WELLTON-MOHAWK IRRIGATION SYSTEM, RELIFT STATION,
TEXAS HILL CANAL 2.5
Northern Terminus of Avenue 51 East, approximately .5 mile south of
Union Pacific Railroad
Wellton vicinity
Yuma County
Arizona

HAER AZ-68-D
AZ-68-D

HAER
AZ-68-D

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
INTERMOUNTAIN REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
PO Box 728
Santa Fe, NM 87505

HISTORIC AMERICAN ENGINEERING RECORD

Wellton-Mohawk Irrigation System, Relift Station, Texas Hill Canal 2.5

HAER No. AZ-68-D HAER AZ-68-D Page 1

Location: Relift Station, Texas Hill Canal 2.5, is located 2.5 miles downstream from the Texas Hill Canal turnout, Wellton vicinity, Yuma County, Arizona. The irrigation feature is situated near the northern terminus of Avenue 51 East. The Union Pacific Railroad (which connects the communities of Wellton and Buckeye) runs roughly parallel to this segment of the canal, approximately ½ mile to the north.

The relift station lies within the NW ¼ of the NW ¼ of the NW ¼ of Section 13, Township 7 South, Range 15 West, on the 1955 Growler, Arizona, 7.5-minute U.S. Geological Survey (USGS) quadrangle (photorevised 1982). Universal Transverse Mercator Coordinates: Zone 12, N 3634981 E 241291.

Present Owner: U.S. Department of the Interior, Bureau of Reclamation
Lower Colorado Regional Office
Boulder City, Nevada

Present Use: Relift station on the Texas Hill Canal.

Significance: Construction of the Wellton-Mohawk Division of the Gila Project began in 1949 and was essentially completed in 1957. With the completion of the irrigation system, Colorado River water was delivered to previously arid lands in the lower Gila River valley. Construction of the Texas Hill Canal began in July 1955 and was completed in October 1956. The U.S. Department of the Interior, Bureau of Reclamation engineers designed the gravity-fed system to carry water up the Gila River valley, opposite the river's flow. This required several large and small pumping stations along the canal to compensate for elevation changes. Although not individually eligible for listing in the National Register of Historic Places, the relift station contributes to the function and significance of the Wellton-Mohawk irrigation system (Thompson and Sterner 2005:111).

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Date: September 2006

I. PHYSICAL HISTORY

A. Date of Construction

The relift station, Texas Hill Canal 2.5, is one of several pumping plants on the Wellton-Mohawk irrigation system and was constructed between 1955 and 1956.

B. Architect

The Office of the Chief Engineer, Bureau of Reclamation, Denver, Colorado, designed the pumping plant.

C. Original Owner

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) holds title to the facilities, works, and lands of the Wellton-Mohawk Division of the Gila Project. The Wellton-Mohawk Irrigation and Drainage District (WMIDD), a state-chartered agency that was established as the local water users organization that would administer the irrigation project, is responsible for operating and maintaining the irrigation system.

D. Builder

Bids to construct the Texas Hill Canal and distribution system were opened June 9, 1955, with the Vega Engineering and Construction Company submitting the low bid of $1,519,646.90. Reclamation awarded the contract to the company on July 13, 1955, and work began later that month. All work was completed on October 31, 1956, the last day of the contract. Reclamation delayed formal acceptance until December 7, 1956 (Reclamation 1955:12–13, 1956:11). The relift station at Mile 2.5 on the Texas Hill Canal was one of many canal structures completed under this contract.

E. Original Plans and Construction

Reclamation's Office of the Chief Engineer, Denver, Colorado, produced the original architectural and engineering drawings for the pumping plant. Dates on the drawings range from January to February 1955. The Vega Engineering and Grading Company constructed the relift station as part of a larger contract to build the Texas Hill Canal and distribution system.

II. ARCHITECTURAL AND ENGINEERING INFORMATION

The Wellton-Mohawk irrigation system begins approximately 15 miles below Imperial Dam. Water is first diverted from the Gila Gravity Main Canal into the 18.5-mile-long Wellton-Mohawk Canal, which has an overall capacity of 1,300 cubic feet per second (cfs). The system has two main branches, the 19.9-mile Wellton Canal and the 46.8-mile Mohawk Canal. The Wellton Canal has a diversion capacity of 300 cfs and the Mohawk Canal has a diversion capacity of 900 cfs. Subordinate to these three conveyance channels are over 200 laterals that distribute water to individual users through a labyrinth of smaller conveyances. The two largest laterals are the 13-mile Dome Canal and the 9.8-mile Texas Hill Canal. Although technically they are laterals, the capacities of the Dome Canal (220 cfs) and the Texas Hill Canal (125 cfs) far exceed the flow capacity of most of the laterals in the system.

At the east end of the Wellton-Mohawk irrigation system, the Texas Hill Canal receives water from the Mohawk Canal and extends about 10 miles to the east and north of the Mohawk Mountains. The Texas Hill Canal irrigates farms in the Texas Hill area. The concrete-lined canal has an initial bottom width of 5'-0".

The entire irrigation system can best be described as gravity fed, using large and small pumping stations only when elevation corrections are necessary. The relift station at Mile 2.5 on the Texas Hill Canal (Figures 1 and 2) raises and regulates the flow of water along that section of the canal and functions in much the same manner as Pumping Plant Nos. 1–3 on the Wellton-Mohawk Canal (see AZ-68-A through AZ-68-C) but on a smaller scale.

The following sections describe the pumping-plant features and operations.

A. Description of Forebay and Intake

Water in the Texas Hill Canal generally flows in an easterly direction as it approaches the forebay of the relift station at Mile 2.5. The concrete-lined forebay is about 23' wide at the opening and about 27' wide at the intake for the pumping units. A metal trash rack covers the intake to the pumping units and prevents plant matter and other debris from interfering with pumping operations. Maintenance crews clean the trash rack manually from the operating deck above the intake to the pumping units.

The intake structure is constructed of reinforced concrete and consists of three bays (one for each pumping unit) separated by two 16"-wide concrete piers that provide support to the operating deck. Water flows into the intake where the pumps pull up the water and convey it to the new canal level. When the water-surface level in the upstream canal is normal, the intake bays are mostly submerged.

On the north side of the canal bank, at the point where the canal transitions to the forebay, there is an outlet structure for the spillway located in the afterbay section (described below). An underground,

concrete pipe connects the spillway to the outlet structure. A concrete box in place above the outlet functions as an energy dissipater to minimize return-flow turbulence (Figure 3).

B. Description of Operating Deck

The concrete operating deck above the intake supports the pumping units and provides access to the trash rack on the intake side. It is rectangular in plan and measures 13'-4" x 29'-0". A solid-metal railing spans the deck directly above the trash rack. Metal grates cover the stop-log slots on the portion of the deck behind the trash rack (Figure 4). Stop logs are placed in the slot to seal off the pump intake opening when a pumping unit is taken out of service for maintenance, repair, or inspection.

The relift station incorporates three vertical turbine-type pumps. Each unit has a capacity of 41 cfs and is powered by a 125-horsepower electric motor (Figure 5). The turbine pumps pull water from the canal forebay and deliver it to the canal afterbay through three 42"-diameter, steel discharge pipes that are connected to precast-concrete discharge pipes of the same diameter. The steel discharge pipes pass through a 9'-0"-high concrete retaining wall where they then connect with the buried, concrete discharge pipes, the latter of which empty into the afterbay section.

C. Description of Afterbay

Water is lifted from the canal forebay about 19' in elevation and is then discharged into the afterbay. The afterbay section consists of three discharge channels, one for each of the discharge pipes connected to the turbine-type pumps. The outlet structure is constructed of reinforced concrete. Similar to the intake, the outlet structure has three bays, or compartments, into which the pipes dump water. This structure consists of a bulkhead wall, two partition walls, and a downstream wall that spans the width of the canal. The structure does not have a deck and is open at the top. A chain-link screen covers the opening as a safety precaution. The bulkhead wall is 10'-3" high and contains the pipe openings. Two 8"-thick concrete walls divide the outlet structure into thirds. Both walls are 8'-8" high. The downstream wall measures 8" thick x 8'-8" high x 16'-0" wide. Incorporated at the base of the downstream wall are three circular openings; each opening is 48" in diameter. Three steel flap gates are attached to the downstream side of the wall above the openings (Figure 6). When a pump is operating, the corresponding flap gate is forced open by the flow of water being discharged into the afterbay. When the pump is shut down, the weight of the gate combined with the water pressure in the canal causes the flap gate to close. In its closed position, the flap gate prevents water from flowing back into the pump when the unit is shut down for repairs.

The relift station incorporates a side-channel spillway, or lip spill, in the afterbay section. Spillways are structures that protect the irrigation system from uncontrolled excess flow in the canal (Aisenbrey et al. 1978:179). This structure is situated on the north side of the canal with the spillway crest parallel to the canal alignment. When too much water is discharged into the afterbay, the water surface rises over the crest and flows into the spillway. From the spillway, the water is redirected to the forebay through an underground, 36"-diameter, precast-concrete pipe. The spillway is constructed of reinforced concrete with a rectangular cross section 5'-0" wide x 45'-0" long. To ensure unrestricted discharge into the side channel,

the water surface in the side channel is below the spillway crest and the side channel has a downward slope from the downstream end to the upstream end. At the upstream end of the feature is a 10'-0"-deep pool where the water flows into the discharge pipe. As a safety measure, a protective metal grate covers the opening to the pool (Figure 7).

D. General Description of Surrounding Features

On the north side of the operating deck, one timber utility pole supports the power lines and transformer that provide electricity for pumping operations. Metal motor-control cabinets set on a concrete-floor base are located north of the three pumping units. These cabinets contain the switchgear for operating the pump motors.

A reinforced-concrete retaining wall surrounds the pumping plant to the east, north, and south. The wall is about 9' high and holds in place the compacted, upward-sloping, earthen embankment.

Vehicle access to the relift station is by bladed dirt roads on either side of the canal. A service yard with a bladed, dirt surface lies immediately south of the deck area.

E. Recent Construction

In 2005, the WMIDD reconstructed approximately 3,000' of canal immediately upstream from the station. This section of the Texas Hill Canal had completely deteriorated into a natural stream and did not resemble a canal. Water from elevated farm land on either side of the canal migrated down and underneath the canal lining, resulting in massive erosion (Figure 8). To remedy the situation, this length of canal was converted to an underground culvert, aided by a sump-pump system to prevent water erosion (Figure 9). According to Charles Slocum (personal communication 2006), WMIDD Manager, altering this section of the canal did not have an impact on the integrity of the relift station. Workers tied in the new concrete with the concrete of the existing forebay structure, thus preserving the size and configuration of the forebay. That same year, the WMIDD raised the height of the concrete box associated with the spillway outlet and raised the wall along the north side of the forebay to mitigate the effects of splashing water when the spillway return is discharging at full capacity (Charles Slocum, personal communication 2006) (see Figure 2).

III. REFERENCES CITED

Aisenbrey, A. J., Jr., R. B. Hayes, H. J. Warren, D. L. Winsett, and R. B. Young
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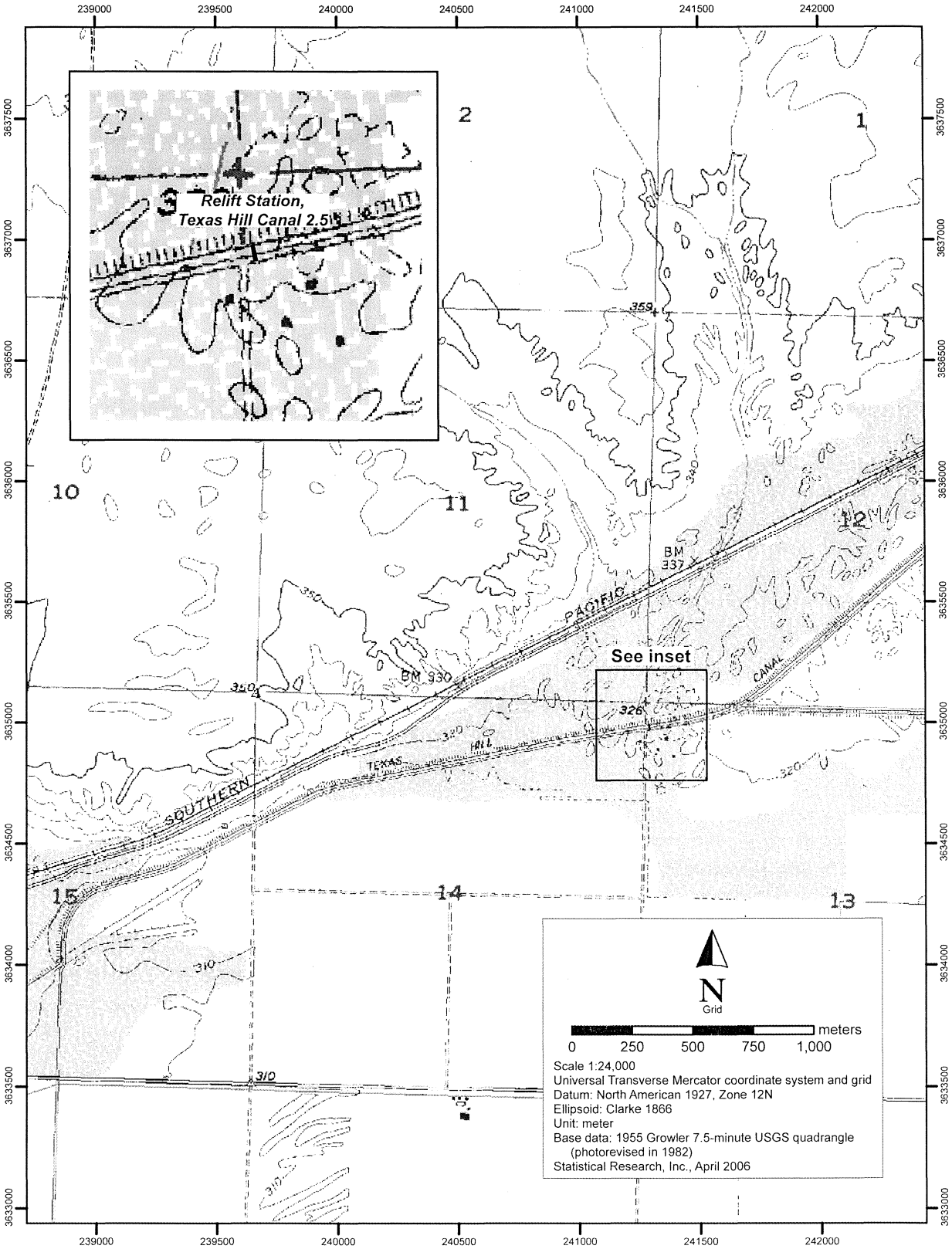

Figure 1. Project location (1955 Growler, Arizona, 7.5-minute USGS quadrangle [photorevised 1982]).

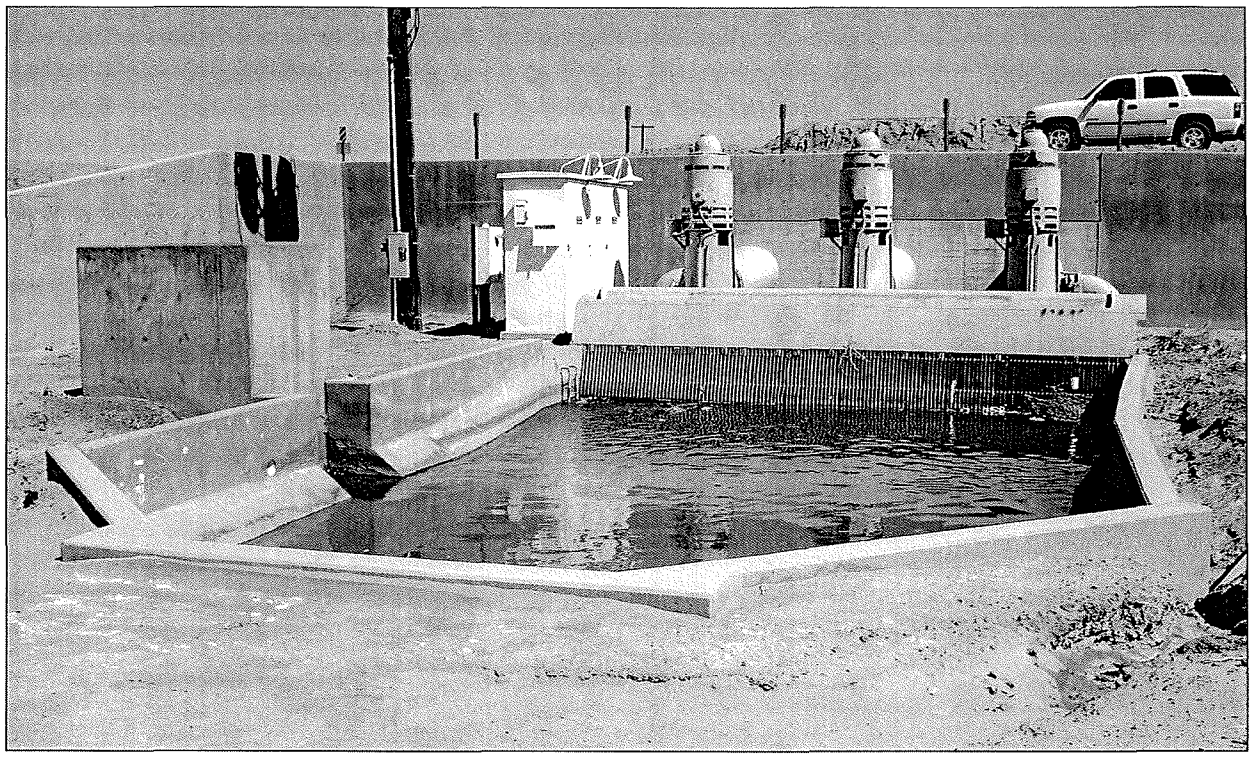

Figure 2. Relift station, Texas Hill Canal 2.5, view to the east, October 2005.

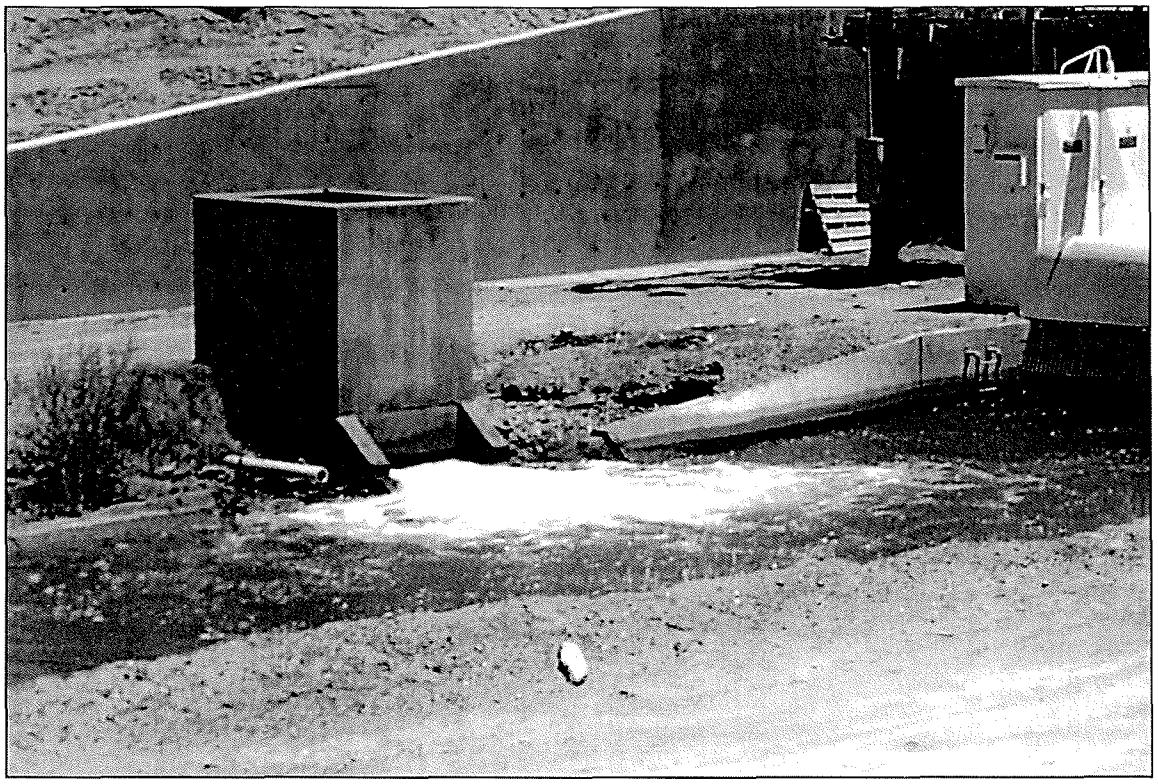

Figure 3. Outlet for spillway, June 2004.

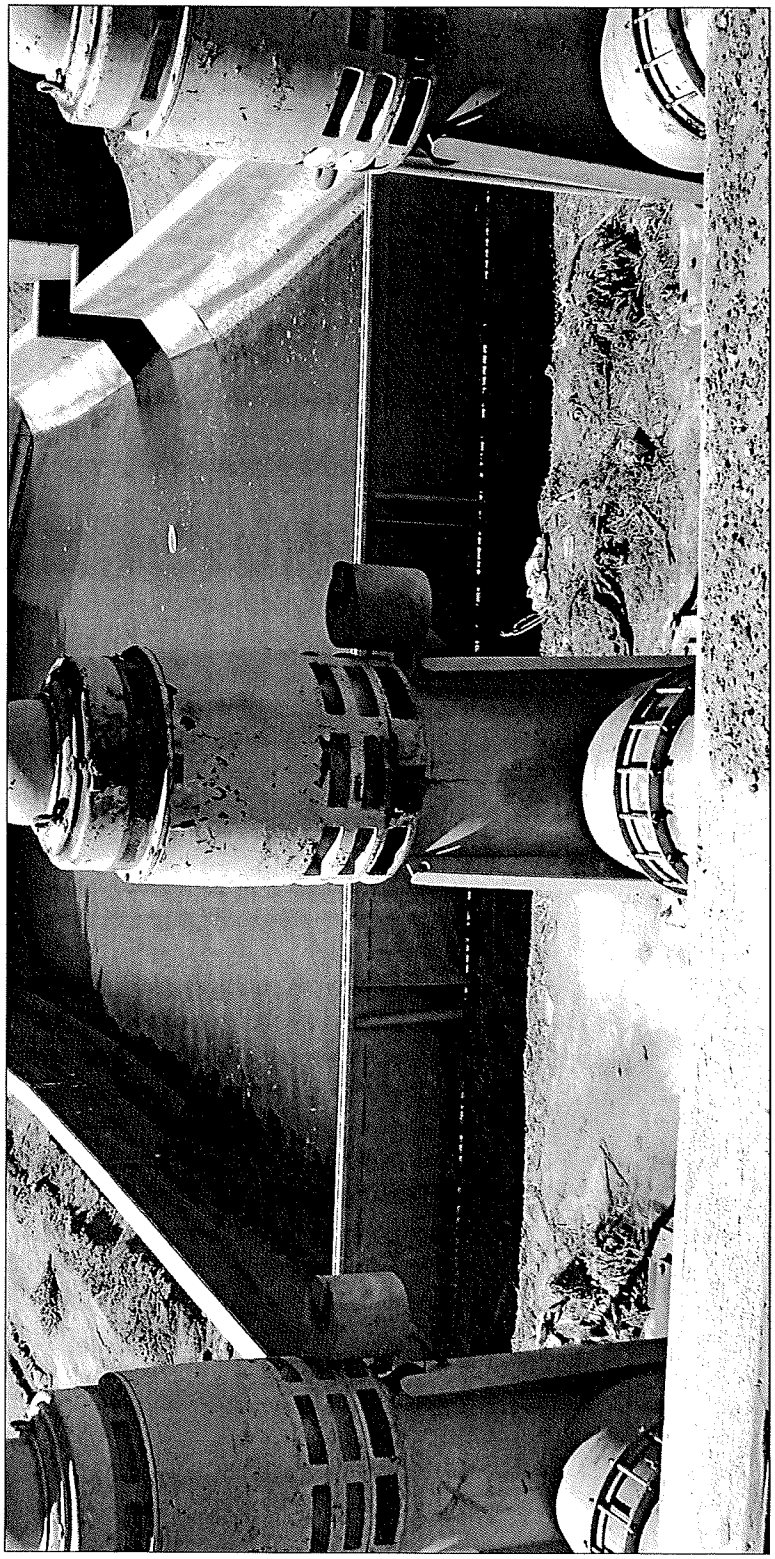

Figure 4. Operating deck of relift station showing metal railing and grates, view to the west, October 2005.

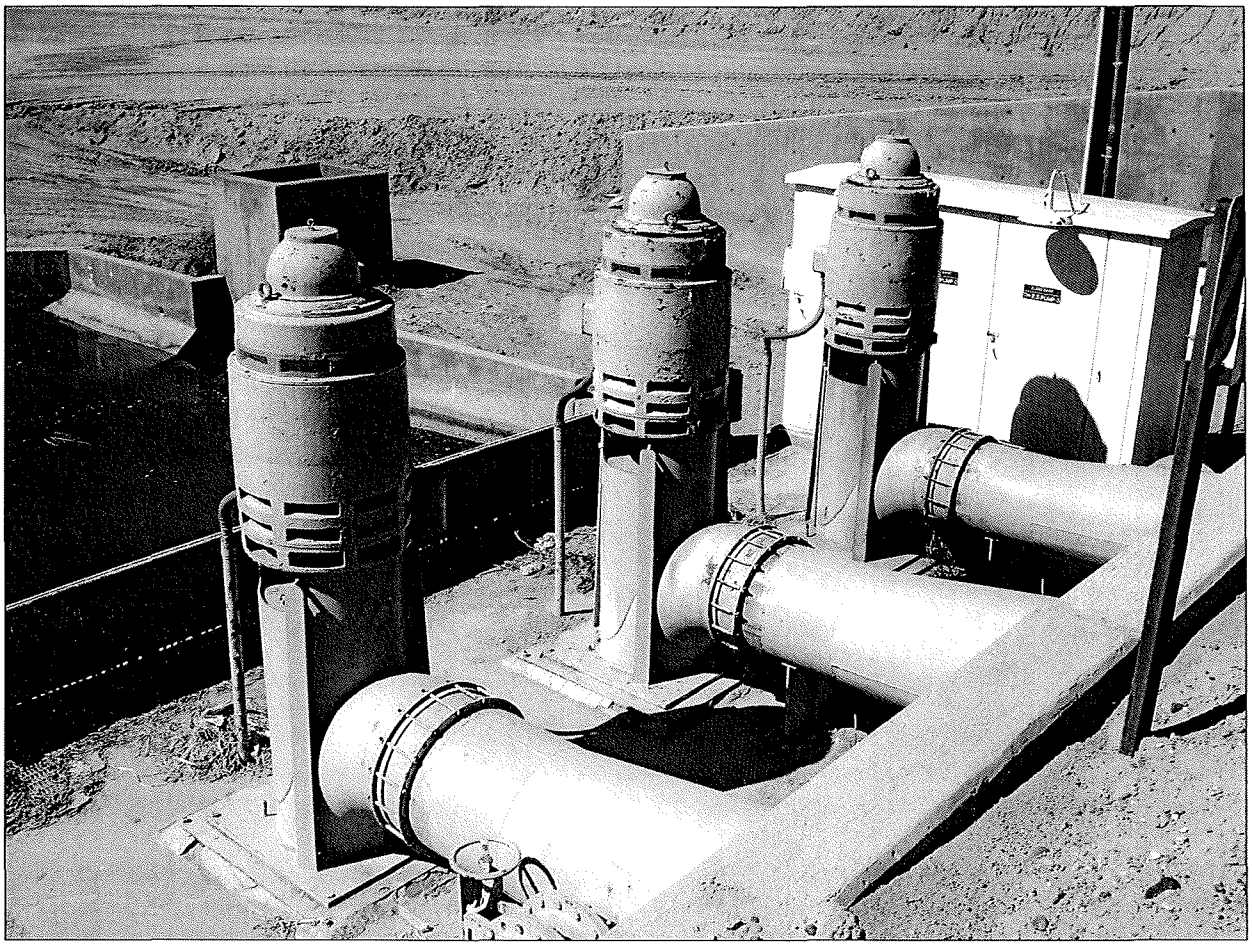

Figure 5. Vertical turbine-type pumps and motors, view to the northwest, October 2005.

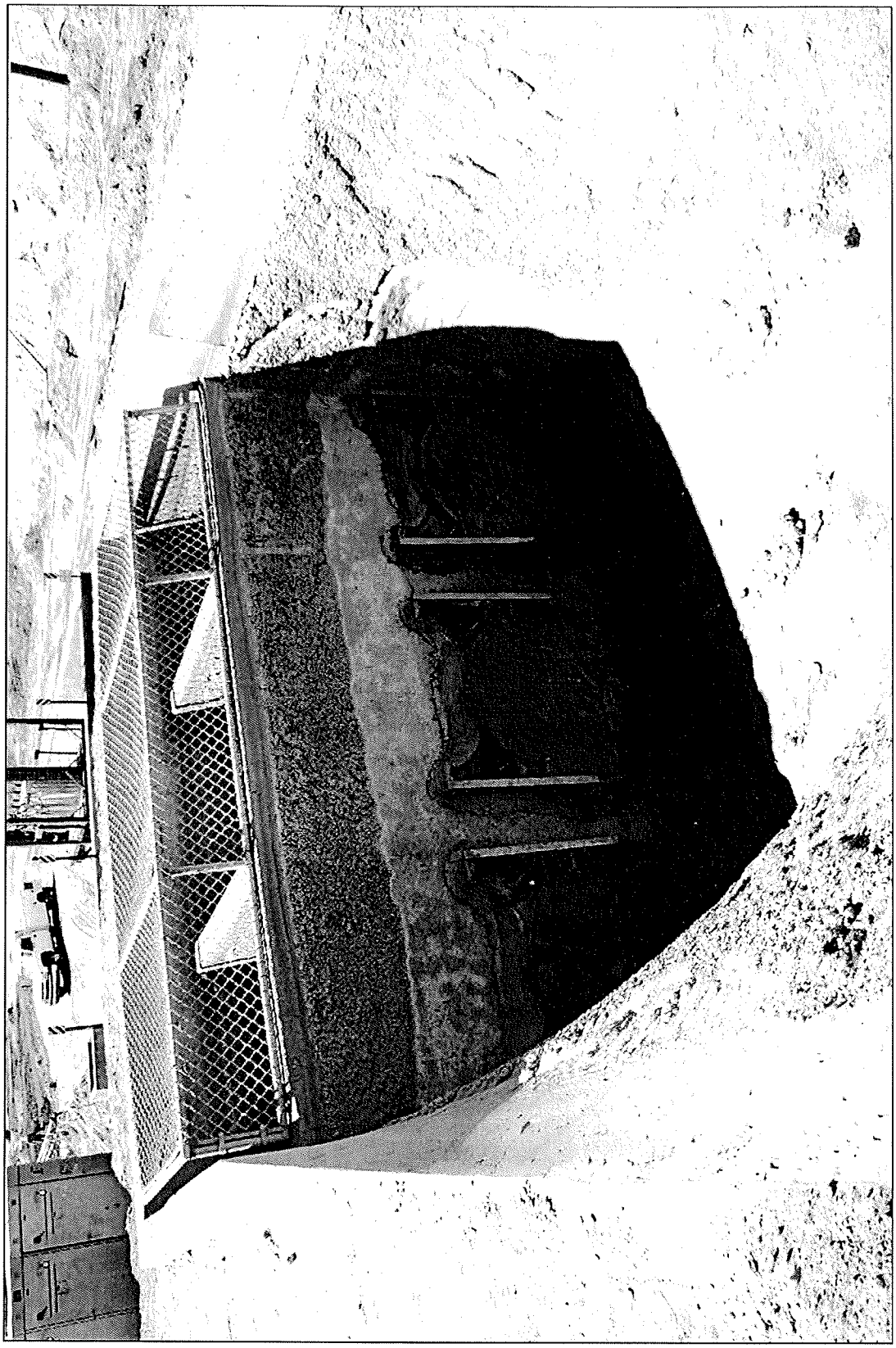

Figure 6. Flap gates on outlet structure, view to the west-northwest, September 2004 (photograph courtesy of the WMIDD).

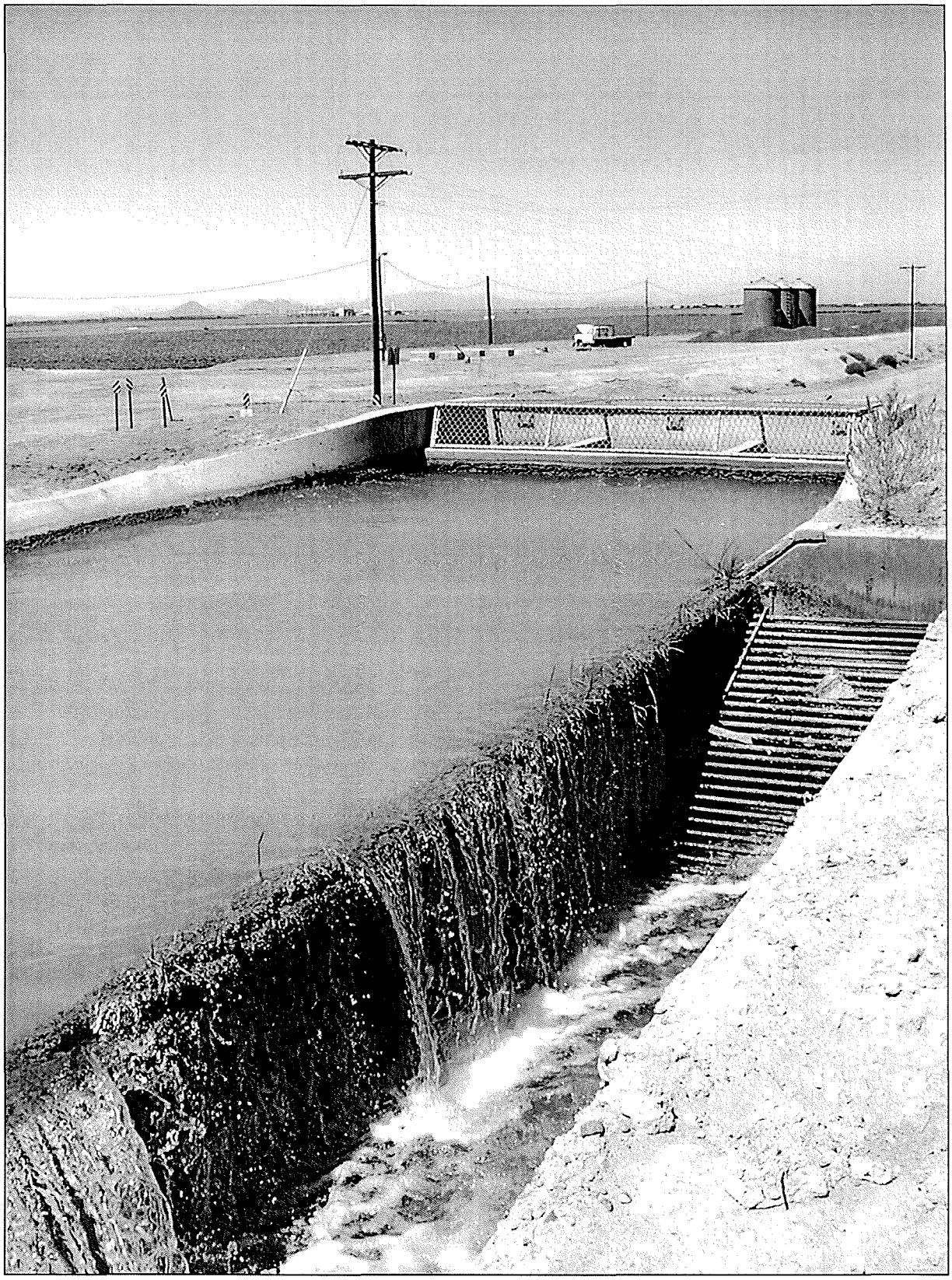

Figure 7. Spillway in afterbay section, view to the west-southwest, June 2004.

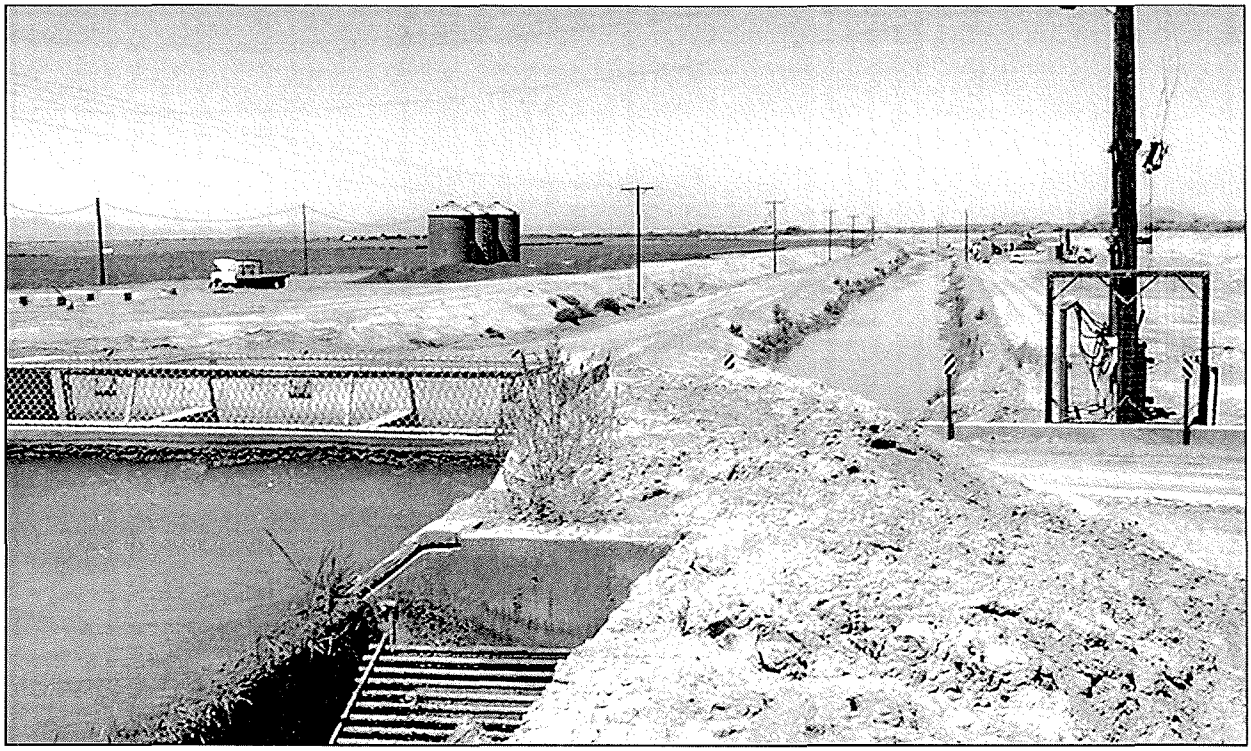

**Figure 8. Looking upstream from the afterbay, June 2004.
Note the eroded canal banks in the background.**

Figure 9. Looking upstream from the relift station, October 2005.