752 Eastdale Drive
Fort Collins, Colorado

FIELD TRIP REPORT RELATING

to

BENTONITE SEDIMENTING OF CANALS

in

Wheatland Irrigation District

Wheatland, Wyoming

Prepared for the
Wyoming Natural Resource Board
and the
Wheatland Irrigation District

by
R. D. Dirmeyer, Jr.
Consulting Engineer

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Introduction

At the request of Mr. Paul A. Rechard, Chief of Water Development, Wyoming Natural Resources Board, and with the concurrence of the Board of Directors of the Wheatland Irrigation District, Wheatland, Wyoming, a field trip was made to District area on October 2 and 3, 1957. The purposes of the trip were to:

a. review the results of the past sedimenting work completed by the District during the fall of 1956, and

b. assist Mr. Jack Cole, Engineer, and Mr. Charles Preuit, Superintendent, both of the District, in their current sedimenting installation plans.

Summary of 1956 Sedimenting

The District completed two bentonite sedimenting trials in two short reaches of canal during the fall of 1956. Dr. D. B. Simons formerly of the University of Wyoming assisted in the No. 3 canal trial.

Trial in No. 2 Canal:- About 1/2 mile of this canal was treated, starting at the bridge at about mile 3.0 from the canal headgate. The canal is fairly large - - maximum capacity of about 225 cfs and a wetted perimeter of from 25 to 30 feet. It is also a fairly slow canal - - canal slope of between 2 to 3 feet per mile.

Trial in No. 3 Canal:- About 3/4 mile of the canal was treated, starting near the siphon across Sand (?) Creek and about 1 1/2 miles from the canal headgate. The first 1/4 mile or so of the treated reach is a fill section. This canal is considerably smaller than canal No. 2 - - a maximum capacity of about 60 cfs and a wetted perimeter of about 10 to 15 feet. The slope is quite flat - - probably between 1 to 2 feet per mile.

In both reaches the canal bed materials are quite sandy to gravelly, but at the present time a silt layer mantles most of the canal bottom and bank areas. The latter, however, is probably largely related to several very muddy flows of river water experienced during the 1957 season.

In both trials a local pit-run bentonite material was used and it was mixed into the sedimenting water with compressed air jetting. A ponding method of sedimenting was used in both trials. Information on the amount of bentonite used in the trials was not obtained, nor was cost information obtained.

The field below the No. 2 Canal trial is noticeably drier this year than it was last year. Thus, it is believed that the trial was successful -- especially since the canal carried considerably more water this year than it did during the preceding water short years.

The results from the No. 3 canal trial are somewhat less favorable in that the borrow area on the downstream side of the fill section of the trial reach is still wet. The borrow area on the upstream side of the fill is, however, dry where it was wet in the previous years. It may be, however, that water from some other source, other than canal seepage, is contributing to the high water table in that area.

Scheduled New Work

Another bentonite sedimenting installation is being planned for the No. 2 Canal -- the reach immediately upstream from the bridge at the head end of the 1956 trial. The length involved will probably be about 1/2 mile long -- depends on how far the water can be backed up with a temporary dam at the bridge.

Conclusions and Recommendations

1. Evaluation of effectiveness:-- The safest way to evaluate the effectiveness of the sedimenting trials in the District area is by use of actual inflow-outflow canal water measurements, before and after the installations. The drying-up effect on nearby seep-damaged areas is quite often not a reliable guide inasmuch as the seepage area may receive water from several different sources in addition to canal seepage. It is also possible that an underground impervious barrier can contribute to maintenance of the seepage areas even after the canal seepage source is largely eliminated.

2. Water loss measurements:-- It is recommended that inflow-outflow measurements be made this fall on the canal reaches treated last fall and on the reach in No. 2 canal scheduled for treatment this fall. In the latter case the before-treatment measurements should be set-up so that they can also be continued during and after the installation so as to provide an immediate check on the effectiveness of the installation. It is also recommended that at the start of water measuring, the above testing be run in two stages. First determine the inflow-outflow flows for each of the reaches without ponding. Then determine the flows with the greatest possible ponding depth in each of the trial reaches.

3. Inflow from above canal:-- The groundwater level in the area above the No. 2 canal reach scheduled for sedimenting this fall is higher than the normal operating level in the canal. Consequently an inflow of groundwater into the canal occurs along most of the upslope canal bank. Therefore, the inflow-outflow measurements for this reach will be in error in an amount equal to the groundwater inflow. It is also possible that the seepage area below the canal is fed by groundwater flowing under the canal. In any case it will be helpful to actually measure the apparent seepage loss

in this reach of canal before going ahead with the scheduled sedimenting work.

4. Effect of silt cake:-- During the 1957 season the water carried considerable more silt than it has in the preceding water short years. It seems very likely that the resulting natural silting produced some sealing effects in District canals during the past summer. For example, a heavy accumulation of a black mucky silt is found in the No. 2 canal reach scheduled for sedimenting this fall. Because of this it is all the more important that the seepage losses be determined before going ahead with the bentonite sedimenting. If appreciable loss still occurs from this reach of canal, a mechanical method of breaking this silt cake will probably have to be used in order to be certain that a satisfactory penetration of the bentonite sediment is obtained. Discing with a spike tooth harrow or similar farm equipment is recommended -- both before and during the bentonite sediment ponding.

5. Sedimenting procedure:-- Since previous canal bed soils vary over a wide range from one area to another and from one canal to another, fitting the sediment sealing procedures to these varied conditions is always a major problem. Due to the District's past experience with the sedimenting trials installed last fall, many of the major considerations have already been determined. The only recommended changes from last year's procedures involve; (1.) the previously outlined need for accurate water loss measurements, (2.) the possible need for discing because of the natural silt cake in the canals, and (3.) a possible change in bentonite sediment mixing method.

6. Mixing method:-- If the District desires to qualify for ASC payments, a powdered or granulated bentonite will probably have to be used. This material could be prepared by grinding the local pit-run bentonite or it could be purchased from one of the commercial bentonite companies. In the event a prepared bentonite is used, it is recommended that one of the water jet methods of mixing be utilized. Mr. Michael A. McNamee, Agricultural Engineer, Wyoming Extension Service, University of Wyoming, Laramie, Wyoming has a jet that possibly could be obtained on a loan basis.

7. Acceptability of bentonite:-- To determine whether the local bentonite can qualify as an acceptable material in the ASC Specifications, a good representative sample (10 lb. size) of the pit material should be forwarded to Mr. McNamee.

8. Long range considerations:-- In talking with Mr. Cole and Mr. Premit it is evident that the present sedimenting work is being guided by much more than the short range objectives of sealing three relatively short reaches of pervious canal. For example accurate delivery records are now being maintained. From these records it will be possible to accurately pin-point the District canals and laterals with the highest losses. The purpose of the present sedimenting development work is to develop a practical and low-cost method of sealing the many high water loss areas in the District's canals and laterals.