MUNICIPAL REQUIREMENTS OF A SALINE CONVERSION PLANT

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I have been asked to briefly discuss some of the background which let to Roswell being designated as a site for a demonstration plant to convert brackish water into potable water suitable for municipal and industrial use. I shall also point out some of the problems which the City had to overcome to meet various requrements of the government and what we hope to achieve by the location of this plant at Roswell.

The problem of saline water has been present in the Roswell Artesian Basin for many years. The analysis of water from ten irrigation wells west of the Pecos River during the early days of irrigation showed a range in chloride content of 69 parts per million to 287 parts per million. As pumping continued, the chloride content of water in the artesian wells between Roswell and the river increased. By 1958, the chloride content of the water in the wells ranged from 500 parts per million near the eastern limits of Roswell to more than 5,000 parts per million near the Pecos River east of Roswell. This encroachment of sodium chloride posed a serious problem for the City of Roswell and the farmers in this area.

The United States Geological Survey, in cooperation with the State Engineer of New Mexico, began a study of this saline area in 1952. The Pecos Valley Artesian Conservancy District entered into a Cooperative Agreement with the United States Geological Survey covering the period of 1956 through 1958 to continue the study of the salt water encroachment. The results of these studies were published by the New Mexico State Engineer as Technical Report 17.

One of the proposed methods for inhibiting the encroachment involved the reducing of the artesian pressure in the source area of the saline water which is East and Northeast of the City. It was apparent that steps should be taken immediately to retard this salt water encroachment.

In 1958, the City of Roswell, received information concerning the government's plan to establish five saline water conversion plants in the United States, each to utilize a different method of conversion, with one of the plants to be located in the arid Southwest. The matter was discussed fully by City officials,

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the directors of the Pecos Valley Artesian Conservancy District, and the Chamber of Commerce. It was decided that Roswell should make an all out effort to obtain the plant designated for the arid Southwest.

The interested groups were of the opinion that this plant might establish that the large quantity of highly saline water in the area might be salvaged to furnish the entire municipal needs of the City at a cost which would not be prohibitive. In the event this could be established, such operation would eliminate pumping the City wells in the fresh water areas, resulting in increased artesian pressure in this area which would retard or hold back the salt water encroachment.

These groups also felt that the demonstration plant might prove the effectiveness of retarding the encroachment by reducing the artesian pressure in the source area of the saline water as suggested by Technical Report 17.

The City obtained from the Office of Saline Water a questionnaire listing the various types of information needed by that office for site selection purposes. A bound brochure covering all the various types of information needed was complied by the City and the Chamber of Commerce, which accompanied the City's application which was sent to Washington on January 29, 1959. The format of this brochure, the imagination and the hard work which went into its preparation, returned large dividends to the City. It was this brochure which resulted in Roswell being selected as one of ten cities out of 55 applicants from the arid Southwest, for a physical inspection by the Site Selection Board.

The Site Selection Board at that time used the following rating system:

A.	Technical Factors	62%
B.	Demonstration Value	24%
C.	Assistance Offered	14%

The New Mexico State Legislature contributed to the effort of New Mexico cities in obtaining a plant site for the state by appropriating $100,000.00 toward the construction cost of the plant.

The Site Selection Board visited Roswell on November 9, 1959. An informal dinner and meeting was held at Walker Air Force Base. It was attended by city officials, members of the Chamber of Commerce, Pecos Valley Artesian Conservancy District Directors and other interested citizens. This informal meeting was extremely helpful in enabling the working committees to become personally acquainted with the Site Selection Board members and paved the way for a very successful meeting with them the following day.

This informal get together enabled the various officials to determine in advance the information in which the Board was primarily interested and the various physical facilities the Board wished to visit. This permitted these officials to insure that all required information was available at the meeting and the tour of the plant site and other physical facilities of interest to the Board was arranged in a most efficient manner.

The City of Roswell was advised on February 3, 1960, that the saline water plant was to be awarded to Roswell, New Mexico. In May of 1960, it appeared that Roswell might acquire a larger conversion plant capable of producing one million gallons of product water per day to be powered by atomic energy. This was a plant that was originally scheduled for the West Coast. It was finally determined that because of the availability of gas and electric power close to the plant site in Roswell, there was no justification for the atomic powered type of plant with its resulting high cost of atomic power.

The original plan was for Roswell to have an electrodialysis plant which was later switched to Brewster, North Dakota. A Cooperative Agreement between the United States of America and the City of Roswell was entered into on September 7, 1960, which set out the various obligations of the City and the United States in connection with the construction and operation of the salt water conversion plant. These obligations are as follows:

I.

The City was required to obtain a fee simple title to the land upon which the plant would be constructed and convey this land to the government. A tract containing approximately 6.9 acres was acquired for this purpose.

Examination of the title covering this property disclosed that there was an outstanding oil and gas lease on the property which would not expire until late in 1961. The City was unsuccessful in running down the various owners of interest in this oil and gas lease and, therefore, could not get it released. The City finally agreed to furnish an indemnity or hold-harmless agreement to the United States covering any possible adverse claim during the remaining period of this oil and gas lease.

II.

The United States agreed to use its best efforts to design, construct and operate on the site a demonstration plant designed to process from brackish water 250,000 to 1,000,000 gallons per day of fresh water by the forced circulation vapor-compression-distillation process. The United States was to own, be responsible for, and exercise exclusive control over the design, construction and operation of the plant during the period of the contract.

III.

The City was required, at its sole expense, to construct, install, and furnish pipe lines and other mechanical and storage equipment and facilities necessary to deliver to the plant brackish water of a saline concentration of approximately 11,200 parts per million and to dispose of the brine effluent from the plant, transport product water from the plant and deliver the same to the city water system. These obligations created a number of problems for the City of Roswell.

The Roswell Artesian Basin has been closed to any further appropriations of water from the artesian aquifer since 1931. The saline water is encountered in the artesian aquifer which raised a legal problem. Could a new appropriation of this water be legally made in this closed basin, particularly in view of the fact that the water to be appropriated could not be placed to any other beneficial use? A companion question was, would it be necessary to secure an appropriation for the full quantity delivered to the plant or just in the amount of the product water which the plant produced? These questions have not been resolved at this time. Fortunately, the City of Roswell owned sufficient valid water rights, in excess of their present needs, to supply the requirements of the plant. The matter has been temporarily solved by designating the plant well as a supplemental City well and the total water produced is charged against the City's water rights.

The Pecos Valley Artesian Conservancy District drilled test wells in the area of the plant site to determine whether they could secure an adequate supply of water with the salinity content required by the United States. Three such test wells were drilled prior to the drilling of the present well which is furnishing the water to the plant. The Pecos Valley Artesian Conservancy District drilled all of these wells and also furnished the casing for the production well which was drilled 32 feet into the San Andres Formation and which, upon completion,

flowed 1,150 gallons per minute from a stand pipe 4 feet above the ground.

IV.

The City was required to deliver to the plant at the rate of not less than 600,000 to 2,400,000 gallons per day of brackish water, the salinity concentration of which would be approximately 11,200 parts per million. The chloride content of the water from the present plant well varied from 8,130 parts per million to 8,190 parts per million and will undoubtedly increase as the well is pumped.

V.

The City was required to dispose of the brine effluent from the plant at a rate of approximately 350,000 to 1,400,000 gallons per day at the site and by a method mutually agreeable to the State of New Mexico, the City, and the contracting officer. This requirement presented the greatest problem of any insofar as the City of Roswell was concerned.

The City had originally planned to construct large earthen tanks into which the effluent would be deposited and the fluids evaporated therefrom. There arose a serious difference of opinion between various agencies as to whether the depositing of this effluent in unlined tanks would contaminate the shallow ground-water basin underlying the tanks and resulting contamination of the Pecos River. One of the main problems, of course, would be the effect upon wells in the immediate area of the tanks.

In an effort to solve this problem, the Roswell Geological Society was requested to make a study of the problem and give its recommendation as to how the effluent should be handled. The New Mexico Institute of Mining and Technology was also asked for their recommendation. Due to the time element, extensive studies could not be carried out by either of these groups. It was the opinion of both the Geological Society and the Institute that, because of the possibility of leakage and subsequent contamination of the Pecos River and the existing shallow ground-water supplies, the initial disposal would be done more safely by injecting the effluent into the deep lying formations east of the river. It was estimated that the initial cost of transporting the effluent by pipe line and injecting into an abandoned oil test well some ten miles from the plant site would be $182,000.00 with an annual operating

cost of $2,000.00. This method was ruled out because of the cost.

To prevent any possible contamination of the underground waters, or the waters of the Pecos River, the City finally agreed to construct and line these tanks and when they are completed, will be the largest lined tanks in the world. The City of Roswell purchased 240 acres of land adjacent to the proposed plant site from the State of New Mexico upon which these tanks were constructed. The tanks were constructed in three parts--one covering 40 acres, another 30 acres, and the third one 20 acres. Each of the tanks are to be filled with effluent by stage. The tanks are being lined with polyethylene and it took 4,400,000 square feet of lining at a cost of $35,000 for the material and approximately 1 cent per square foot for laying the lining or approximately $40,000.00. All of the work in the constructing of the tanks and laying of the liner was accomplished by the regular City employees. Prior to the construction of the tanks it was necessary that the land underlying these tanks be drained. The shallow water table was so close to the surface in this area that it was impossible to get heavy equipment in to construct the tanks. These tanks are 7 feet high, approximately 2 miles in length, and have a 16-foot top. After the polyethylene liner was laid, then it was necessary to cover it with a minimum of 6 inches of dirt to prevent the sun from deteriorating the polyethylene. It is estimated that the effluent from the plant will produce 130 tons of minerals per day. The Department of Health, Education and Wefare agreed to provide 30% of the total cost of lining the tanks on the basis that it would prevent the pollution of an interstate stream, being the Pecos River, to which the shallow water basin would normally drain.

VI.

The City agreed to transport the product water from the plant and deliver the same to the City water system at a rate of approximately 250,000 to 1,000,000 gallons per day. The City was also required to provide fresh water at the plant site to the United States, and its contractors, as needed for the constructing, operation and maintenance of the plant or any part thereof.

VII.

During the period that the plant is owned and operated by the United States, the City agreed to purchase from the United States at the government's actual cost of production, not to

exceed the price of 60 cents per thousand gallons, the product water estimated to be 250,000 gallons per day and not to exceed the price of 40 cents per one thousand gallons of product water estimated to be from 250,000 to 1,000,000 gallons per day. Under the terms of this Agreement, the United States, in accordance with the provision of Section 4 of Public Law 85-883, must proceed as promptly as practicable after September 2, 1965, to dispose of the plant by sale to the highest bidder unless otherwise directed by act of Congress.

We hope that this demonstration plant will come up with the answers which will solve some of our problems.