and utility corridors and possible expansion of transportation infrastructure. For the purposes of this EA, any future development of an off-site commercial-scale facility is considered to be independent of the IABR pilot-scale project. In addition, it is recognized that any future expansion of the IABR pilot-scale project facility onto adjacent properties would be reviewed cumulatively with the findings of this EA, but is not addressed in this EA since plans for expansion are speculative.

### **F.6.3. Potential Adverse Effects**

Potential adverse environmental and social impacts associated with construction of the IABR include:

- Loss of 400 acres of habitat for fauna potentially utilizing the area while the IABR facility is being constructed and operated
- Increased air emissions of hydrocarbons from increased truck traffic transporting chemicals and supplies to and from the IABR facility
- Increased emissions of particulate associated with the increase in truck traffic to and from the IABR
- Increased demand on local services associated with fire and security protection
- Increased demand for housing
- Degraded groundwater quality from infiltration of water from ponds

A discussion of all of these impacts is provided in the appropriate sections above.

### **F.6.4. Alternatives**

Several other alternative locations for the IABR were evaluated in arriving at the preferred location in Luna County. Particular effort was placed on evaluating candidate sites in New Mexico, an area that exhibits climatic conditions conducive to fostering algal growth. Sites in southeastern and central New Mexico were considered and dismissed primarily because of the desire of the applicant to site the facility on private land, a situation that presented itself with the property in Luna County. The benefit of

locating this demonstration project on private land was primarily because of the relatively short time required to secure necessary permits to support the development as well as secure the water rights necessary for the operation. In addition, the Luna County site presented relatively favorable conditions for minimizing impacts to flora, fauna, water resources, and air quality, and presented a direct opportunity to improve local economic conditions. Locating the project within the preferred alternative western parcel was chosen over the eastern parcel (also owned by the applicant) due to potential for adverse affects to cultural resources, availability of water rights, and site access issues.

Several alternative designs were evaluated by the applicant for the process it is promoting, in both its laboratory in San Diego as well as a research and development facility in Las Cruces, New Mexico. The various alternative process designs have all been carefully evaluated and adjusted to optimize the efficiency of the operation while recycling as much of the various components used in the process as possible. Because the IABR, as proposed, is a demonstration project, the applicant fully expects that additional adjustments in the design of the facility will be necessary as more is learned about process components that add value and those that do not.

With respect to other types of processes, the applicant has completed exhaustive research of various biofuels technologies in developing the type of processes that will be applied at the IABR. The benefit of the process this project is promoting over other biofuel technologies is that this process can be used on non-productive land and can use non-potable water, particularly saline water when brought to the full-scale commercial level. These factors provide a considerable relative advantage over other biofuel technologies in that productive land is maintained and scarce fresh water resources are preserved.

The “No Project” alternative will provide no direct benefit to the local communities in Luna County, the State of New Mexico, or the United States. Opportunities to develop a viable alternative fuel source for the country will be lost under this alternative and the economic stimulus that will accompany such an enterprise will be forfeited. In addition, advancement of the science and engineering for efficiently and effectively producing green crude will be curbed by not acting on this proposal.

### F.6.5. Mitigation Measures

Possible mitigation measures that could be taken to overcome the environmental and social impacts associated with the IABR, as described above are listed in Figure 11.

Figure 12. Potential Environmental Impact and Proposed Mitigation Methods

Potential Impact	Proposed Mitigations
Migratory Bird Treaty Act Species and Raptors including aplomado falcon	<ul style="list-style-type: none"> <li>The USFWS recommends that in order to minimize the likelihood of adverse impacts to all birds protected under the Migratory Bird Treaty Act (MBTA), construction activities should occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during nesting season be surveyed, and when occupied, avoided until nesting is completed.</li> </ul>

	<p>It is highly recommended to have a biomonitor onsite during bulldozing and clearing activities to ensure birds were not nesting or being harmed.</p>
Burrowing owls	<ul style="list-style-type: none"> <li>• The applicant should coordinate with the USFWS and NMDGF in order to minimize potential impacts to any burrowing owls located on the site as outlined in the “Guidelines and Recommendations for Burrowing Owl Surveys and Mitigation” (July 2007). ”</li> </ul>
Loss of 350-400 acres of habitat for fauna potentially utilizing the area while the IABR facility is being constructed and operated	<ul style="list-style-type: none"> <li>• Construction of a series of ponds may enhance habitat for certain types of fauna, potentially offsetting destruction of habitat.</li> <li>• Salvage topsoil from the site prior to development; use soil as growth medium to support reclamation of property.</li> <li>• Develop a reclamation plan that restores habitat to at least pre-project conditions.</li> </ul>
Increased air emissions of hydrocarbons associated with exhaust from increased truck traffic transporting chemicals and supplies to and from the IABR facility.	<ul style="list-style-type: none"> <li>• Design systems such that aerial emissions achieve compliance with applicable air quality standards.</li> <li>• Incorporate into the system design means to capture and reuse emissions to the extent possible.</li> <li>• Combine trips, promote car pooling, or utilize buses to reduce vehicular emissions.</li> </ul>
Increased emissions of particulate associated with the increase in vehicle and truck traffic to and from the IABR.	<ul style="list-style-type: none"> <li>• Pave the approach road and access roads within the IABR site to limit emissions.</li> <li>• Combine trips, promote car pooling, and utilize buses to reduce total particulate created by vehicle traffic.</li> </ul>
Increased demand on local services associated with fire and security protection.	<ul style="list-style-type: none"> <li>• Retain a private security company to provide services specific to the IABR.</li> <li>• Work with Luna County officials to secure fire response equipment in Columbus.</li> <li>• Install fire response equipment at IABR and develop a training program for employees.</li> </ul>
Increased demand for housing.	<ul style="list-style-type: none"> <li>• Hire locally, to the extent possible.</li> <li>• Operate buses, to the extent practicable, to bring workers to site from larger communities in the region that are more able to accommodate influx of workers.</li> </ul>
Degraded groundwater quality from infiltration of water from ponds.	<ul style="list-style-type: none"> <li>• Modify pond bottoms through amendment to achieve compliance with groundwater discharge permits.</li> <li>• Monitor leakage to provide for early detection</li> </ul>



of any excursions.

## F.7. Consistency with Rural Development’s Environmental Policies

As discussed throughout the environmental evaluation sections of this application, the IABR project will be consistent with USDA environmental polices (§§1940.304 and 1940.305) and the New Mexico Resource Management Guide. The proposed IABR will not adversely impact waters of the U.S. including wetlands, floodplains, important or prime farmlands, T&E species, fisheries, cultural or archeological sites, air quality, or water quality. The IABR will remove 400 acres of land previously used for traditional agriculture and replace it with non-traditional agriculture. Non-threatened and non-endangered flora and fauna that currently utilize the acreage where the IABR will be located will be impacted; however, sufficient land of equal or better value exists surrounding the property to accommodate these species. Additional details to support the claim that the IABR project will be consistent with the Resource Management Guide are included with this submittal.

## F.8. Environmental Determinations

Based on an examination and review of the foregoing information and such supplemental information attached hereto, I recommend that the approving official determine that this project will not have a significant effect on the quality of the human environment.

I recommend that the approving official make the following compliance determinations for the below-listed environmental requirements.

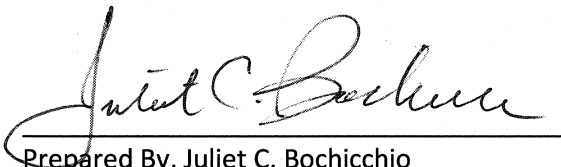
Not in Compliance	In Compliance	Unknown	Federal or State Law
	X <sup>1</sup>		Clean Air Act
	X		Federal Water Pollution Control Act
	X		Safe Drinking Water Act—Section 1424(e)
	X <sup>2</sup>		Endangered Species Act
	X		Coastal Barrier Resources Act
	X		Coastal Zone Management Act—Section 307(c) (1) and (2)
	X		Wild and Scenic Rivers Act.
	X		National Historic Preservation Act
	X		Archeological and Historic Preservation Act
	X		Subpart B, Highly Erodible Land Conservation
	X		Subpart C, Wetland Conservation, of the Food Security Act
	X		Executive Order 11988, Floodplain Management



	X	Executive Order 11990, Protection of Wetlands
	X	Farmland Protection Policy Act.
	X	Departmental Regulation 9500-3, Land Use Policy.
	X	State Office Natural Resource Management Guide.

1 – An air permit will likely be required; 2 Coordination required related to plant species.

I have reviewed and considered the types and degrees of adverse environmental impacts identified by this assessment. I have also analyzed the proposal for its consistency with USDA Rural Development's environmental policies, particularly those related to important farmland protection, and have considered the potential benefits of the proposal. Based upon a consideration and balancing of these factors, I recommend from an environmental standpoint that the project be approved.



Prepared By, Juliet C. Bochicchio  
Environmental Protection Specialist  
Program Support Staff

09-21-2009

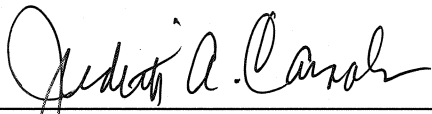
Date



Recommended By, Linda Rodgers  
Acting Director  
Program Support Staff

09-21-2009

Date



Approved By, Judith A. Canales,  
Administrator  
Business and Cooperative Programs

9/21/09

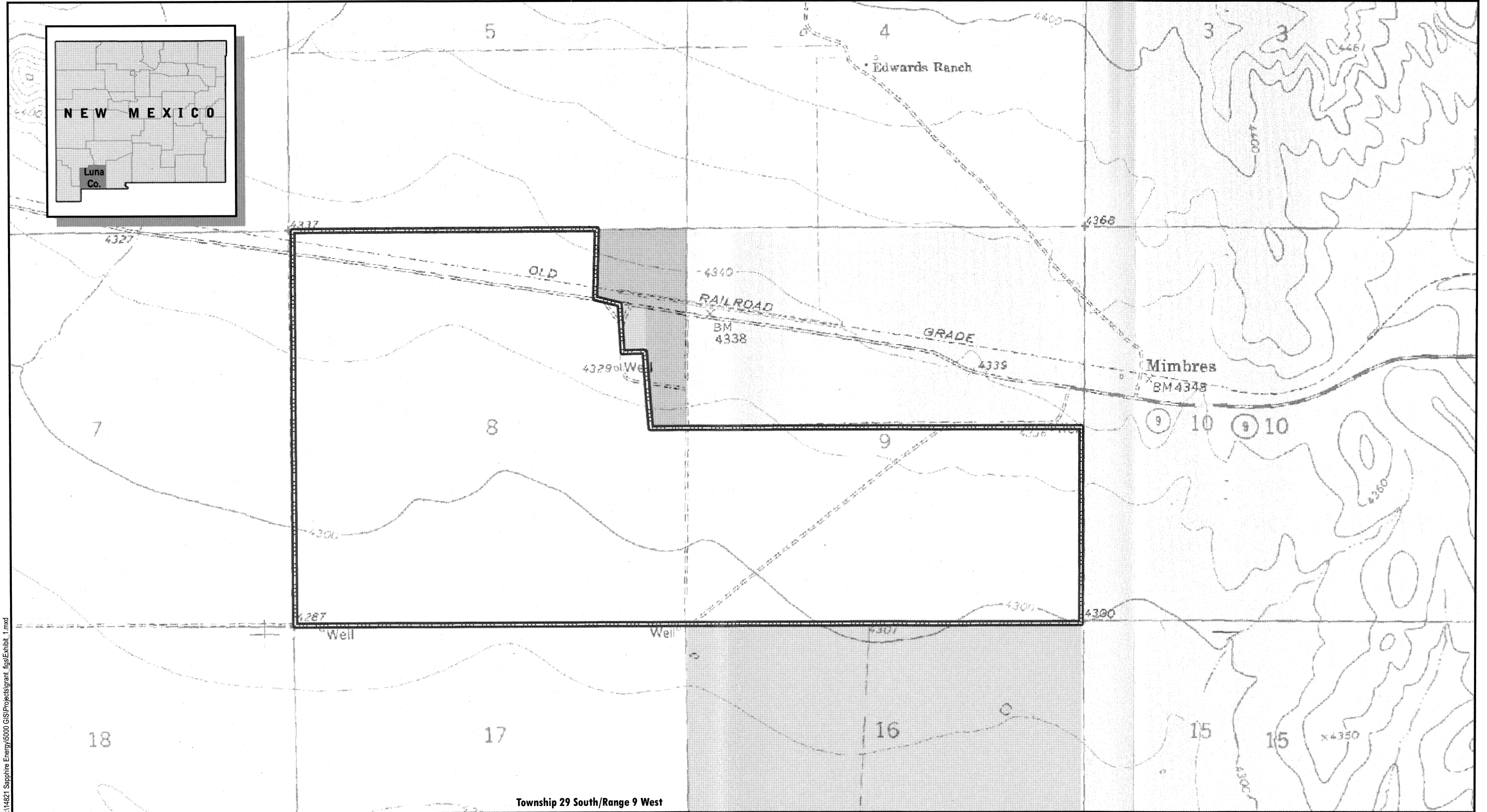
Date

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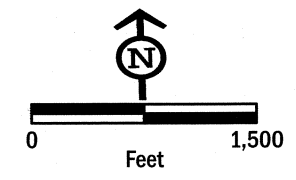
## EXHIBITS





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Township 29 South/Range 9 West



- Columbus Western Parcel
- Cook Property
- Bureau of Land Management
- May Property
- Other Private
- State of New Mexico

Site Map  
Proposed IABR Facility  
Luna County, New Mexico  
EXHIBIT 1



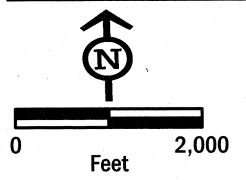


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LUNA COUNTY, NEW MEXICO

CHIHUAHUA, MEXICO

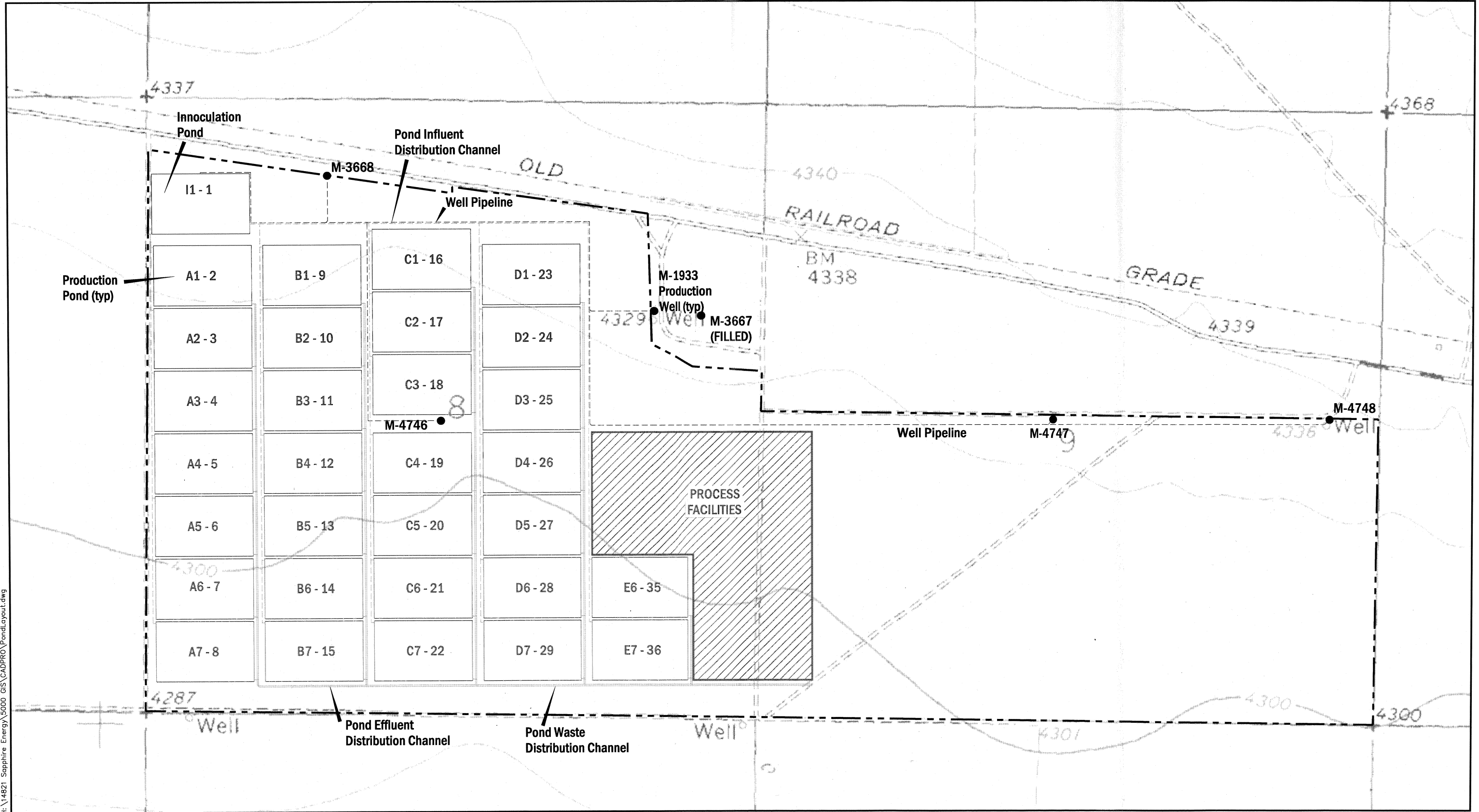
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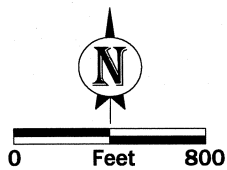
- Columbus Western Parcel
- Cook Property
- May Property
- Other Private
- Bureau of Land Management
- State of New Mexico

Site Map - Air Photo Base  
 Proposed IABR Facility  
 Luna County, New Mexico  
 EXHIBIT 2





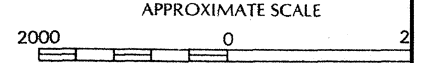
H:\14821 Sapphire Energy\5000 GIS\CADPRO\PondLayout.dwg



Project/Property Boundary

General Facilities Layout  
 Proposed IABR Facility  
 Luna County, New Mexico  
 EXHIBIT 3

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-358-7777.



Special Flood Hazard Areas  
Inundated By 100-Year Flood  
ZONE A - No Base Flood  
Elevation Determined

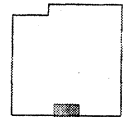
NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP  
LUNA COUNTY,  
NEW MEXICO AND  
INCORPORATED AREAS

PANEL 800 OF 850  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLUMBUS, VILLAGE OF	35037	0800	B
UNINCORPORATED AREAS	350139	0800	B



PANEL LOCATION  
**MAP NUMBER**  
35029C0800 B  
**EFFECTIVE DATE:**  
SEPTEMBER 14, 1990

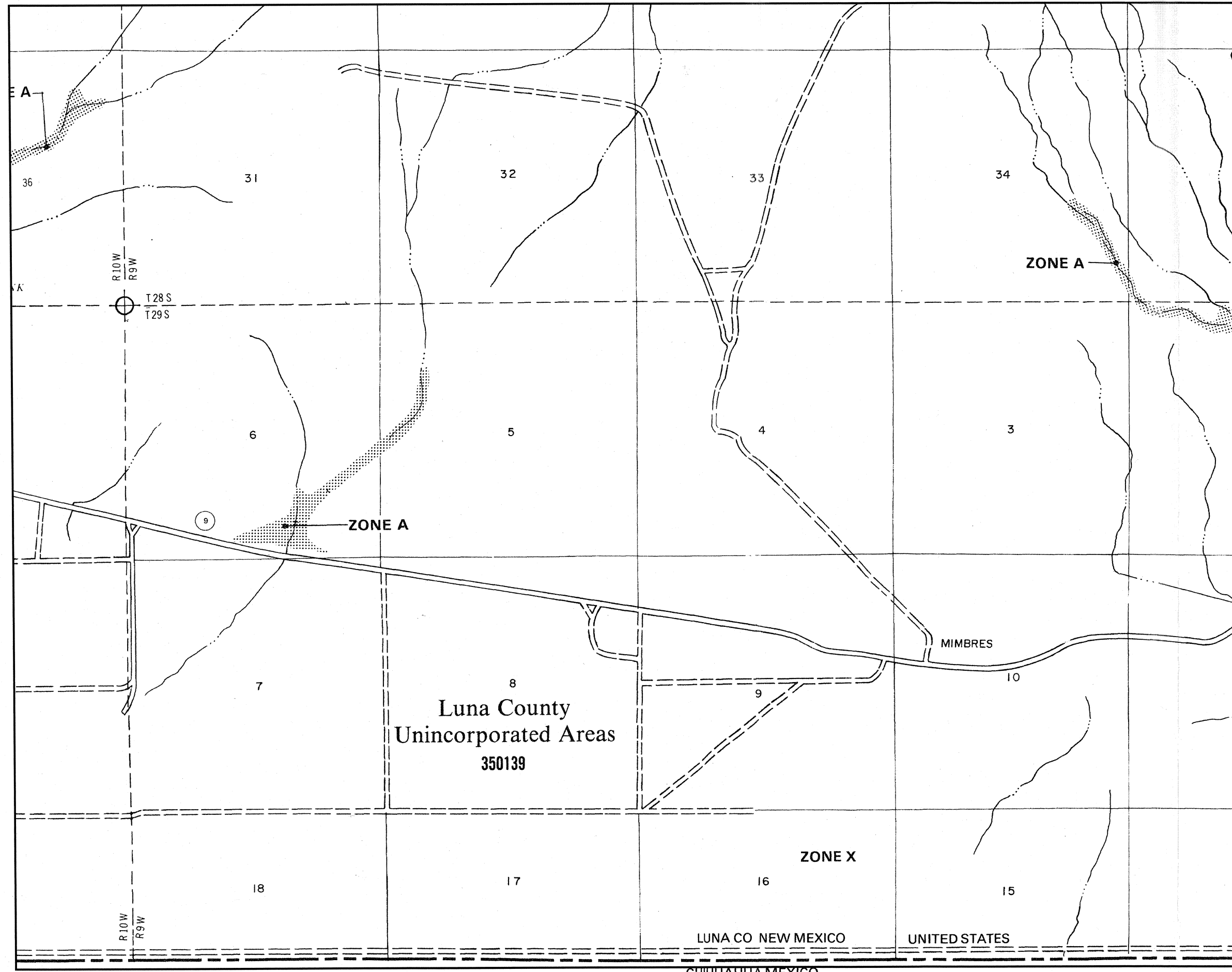


Federal Emergency Management Agency

Columbus Western Parcel

FEMA FIRM Map  
Proposed IABR Facility  
Luna County, New Mexico  
EXHIBIT 4

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)



MEXICO



