

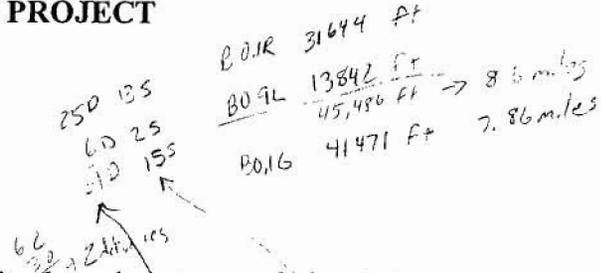
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION

# **BLOCK 9 - STAGE 2**

DESIGN DATA REPORT

FARMINGTON CONSTRUCTION OFFICE  
MAY 2001

**DESIGN DATA REPORT**  
**for**  
**BLOCK 9 PUMPING PLANTS AND LATERALS, STAGE 2**  
**NAVAJO INDIAN IRRIGATION PROJECT**  
**NEW MEXICO**  
**May 3, 2001**



**A. Introduction**

Block 9 will include six pumping plants with pressurized pipe lateral systems and elevated tanks and one gravity pipe lateral system. Stage 2 will deliver water to 30 double and 17 single delivery boxes serving 77 fields and 5,339 acres. Irrigation water for Block 9 will be supplied by Gallegos Pumping Plant and the Burnham Lateral.

**B. Scope of Stage 2**

Stage 2 consists of two pumping plants, B0.1R and B0.9L, each having adjacent elevated tanks. Stage 2 also has one gravity lateral system. Pumping plant B0.1R will have a pumped capacity of 35.2 cfs. The gravity system (B0.1G) will have a capacity of 40.7 cfs. The pumped lateral system served by pumping plant B0.1R will have 6.4 miles of pipelines. The gravity system will have 7.8 miles of pipelines. Pumping plant B0.9L will have a capacity of 19.4 cfs. The lateral system served by pumping plant B0.9L will have 2.7 miles of pipelines.

**C. List of Drawings (See Appendix A)**

- 809-529-7787 General Map
- 809-529-7788 Location Map
- 809-529-7789 Pumping Plant B0.1R, Site Plan.
- 809-529-7790 Pumping Plant B0.9L, Site Plan.
- 809-529-7791 Plan and Profile, Lateral B0.1L,  
Beginning to Station 50+00.
- 809-529-7792 Plan and Profile, Lateral B0.1L,  
Station 50+00 to Station 100+00.
- 809-529-7793 Plan and Profile, Lateral B0.1L,  
Station 100+00 to End.
- 809-529-7794 Plans and Profiles, Lateral B0.1L-0.9L and  
Lateral B0.1L-1.7R.
- 809-529-7795 Plan and Profile, Lateral B0.1R,  
Beginning to Station 60+00.
- 809-529-7796 Plan and Profile, Lateral B0.1R,  
Station 60+00 to End.

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| 809-529-7797 | Plans and Profiles, Lateral B0.1R-0.7R and Lateral B0.1R-1.6R                    |
| 809-529-7798 | Plan and Profile, Lateral B0.1G, Beginning to Station 40+00.                     |
| 809-529-7799 | Plan and Profile, Lateral B0.1G, Station 40+00 to Station 90+00.                 |
| 809-529-7800 | Plan and Profile, Lateral B0.1G, Station 90+00 to Station 140+00.                |
| 809-529-7801 | Plan and Profile, Lateral B0.1G, Station 140+00 to End.                          |
| 809-529-7802 | Plan and Profile, Lateral B0.1G-0.9R, Beginning to Station 58+00.                |
| 809-529-7803 | Plan and Profile, Lateral B0.1G-0.9R, Station 58+00 to End.                      |
| 809-529-7804 | Plan and Profile, Lateral B0.1G-0.9R-0.5R, Beginning to Station 55+00.           |
| 809-529-7805 | Plan and Profile, Lateral B0.1G-0.9R-0.5R, Station 55+00 to End.                 |
| 809-529-7806 | Plan and Profile, Lateral B0.1G-0.9R-0.5R-1.4R.                                  |
| 809-529-7807 | Plans and Profiles, Lateral B0.9L, Beginning to Station 40+00.                   |
| 809-529-7808 | Plan and Profile, Lateral B0.9L, Station 40+00 to Station 50+00.                 |
| 809-529-7809 | Plans and Profiles, Lateral B0.9L, Station 50+00 to End; and Lateral B0.9L-0.4L. |

#### **D. Survey Control**

Horizontal survey control for Block 9 is based on New Mexico State Plane Coordinates-West Zone. The grid factor used to convert ground distance to state plane coordinates is 0.9996305. All alignments are referenced and temporary bench marks are or will be set for construction surveying.

## **E. Hydraulic Design Criteria and Operating Data**

### 1. General

The following is general data that should be used in the design of the pumping plants and lateral systems:

- a. Annual water requirement is 2.96 acre-feet/acre irrigated.
- b. Days of peak pumping per year is seven.
- c. The peak pumping flow should be based on 8 gallons per minute per acre irrigated.
- d. The irrigation season is seven months per year, April through October.
- e. Irrigation is performed 24 hours per day during the irrigation season.
- f. Estimate of percent of annual water required by month:
  - 1) April . . . . . 6.8%
  - 2) May . . . . . 14.8%
  - 3) June . . . . . 20.6%
  - 4) July . . . . . 24.3%
  - 5) August . . . . . 17.8%
  - 6) September . . . . . 11.7%
  - 7) October . . . . . 4.0%

### 2. Deliveries

The delivery tables showing the required delivery and lateral flows, pressures and other delivery data for Block 9, Stage 2 are attached in Appendix B. The design flow for delivery design should be based on demand of 8.5 g.p.m. per acre.

The delivery water surface elevation is the sum of the following five items:

- a. Ground elevation of high point inside center pivot circle.
- b. 25 psi sprinkler nozzles (converted to feet of head).
- c. 5 psi of head loss in nozzle pressure compensators (converted to feet of head).
- d. Head loss in the center pivot based on formula provided by Valmont Irrigation. Diameter of pipe used in Valmont formula was 6<sup>5</sup>/<sub>8</sub>-inch.
- e. Estimated head loss in the pipe from the delivery to the center pivot (field line). To estimate the head loss in the field line, PVC pipe with a diameter that yielded a maximum water velocity of 6 to 7 feet/second was used, with some exceptions.

The deliveries for Block 9, Stage 2 should be identical to those designed for Block 9, Stage 1 (See Solicitation 00-SI-40-3360, including four amendments).

The pressure-sustaining settings in the deliveries should be set above the low water shutoff level for the pumping plant and below the last pump-on level. The pressure-sustaining valves in the deliveries must not open until the water in the elevated tank is above the low water

shutoff level and the main pumping units in the plant can start on auto. An appropriate dead band should be provided to insure that the pressure-sustaining valves do not open until the water is well above the low water shutoff level, and do not prematurely close during normal operations.

## 2. Laterals

Lateral piping that will serve three or less fields should be sized based on the sum of the delivery design flows (8.5 g.p.m. per acre.) Mainline lateral piping (that which will serve four or more fields) should be sized based on a flow of 8.0 g.p.m. per acre, using the cumulative acreage served by that lateral. Sectionalizing valves should be provided as shown on the drawings to isolate portions of the system during the operating season.

## 3. Pumping Plants

Pumping Plants should be sized to deliver a flow of 8.0 g.p.m. per acre, using the cumulative acreage served by the laterals. An insertable magnetic flowmeter is required at each pumping plant and in the gravity lateral. Traveling water screens will be required to screen the water being withdrawn from the canal into the plants. The conveyors for the traveling water screens should be the same as those specified for Block 9, Stage 1 (See Solicitation 00-SI-40-3360, including four amendments). The outlet for the gravity Lateral B0.1G shall be between the traveling water screen and the pumping plant sump. Provision shall be made for installation of a gate or stoplogs between the gravity lateral outlet and the pumping plant sump that will allow use of the gravity system without filling the pumping plant sump. The stoplogs design for Burnham Lateral are not desirable as they do not hold water. The traveling water screen should be capable of full operation without water in the pumping plant sump. Installation of a separate screen spray pump will be required for Pumping Plant B0.1R.

The pumping plants should be designed so that the laterals will automatically refill and repressurize following a power outage, provided that all equipment is fully operational and undamaged. The pressure-sustaining valves in the deliveries must not open until the water in the elevated tank is above the low water shutoff level and main pumping units in the plant have been allowed to start.

Extension of the turnout pipe will be required at pumping plant B0.1R. Construction of a new turnout will be required at pumping plant B0.9L. See Drawings 809-529-7789 and 809-529-7790 for the details.

## 4. Elevated Tanks

Elevated tanks should have adequate storage capacity so that a momentary power outage will not cause the tanks to drain below the low water shutoff level at 100 percent of design flow.

Storage must be adequate to allow the motor-operated discharge valves to close and then reopen while the laterals continue to deliver water. A pressure switch should be installed on the tank riser, five feet above the ground surface, to provide for low water shutoff of the plant. The low water shutoff level will need to be set well below the lowest pump-on level to provide an adequate dead band for positive operation of the pressure-sustaining valves.

#### **F. Pipe Requirements**

We require that all lateral pipe be minimum of class B. A 3 foot minimum cover is required above all pipe, unless otherwise indicated on plan and profile drawings or in this narrative. A 5 foot minimum cover is required at the following areas; 1) inside of future fields, 2) at existing washes, and 3) at roadway ditches (unless the lateral pipe is installed in a steel casing). The cover depth at the Gallegos Discharge Line crossing shall be the maximum that the situation and pipe sizes allow. The minimum 5 foot cover will be waived in this area. The same pipe options and pipe bedding options allowed in Block 9, Stage 1 should be used for Block 9, Stage 2 (See Solicitation 00-SI-40-3360, including four amendments).

No air valves, blowoffs, manholes or other above ground structures are allowed within the limits of the fields. Guard posts are required to mark the locations of buried manholes.

#### **G. Hydrology**

The topography of the Block 9, Stage 2 area shows that the laterals will cross no streams or significant cross drainages.

#### **H. Access Roads**

Gravel surfaced access roads are required to the pumping plants and elevated tanks from the adjacent canal berm roadways. Access to the deliveries and above-ground lateral structures will be via dirt roads around the fields.

#### **I. Road Crossings**

The laterals will cross existing and future paved BIA roads at six locations and will cross paved county road 302 at two locations. The laterals will also cross numerous unimproved dirt roads to oil and gas wells. Some of the BIA roads shown on the drawings may be under construction at the same time as the laterals. FCO will obtain crossing permits from BIA and San Juan County. Boring or open cut shall be used for crossing of all existing paved roads as pipe size and local conditions deem appropriate. The construction of road crossings by open cut shall be in accordance with specification requirements from Block 9, Stage 1. Specifications for road crossings by boring will have to be prepared.

## **J. Pipeline and Transmission Line Crossings**

The locations of pipelines and transmission lines shown on the drawings are approximate. The contractor shall verify the exact locations, depths and clearances prior to construction. The contractor shall coordinate all work on the pipeline or transmission line right-of-way with the owners and shall be responsible for all costs associated with the crossings. No air valves, blowoffs, manholes or other structures should be located within the right-of-way for the pipelines or transmission lines. FCO will obtain permits and/or agreements for the crossings as necessary.

FCO will attempt to locate all existing pipelines. There are numerous above ground and buried pipelines in the area of Stage 2. Some pipelines may be missed. The future contractor needs to be made aware of this fact. (Pipelines will be added to drawings at a later date and submitted by amendment to this design data package.)

The requirements of the natural gas and crude oil pipelines crossings will be determine at a later date when the crossing agreements are prepared. If possible the lateral pipeline shall go under the gas and oil pipelines with a minimum clearance of two feet.

The laterals will cross 34.5 kV, 230 kV, and 345 kV at various locations. The 34.5 kV and 230 kV lines are Navajo Indian Irrigation Project (NIIP) lines. The 345 kV lines are owned by Public Service Company of New Mexico (PNM). FCO will obtain permits to cross beneath the PNM lines.

## **K. Gallegos Discharge Line Crossing**

Lateral B0.1G-0.9R-0.5R will cross the existing Gallegos Discharge Line. The lateral shall cross above the existing pipe. Any additional requirements for this crossing should be included in the specifications. As stated above the minimum 5 foot pipe coverage will be waived in the area of the Gallegos Discharge Line crossing. There shall be a minimum of 1 foot of clearance between the existing Gallegos Discharge Line pipe and the lateral pipe. The coverage above the lateral pipeline shall be the maximum that the pipe size and existing conditions allow.

## **L. Permanent Power Supply**

Electrical power for both pumping plants B0.1R and B0.9L will be provided via a 13.8 kV distribution line from Pinabete Substation. This line was scheduled to be completed by February, 2002, but has been indefinitely delayed. Disconnects and conduit down the pole will be provided for each plant. Conduit from the disconnect pole to pumping plant and the power cable will be required to be installed under Block 9, Stage 2. The disconnect pole for Pumping Plant B0.1R is approximately 670 feet from the pumping plant yard as shown on Drawing No. 809-529-7789. The proposed disconnect pole location at Pumping Plant B0.9L

is approximately 30 feet from the pumping plant yard as shown on Drawing No. 809-529-7790.

In performing the design calculation use the following costs for electrical power:

1. Demand Charge . . . . . \$3.54 per Kilowatt/month.
2. Cost of Electricity used . . . . . \$0.084 per Kilowatt-hour.

**M. Supervisory Control and Communications**

All Block 9 pumping plants will be connected to Gallegos Pumping Plant by a fiber optic communication system. Gallegos Pumping Plant operations will be controlled by the cumulative pumping plant demands and will be linked to the Navajo Agricultural Products Industry (NAPI) headquarters by the future Phase 2 Supervisory Control System (SCS). The SCS will monitor pumping plant status and automatically regulate project canals to meet the irrigation demand.

An overhead optical ground wire will be installed on the 13.8 kV distribution line to provide communications to the pumping plants. The contractor will be required to install the fiber optic cable from the disconnect poles to the pumping plants.

**N. General Information**

1. Transportation/Shipping

The nearest shipping terminals are in Farmington, New Mexico. The nearest railroad terminal is in Gallup, New Mexico. There are several motor freight terminals in Farmington.

2. Access for Construction

The BIA Road 4178 is scheduled to be constructed prior to award of the contract to construct Block 9, Stage 2. County Road 302 and New Mexico State Highway 371 are existing paved roads. There are dirt access roads to the oil and gas well sites shown on Drawing No. 809-529-7788. These dirt roads are adequate except during and after rainstorms and snowstorms.

3. Housing and Population

The nearest towns are Farmington (estimated population 1994 - 37,500), Bloomfield New Mexico (estimated population 1994 - 6,000), and Aztec, New Mexico (estimated population 1990 - 5,400). Rental housing is in short supply and relatively expensive. Houses for sale are generally available. No government housing is available.

No permanent building will be required for operating personnel. Public facilities for water, sewage, and electricity are not available on site at this time. Electric power may be available at the pumping plant sites prior to construction.

#### 4. Weather

The historical monthly low temperatures, high temperatures, and monthly precipitation from 1969 to present were obtained from the New Mexico State University Agricultural Science Center South of Farmington and are presented in Appendix C. Winds are persistent and fairly strong in the spring, early summer, and fall and usually blow sand and dust.

#### 5. Clearing Vegetation

Vegetation in the project area is very sparse and consists primarily of native desert grasses and small shrubs.

#### 6. Right-of-way

The right-of-way limits are shown on the drawings. FCO should be notified immediately if the right-of-way does not appear to be adequate at any location. All right-of-way is on Navajo Nation tribal trust lands.

### **O. Geological Investigations**

The geological data will be submitted by separate report.

### **P. Construction Material**

If required, borrow areas will be located adjacent to the site and will be identified in the field.

Concrete, aggregate, and gravel surfacing are available from the same sources described in Block 9, Stage 1 (See Solicitation 00-SI-40-3360, including four amendments). San Juan Gravel Products and ARCO Materials were purchased by the same company, therefore there is only one source of materials whose aggregates are presently approved.

### **Q. Environmental Considerations**

#### 1. General

The specifications should include standard environmental protection paragraphs, including dust abatement, noise abatement, light abatement, landscape preservation, and pesticides.

#### 2. Cultural Resources

The Block 9 area has been surveyed and an archeological clearance has been given for construction. The contract should contain the appropriate paragraphs for protection of cultural resources should any be discovered.

### 3. Water Quality

Construction of Block 9 will have minimal impact on water quality. The contract should include standard paragraphs for prevention of water pollution. A general National Pollutant Discharge Elimination System (NPDES) permit will be required since the area to be disturbed will exceed five acres. No. 402 and 404 permits should be necessary for construction.

### 4. Topsoil and Seeding

Stripping and replacement of topsoil outside of field areas will not be required. For areas inside of fields the top one foot of existing material should be stripped, stockpiled, and replaced after lateral constructions. All disturbed areas shall be scarified and regraded, as required, so that all surfaces blend with the natural terrain and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

All areas disturbed during construction will be seeded after completion of the contracts by NAPI.

## **Appendixes**

- A. Drawings
- B. Delivery Data
- C. Weather Data