

CONDENSED REPORT
OF THE
SUB-COMMITTEE

UPON A PUMPING PLANT FOR
THE TEMPE CANAL COMPANY

TEMPE, ARIZONA, FEBRUARY 4, 1904

G. JONES
J. W. WOOLF
CARL HAYDEN
J. W. YEAGER
I. V. STEWART
P. E. FULLER, ENGINEER.

NOTICE—To every stockholder under the Tempe Canal:

Attend the Stockholders' Meeting to be held at Odd Fellows' Hall, Tempe, 10 o'clock A. M. sharp, Saturday, February 13, 1904, to vote upon the Pumping Plant question. YOU ARE INTERESTED.

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TEMPE, ARIZONA, MARCH 10, 1904.

To our Friends and Neighbors under the Tempe Canal:

At the present moment a condition confronts us that is, without question, most serious. Not for years has there been so little rain or snowfall in the mountains as during the past season, hence the outlook for irrigating water is bad--very bad. The pumping plant on which there is to be taken a final action on Saturday next, is our only and last hope to secure an ample supply of water for our land. We, the undersigned, have considered every side of the question, and each one of us have signed up for all our land under the Tempe Canal, and in a word, the project has our most hearty and unqualified endorsement.

W. J. KINGSBURY,
President Farmers and Merchants Bank
GRANT JONES,
President Tempe National Bank
NIELS PETERSEN
J. W. WOOLF
A. J. PETERS

P. S. Saturday March 12, 2 p. m., is the last meeting. Books will be closed on that day.

TEMPE'S REPORT.

MESA, ARIZONA, FEBRUARY 3, 1904.
TO THE TEMPE CANAL CO.,

Tempe, Arizona.

GENTLEMEN:—We beg to submit herein the report covering the investigation of the various plants for pumping water to augment the supply in the Tempe canal system.

During the past three months the sub-committee appointed for that purpose have carefully considered a number of methods and kinds of plants, for pumping water and have adopted, as the most feasible and best suited to the requirements of the Canal Co., a steam pumping plant which will permit of enlargement without altering the original plant.

This plant would be equipped with a compound condensing engine, water tube boilers and all necessary auxiliary equipment. The furnaces would be arranged for the use of oil or wood as fuel.

The engine would be belted to a 1000 inch centrifugal pump.

The plant is intended to develop 1000 inches of water from one group of ten wells located at the station. There is little doubt that 1000 inches of water can be developed at one location when we consider the results obtainable in plants in this valley where nearly 400 inches at one point are developed and as compared with the quantity of water obtained in California where the water stratum is not so great as here.

So that we may be sure, however, that such a quantity is warranted we propose to sink six wells and install the steam plant and test these wells, proceeding with the installation of additional wells as we found the quantity available, and should we find the limit less than 1000 inches it is the intention to install a small electric generator and transmit the remaining power to an electric pumping station located near the plant.

It will thus be seen that the experiment is not without assurance that the results are justifiable.

LOCATION.

The location chosen for the plant is at a point between the southern extension and the western branch, between the railroads and convenient to all of the canals by providing a cross cut to the Kirkland-McKinney canal.

The lands lying east of the plant and not susceptible to it would receive their pro rata share of pumped water by an additional equivalent in river water.

This condition would, however, exist only until the plant were extended when a pumping plant would be located at the junction of the Kirkland and McKinney and Western branch, as well as three more electric pumping stations which would be located on the Southern extension.

COMMERCIAL VALUE.

It is true that 1000 inches of water in addition to our present canal supply is not as much water as we would like to have, but if we install a plant of that size at first and it is so arranged as to permit of extension and enlargement without excessive outlay, it will be far easier to acquire the second or third thousand inches when the first thousand has been demonstrated feasible and practicable; and again, a plant of 1000 inches capacity can be built at a cost within the reach of all, and with it as a nucleus to build upon, it will be quite easy to bond it to raise sufficient money to extend as far as desirable without additional outlay of money from the stockholders.

Looking at the project from another point of view, it means that every shareholder who owned an interest in the plant would receive seven and three-tenths more heads of 500 inches, 24 hours per day, each year, and this additional guaranteed supply would make much of the land now under the canal system valuable which was heretofore of small value because it lacked possibly 4 or 5 more irrigations per year.

THE PLANT.

As was stated before the proposed plant would eventually be a central power plant, transmitting electric power to four 500 inch pumping plants, though at present there would be installed only one engine which would operate

one centrifugal pump at the station, pumping 1000 inches of water.

It will be seen that the labor in operating such a plant would not be increased materially if the plant were increased to 2000 inches and not at all if the additional 1000 inches were developed, and it is therefore plain that the capacity could be increased in such a plant and yet the annual fixed costs be increased in a much less ratio.

We have considered the constructing of a building sufficient for the entire capacity of 3000 inches, so that such increase in capacity would not affect the original plant.

INITIAL COST

The initial or first cost of a plant of 1000 inches would be as follows:

Buildings, pump and condensed pits	\$11,400.
Oil tank complete (concrete)	1,400.
Machinery complete, erected in place	30,000.
Ten wells @ \$800	8,000.

Total cost of plant	\$50,800.
To increase the plant to 2000 inches capacity would cost additionally	\$38,542.
To increase the plant to 3000 inches capacity would cost additionally	\$38,542.
If the entire plant were installed at once the cost would be, approximately	\$120,000.

OPERATIVE AND FIXED COSTS.

The yearly operative cost would be as follows:

Labor—engineers and firemen	\$2,700.
Fuel—16 bbls. of oil per day @ \$1.65	10,130.
Depreciation—wells 4 per cent. steam plant 5 per cent. buildings 3 per cent. total	1,750.
Oil and waste	500.
Taxes 3 per cent on two-thirds valuation	900.
Interest at 8 per cent	4,064.

Total yearly operative charges	\$20,044.
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If the plant were increased to 2000 inches capacity the yearly operation and fixed costs would be additional. \$17,678.

If the plant were increased to 3,000 inches capacity the yearly cost would be increased\$8,928.

Total yearly cost for 3000 inch plant\$46,650.

VALUE OF TEMPE CANAL WATER.

Upon the present valuation of \$7,200 per share the Tempe Canal stock represents a total valuation of \$705,600.

Compare this cost with the cost of a pumping plant yielding a constant supply of 3,000 inches and equal to \$120,000. An increase of three-fourths of the total water in the Tempe canal and yet at an expenditure of only about one-sixth the money. The former a variable uncertain quantity of water, the latter a constant, ever available amount. Of course the last 1000 inches of water developed would be required at all times, and would be used mostly at periods of low water in the Tempe Canal system.

QUANTITY OF WATER AVAILABLE.

Examination of the records of the Tempe Canal system shows that during the past three years there were 2,888 heads of water in the Tempe Canal, and charging to a Tempe Canal share, interest at 8 per cent as we have done in the pumping plant, and taxes at 2.5 per cent. and maintenance at \$100.00 it would show an actual fixed cost chargeable to a Tempe share of \$694.00, and upon the total 98 canal shares would represent an annual fixed charge of \$68,012, and dividing this amount by the total 24 hour heads it would show a cost per head of \$23.60, and it should be remembered that a head in the Tempe Canal sometimes carries less than 500 inches and sometimes over 500 inches.

The total heads available in the pumping plant of 1000 inches capacity, would be 730—24 hour 500 inch heads per year or 1460 similar heads if 2000 inches were developed, and 2190 similar heads if 3000 inches were developed. Reducing these heads to cost per head we would have in the 1000 inch plant a cost of \$27.45 per head In the 2000 inch plant a cost of \$25.83 per head, and in

the 3000 inch plant a cost of \$21.30 per head. All of the heads in the pumping plant, being as stated above, 500 inch 24 hour heads.

From comparison it will be seen that the costs per head in the pumping plant are, on an average, about the same as in the Tempe Canal heads, though the water carried in the Tempe head is fluctuating while in the pumping plant it is constant.

Again, the comparison shows that the annual costs for operation are practically the same while the original investment is far greater in proportion in the Tempe to what it is in the pumping plant.

Comparing these costs upon the acre foot basis we find that an acre foot of water under the Tempe, based upon a constant average flow of 4800 inches would be 78.5 cents, while in the pumping plant of 1000 inches capacity the cost per acre foot is \$1.10, and in a plant of 2000 inches capacity the cost per acre foot is \$1.04, and in a plant of 3000 inches capacity the cost is 85 cents per acre foot, or in the latter case the cost is about 6.5 cents per acre foot more than in the Tempe Canal.

The apparent discrepancy between the acre foot basis and the 24 hour head basis of comparison is due to the fact that in the former the comparison is based upon the actual 4800 inches of water delivered to the Tempe Canal, while in the latter case the comparison is based upon the 500 inch heads in the pumped water and the actual heads that were delivered from the Tempe Canal, some of which were over and others less than 500 inches.

Probably no monetary value could be fixed for the water developed by pumping as it carries with it the important moment, that it is available at any and all times, and, above all, when needed.

METHOD OF ORGANIZATION AND FINANCING.

For the administrative features we believe that a corporation should be organized by the land owners under the Tempe Canal, and that they be entitled to one share of stock to each 160 acres owned by them, or such divisions thereof as may be agreed upon.

And that this share or interest in the pumping plant should be appurtenant to the land to which it is issued.

That the par value of the stock be the quotient obtained by dividing the total estimated cost of the plant by the number of shares or fractions thereof, subscribed to the company, and that a contract be entered into between the corporation and the Tempe Canal company giving share holders in the pumping plant the right to run pumped water in the Tempe Canal. That each share holder be charged an hourly rate for pumped water sufficient in the aggregate to cover operation and fixed costs including the charge for carriage of water in the Tempe Canal, and that in case of failure for any reason of said charges to produce a sufficient amount to cover the maintenance operation and fixed costs above stated, that the shares shall be assessable to an extent sufficient to cover the deficiency: Should a stock holder not use his quota of water or should he use a fraction thereof he would be credited with interest at 8 per cent upon his original investment less the proportionate am't. charged on the water he may have used

Upon the above method of organization and disposal of stock, it would bring the initial cost to each holder of one share, covering 160 acres (provided 100 quarter sections were subscribed) \$3.18 per acre, or about \$500 per quarter section, and should the number of quarter sections be increased to 125, which is not improbable, the cost per acre would be \$2.50 or \$400 per quarter section.

The above is of course upon a 1000 inch plant, but as stated heretofore, after the initial or first plant is installed it would be possible to bond it for the necessary capital to proceed with the development of 2000 inches additional and in this way a plant of 3000 inches could be acquired at a total first cost per quarter section of between \$400 and \$500.

The operative costs and the resultant cost per head or per acre foot would not be increased but slightly beyond that already stated, even if the plant were bonded and an interest and sinking fund were both created to care for the bonds; because the interest on bonds would not exceed 3 per cent, if we consider the average interest, and the sinking fund would apply to 20 year bonds so that the total would not exceed 8 per cent, and an interest at 8 per cent has been assumed as constant in all calculations.

A second method of organization was considered by the committee, and which, while it does not seem feasible, we submit herein for the consideration of the stock holders. It is as follows:

That the Tempe Canal Co. as an association levy an assessment upon each of the 98 Tempe Irrigation shares of \$518 to raise the \$50,800 required to install the plant of 1000 inches capacity; or a proportionate increased amount if the larger plants were considered at this time. The operative costs would be by assessment upon the number of heads similar to the manner proposed in the former method of organization except that no interest charge would be made.

This plan possesses the disadvantage of increasing the water by adding an amount of pumped water proportionate with the number of shares now held in the Tempe Canal, giving the one owning the most shares in the Tempe, the largest quantity of pumped water, and it is the purpose to increase the water to the smaller Tempe share holders and supply the larger share holders with an amount of pumped water commensurate with his requirements during certain periods.

A point of objection in the division of stock upon the acreage basis, however, is, that the smaller stock holder in the Tempe would be enjoying the use of the Tempe Canal to carry his pumped water, when his right was covered by a minority interest in the Tempe Canal Co.

We believe that this last objection could be eliminated by paying to the Tempe Canal Co. an amount to cover the use of the Tempe Canal to carry pumped water, and eventually the disposition of the larger share holders in the Tempe Canal would be to sell part of their shares so that the smaller share holders could acquire their quota of canal stock and thus more evenly divide the Tempe and also pumping plant stock.

It must be borne in mind that many minor points in the government of such a project will need to be adjusted as the plant is operated and we believe that many differences in opinion concerning such points should be waived in the effort to create harmony and co-operation of interests in a matter so essential to the welfare of every member of the Tempe Canal Co., and that all haste should

be made in the acquiring of that which is so important an adjunct to our system; and it would seem that the cost is within the means of all and that the members could go into the pumping plant by paying cash without mortgaging the property or the earning power of the plant.

It has been the endeavor of this committee to present this matter before you in a clear and unprejudiced manner, and we believe that the results attained cannot but result in a unanimous vote in favor of the pumping plant here recommended.

Respectfully submitted,

P. E. FULLER, Engineer

GRANT JONES,

J. W. WOOLF,

CARL HAYDEN,

J. W. YEAGER,

I. V. STEWART,

Committee.

You are urgently requested by the committee appointed for the purpose of investigating the pumping plant matter for the Tempe Canal, to attend the meeting of stock holders, to be held at

ODD FELLOWS' HALL, TEMPE,

10 o'clock A. M. sharp,

Saturday, February 13, 1904,

for the purpose of voting whether it is desirable, and you will co-operate in the building of a pumping plant to augment the supply of water in our canal system.

This committee has spent three months in investigating this matter and in deciding upon the merits of a plant and feel that every member should show their interest by attending this meeting.

Read the report contained herein carefully and come prepared to discuss any points not wholly clear to you.

Committee.