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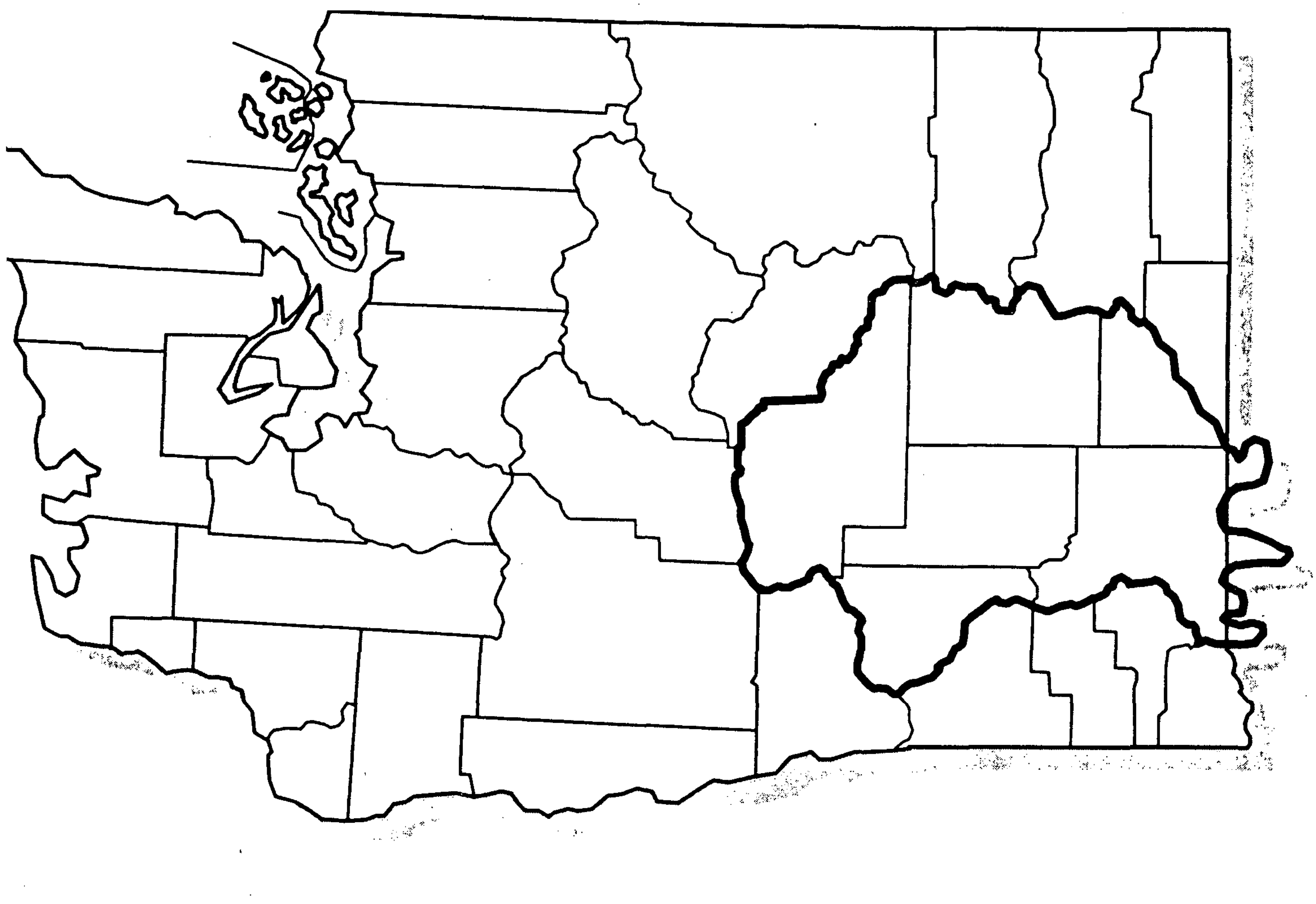

Economic Feasibility of Selected Alternative Sources of Drinking Water for the Eastern Columbia Plateau Aquifer System

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Executive Summary

This report was prepared by the Environmental Protection Agency (EPA) to provide a response to specific public comments that were received during the public participation phase of the Eastern Columbia Plateau Sole Source Aquifer System petition review. During this phase, nine public comments were received suggesting that there were other economically feasible alternative sources of drinking water in this petitioned area. Specifically, five communities, near known Bureau of Reclamation (BOR) Columbia Basin Irrigation Project (CBIP) canals, had claimed that water from the BOR CBIP could be used as an economically feasible alternative source of drinking water.

In addition, public comments were also received suggesting that drilling drinking water wells to deeper areas within the aquifer system could provide an economically feasible alternative source of drinking water. This analyses in this report were used to determine if either alternative source, i.e., BOR CBIP water or drilling deeper wells, could be considered economically feasible for the population in this region.

To assess the economic feasibility of both suggested alternatives, two separate analyses were performed. A study was undertaken to determine the base costs associated with the design and construction of a new surface water treatment system as well as base costs for drilling deeper drinking water wells. These base costs were then compared to the mean household income to determine the relative burden of either of the suggested alternatives on each community.

While the analyses recognizes the need for additional costs in installing and/or maintaining other drinking water treatment components, such as transmission piping, distribution system upgrades, and other forms of treatment technology, these additional costs were not included into the final economic analysis. In addition, this analysis also does not incorporate the costs that would be associated with the design and construction of a winter water storage system and/or any operating and maintenance (O&M) costs that would be associated with the treatment system. Therefore it should be recognized *that the true total costs associated with the use of BOR CBIP water for drinking water would be substantially greater than the base cost that will be determined by this analysis.*

Findings

Upon the determination of the base costs for either alternative, the costs were compared to the mean household income to determine the relative burden to undertake such a project. A threshold level of 0.6% of each community's mean household income was used to determine the economic feasibility for the alternative sources. That is, if these costs exceeded the 0.6% threshold level figure for a community, then the source would be considered by EPA to be economically infeasible.

The analyses found that the annualized capital costs, i.e. the base costs, for the surface water treatment system for each community exceeded the 0.6% mean household income threshold, as shown in Table 1. Therefore, the proposal as applied to each community is considered to be economically infeasible.

Table 1

Economic Feasibility of Using Columbia Basin Irrigation Project Water as an Alternative Source of Drinking Water
(Summarized from Table 4)

Community	MINIMUM Annualized Cost per Household ($)	0.6% of Mean Household Income (MHI) ($)	Exceeds 0.6% of MHI	Economically Feasible
Coulee City	542	135	YES	NO
Moses Lake	203	165	YES	NO
Othello	496	169	YES	NO
Soap Lake	503	118	YES	NO
Warden	492	141	YES	NO

An analysis was also performed to determine that economic feasibility of drilling a deeper well as an alternative source of drinking water. Using 150 feet as an average depth for a deep private water supply well in the Eastern Columbia Plateau area, the total average cost (excluding O&M) for drilling a private well was $3,585 per well per household. When comparing this cost to the 0.6% threshold of mean household income as shown in Table 1, it can be seen that this alternative approach is also economically infeasible (see Table 5).

Introduction

During the public participation phase of the Environmental Protection Agency (EPA) Eastern Columbia Plateau Sole Source Aquifer System petition review, public comments were received suggesting that there were other economically feasible alternative sources of drinking water in the Eastern Columbia Plateau area. During this phase, nine specific comments were received from locally elected community representatives claiming that water from the Bureau of Reclamation (BOR) Columbia Basin Irrigation Project (CBIP) could be used as an economically feasible alternative source of drinking water.

In addition, public comments were also received suggesting that drilling drinking water wells to deeper areas within the aquifer system could also provide an economically feasible alternative source of drinking water. An analysis was performed to determine if such alternative sources, i.e., BOR CBIP water or drilling deeper wells, could be considered economically feasible for the population in this region.

In conducting the economic study of using water from the BOR CBIP or drilling to deeper aquifers, two separate analyses were performed to determine the minimum or base costs for the suggested alternatives.[1] For example, in the case of a surface water treatment system, the capital costs reflecting the construction of a filtration and disinfection system (which is required by regulation) is used as the base cost necessary in converting from a ground water to a surface water source. Similarly, specified costs of those activities related to drilling of the water well would be the base costs in modifying the existing ground water source. After deriving the base costs, analyses were performed to compare the mean household income thresholds to the base costs in order to determine the relative economic burden of either of the suggested alternatives on the respective communities.

Based on the results of the analyses, EPA will be able to determine whether the suggested alternatives could represent an economically feasible source of drinking water for the population in the Eastern Columbia Plateau area.

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[1] "Base costs" represent only those capital costs noted herein and not all of the capital or any of the O&M costs necessary for the completion and the ongoing activity of that project. Accordingly, the base costs reflect a minimum though not complete figure for that project - and therefore, the total dollar amount required for that project has to be greater than the base cost.

Evaluation of Alternative 1: Using Water from the BOR CBIP

The first step in evaluating the alternative of using water from the BOR CBIP was to select the relevant communities. Selection of a community was based on (1) submittal of public comments specifically referring to the use of BOR CBIP water as an economically feasible source of drinking water and (2), whether the community was within reasonable proximity to a BOR CBIP canal. Of the nine communities that submitted specific comments, five of the communities met both criteria: Coulee City, Moses Lake, Othello, Soap Lake, and Warden. The study assumed that these communities were within a reasonable distance to a BOR CBIP canal and that transmission system costs did not substantially add to the total capital costs of the proposal.

The four remaining communities that did submit specific comments but were not included in this study are Creston, Oakesdale, Mattawa, and Ritzville. These communities were not included in the study since they are considerably further from a BOR CBIP canal and accordingly, the economic burden of constructing a surface water treatment system would be compounded by the installation of a lengthy transmission system necessary to supply the community with enough water from the BOR CBIP

The second step in determining the economic feasibility of using water from the BOR CBIP or drilling deeper drinking water wells is to develop a method of analysis, which may include a series of processes and the development of a model, to determine the base costs. In the case of developing a surface water treatment facility the processes involved in the analysis included defining relevant terms and conditions, making appropriate assumptions, development of a conceptual model with a logical flow of events whereby the analysis proceeds or ends based on the response, and data calculation and interpretation.

Terms and Definitions

Communities: Refers to those cities that were selected based on two criteria: (1) a city must have claimed that water from the BOR CBIP could be used as an economically feasible alternative source of drinking water and (2) must be located near an irrigation canal. Those cities include: Coulee City, Moses Lake, Othello, Soap Lake and Warden. Cities that did not meet the criteria were: Oakesdale, Ritzville, Creston and Mattawa.

Irrigation Water: Is that water which originates from the Columbia River which has been allocated by the United States Congress to the U.S. Bureau of Reclamation for use in the Columbia Basin Irrigation Project . Water for the project comes from Lake Roosevelt, the reservoir formed behind the Grand Coulee Dam, which is then pumped to Banks Lake. Water from Banks Lake is used to flow into the Main Canal which is then diverted into the East Low Canal and West Canal. This water is allowed to flow, from North to South, through a series of lined and unlined canals and wasteways into the Potholes Reservoir. This large reservoir then provides irrigation water for the lower half of the CBIP which eventually empties back into the Columbia River near Pasco, Washington.

Wells: Private drinking water wells which could be drilled to provide an alternative source of drinking water.

Assumptions

In approaching this analysis the following assumptions were made:

(a) Institutional or legal conditions are not an impediment to accessing irrigated water. [e.g., Section 9 (c) of the Reclamation Project Act of 1939 authorizes the Secretary of the Interior to enter into contracts to furnish water for municipal water supply or miscellaneous purposes.]

(b) Irrigation water is available to each designated community within a reasonable distance.

(c) Irrigation water is available to each designated community on a year-round basis.

(d) Quality of the irrigation water is acceptable through standard treatment techniques and considered to be a source of drinking water.

(e) In addition to the capital costs for water treatment facilities identified for this analysis, the following are examples of additional costs that have been identified but not quantified and therefore not included in the base cost calculations:

- (1) Transmission System - capital and O&M costs
- (2) Water Storage System - capital and O&M costs
- (3) Surface Water Treatment System - O&M costs
- (4) Rights-of-way - capital costs
- (5) Relocation of Utilities - capital costs
- (6) Land - capital costs
- (7) Utilities - O&M cost
- (8) Labor - O&M cost
- (9) Consulting fees

<u>The Model</u> (Chart 1)

A model was developed in order to identify those processes or steps that are essential to analyzing the economic feasibility of using irrigation water as alternative source of drinking water. These process elements take a progressive approach whereby each succeeding step builds on the prior step. Each step is phrased as a question so that an affirmative answer would continue the process to the next step. If a negative answer were encountered (except Step 4 and 5) then the analysis would not continue, indicating that the proposal was **not** economically feasible. The following is a description of each step used in the model.

<u>Beginning - Irrigation Water</u>

In order to commence the modeling process, it was necessary to first define the term "irrigation water" EPA has used the definition provided above.

<u>Step 1 - Year-round Supply?</u>

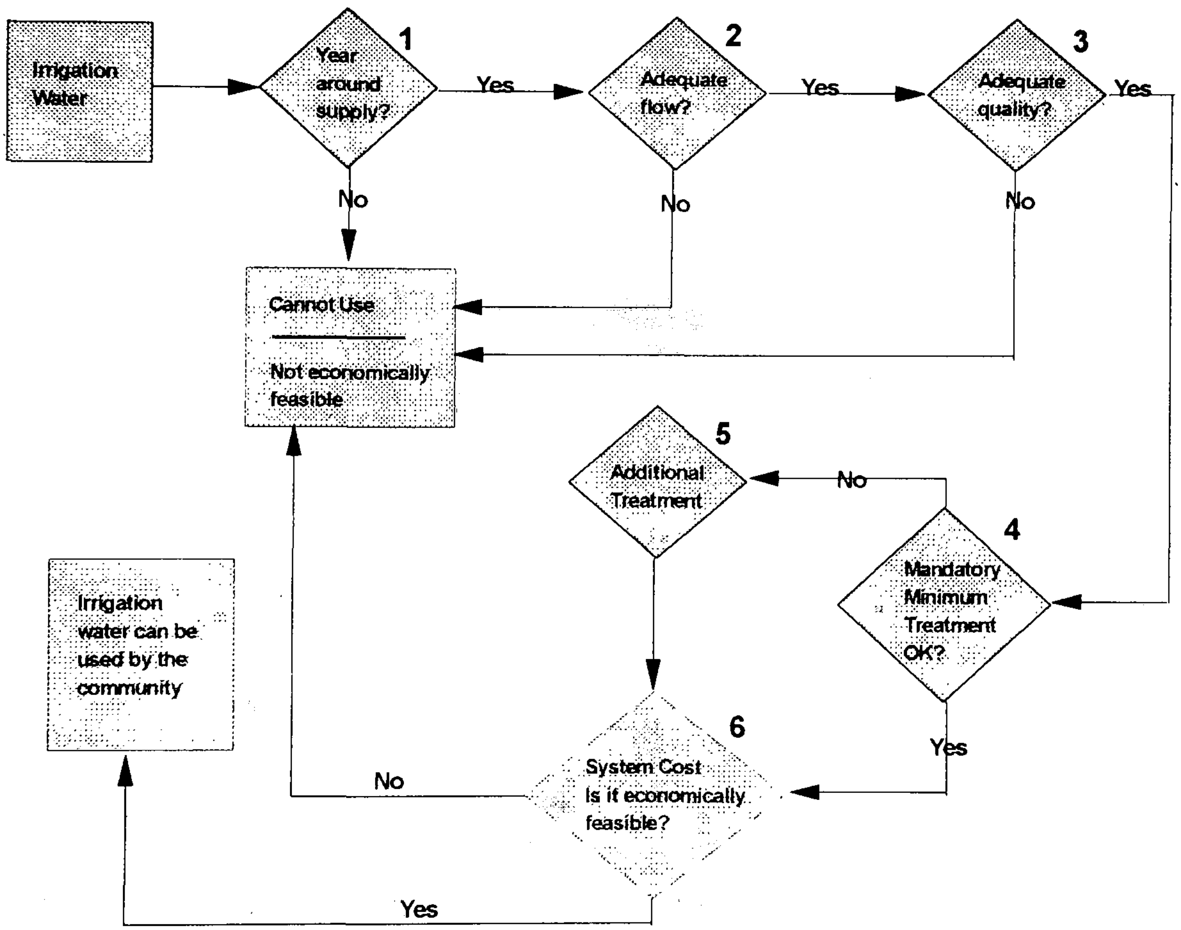
While each community requires a year-round supply of drinking water, the study could not presumptively assume that an adequate supply of irrigation water was available to each community. This step involves determining if each community would have access to a year-round source of water.

Under current practices irrigation water is available only during the agricultural "growing season" which runs from mid-March though the end of October each year. Those communities that would be dependent on this water source would therefore only have drinking water during the growing season and would not have access to an available supply between the months of November through April, i.e., the non-growing period. The irrigation canals that would be accessed as the source of water for each community are shown in Table 2.

Since irrigation water is only provided during the growing season, each community would need to ensure a method of water storage in order to have an available supply of drinking water during the non-growing period. The size of each water storage system would be based on that community's consumption of drinking water during the non-growing period plus being able to provide enough additional storage reserves to allow for unforseen emergencies. EPA did not believe it appropriate to identify the type of construction for each method of storage, since there can be considerable variablity in design which is contingent upon a variety of

Chart 1

Model Used to Determine Economic Feasibility of Using Irrigation Water as an Alternative Source of Drinking Water



environmental, climatic, and geological conditions. Therefore, while EPA has assumed that each community would have to build and maintain an adequate storage system, the capital and O&M costs that would be associated with these storage mechanisms will not be quantified [see Assumption (e)(2)]. These costs must be recognized as being additional to those base costs identified in the study.

Step 2 - Adequate Flow?

As mentioned in Step 1, each community must ensure that an adequate quantity, i.e. flow, of irrigation water is available to provide a year-round source of drinking water. Since irrigation water is first allocated for agricultural use, the communities must ensure that adequate residual flows can be maintained by the BOR CBIP to provide sufficient water for both storage and immediate drinking water use. From data that was provided by the BOR, the average flows for the West and East Low Canals indicate that adequate water flow is available to satisfy the drinking water consumption and storage needs of the community as well as the agricultural mandates of the CBIP

Table 2

Selected Communities and Access Sites for Irrigation water

Community	Canal
City Coulee	Main Canal
Moses Lake	East Low Canal
Othello	Potholes Canal
Soap Lake	West Canal
Warden	East Low Canal

Step 3 - Adequate Quality?

One assumption of the model requires that the quality of the irrigation water meet and/or exceed the quality of the water that is found at the Columbia River. It is important for this assumption to hold in order to further assume that standard filtration and disinfection would be the only treatment requirements that would be needed by the community. For the majority of those communities that are above the Potholes Reservoir, the assumption is that standard filtration and disinfection is all that is required. The only exception is for the those communities that are downstream of the Potholes Reservoir. The quality of the irrigation water that flows through the lower

CBIP area has been characterized by the BOR to contain a variety of pesticides, nutrients, and other contaminants that are anthropogenic in nature. Due to this fact, those downstream communities, such as the City of Othello, would require an additional source of treatment; in this case the use of a Granular Activated Carbon (GAC) filtering system.

Step 4 - Minimum Treatment Needed?

Based on the assumption of the quality of the irrigation water being accessed as just mentioned in Step 3, standard filtration and disinfection has been assumed as the baseline treatment technology that would be needed for the communities in this study. With this step answered in the affirmative, it then becomes necessary to determine the capital costs for a water treatment plant.

As shown in Table 4, column h, capital costs were calculated for a surface water filtration plant appropriately sized for each community. These costs are based on EPA's 1995 Drinking Water Infrastructure Needs Survey[2] ("Needs Survey"). The specific type of filtration system was not specified. The method used for determining the capital cost of a surface water treatment system is based on an equation already provided in the Needs Survey.[3] In order to perform the necessary calculations, the user must first determine the quantity of water in millions of gallon per day (MGD) and then insert the MGD figure into the equation. Capital costs were similarly calculated for disinfection of the water (Table 4, col. i).[4]

To calculate the MGD figure for each community, it is necessary to have either the population (Table 4, col. b) or number of customers (col. d) for each community and then multiply that figure by the maximum water use per customer (col. e). The result is gallons per day (gpd) for each customer (col. f) which is then divided by one million to get Millions of Gallons per Day (MGD) (see col. g). The MGD figure is then substituted for "x" in the equation.

Step 5 - Additional Treatment Expense?

For those communities that would receive irrigation water from the Potholes Reservoir, an additional form of filtration would be necessary in order to properly treat

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[2] U.S. Environmental Protection Agency. Nov. 1995. *1995 Drinking Water Infrastructure Needs Survey: Estimating the Cost of Infrastructure.*

[3] Ibid. Water Treatment Cost Curve - Install or Replace Filtration Plan - Equation 23. Also see Notes to Table 3, Column h.

[4] Ibid. Water Treatment Cost Curve - Disinfection - Equation 21. Also see NOTES TO TABLE 4, column i

the irrigation water for human consumption. As mentioned above, the irrigation water that flows from the Potholes Reservoir contains a variety of pesticides, nutrients, and other anthropogenetic contaminants that could pose a human health risk if the water were to be treated just using the standard filtration and disinfection techniques. In this case, the community of Othello would need to use a GAC filter system to reduce the contaminants that would be found after undergoing standard surface water treatment. This requirement for an additional water treatment system increases the overall capital costs.

Again referring to the Needs Survey, the Othello MGD figure of 2.73 (Table 4, col. g) was substituted for "x" in the equation used to calculate the capital cost for disinfection of the irrigation water.[5] The capital cost for a GAC filter system is estimated to be $2,506,209.

<u>Step 6 - *System Costs: Is It Economically Feasible?.*</u>

At this point, the analysis requires that the annualized cost per household be determined. In looking at Table 4 this was done by:

(1) Summing all the capital costs by community (cols. h + i + j).
(2) Calculating an annualized cost per community. For this calculation the assumption was made that capital costs would be financed through a municipal bond issue where the costs of the bond issue are passed on to each customer. The term of this bond issue is ten (10) years and interest is six percent (6.0%), compounded monthly. Principle is that amount shown in col. k, i.e. the Total Capital Base Costs.
(3) Once the annualized cost per community is calculated, that amount is then divided by the number of customers for that community (Table 4, col. d) that final amount is the MINIMUM Annualized Cost per Household (col. l).

The reason for calculating the (MINIMUM) Annualized Cost per Household is to provide a basis for comparing this to the selected 0.6% threshold figure of average household income to be used as an economic feasibility test. Specifically, the test that is used for determining the economic feasibility of a proposed drinking water system is to compare that proposal's annual system costs to see if these costs exceed a pre-selected percentage (i.e. 0.6%) level of the mean household income for that area in order to determine the economic impact to that community's household income,[6] and

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[5] Ibid. Water Treatment Cost Curve - Granular Activated Carbon - Equation 25. Also see NOTES TO TABLE 4, column j

[6] See Appendix A.

therefore act as a measure for determining the economic feasibility of that proposal.

Now that the annualized system cost calculations completed, Mean Household Income data was obtained from the U.S. Bureau of the Census for each community (Table 4, col. m), and then 0.6% of that mean household income figure calculated (Table 4, column o.)

With both the annualized system costs and the threshold level calculations now available, all that is left is to compare the annualized system costs to the respective threshold figure. The results of the comparison are shown in Table 4, col. p. For each community the minimum annualized cost per household exceeded the 0.6% threshold figure of mean household income for that community.

The implication from this comparison is that for each community the use of irrigation water as a primary drinking water source would place an unusual economic burden on that community and therefore, for each community referenced this drinking water source is not economically feasible.

<u>Evaluation of Alternative 2: Drilling to Deeper Aquifer Depths</u> - see Table 5

Similar to evaluating Alternative 1, the first step in evaluating the economic feasibility of drilling deeper drinking water wells is to select several communities and/or a geographic population base for determining the base costs.

The second step in this evaluation is the development of a methodology for determining the economic feasibility for drilling deeper drinking water wells. For this evaluation a survey was conducted of well drilling companies to determine the base capital costs. The base capital costs were found to include the drilling service (per linear foot) for a deeper well, any necessary permits for well drilling, and materials or well drilling supplies. O&M costs were not included. Based on the data that was collected, an analysis was performed to determine the economic feasibility of drilling deeper drinking water wells.

From survey data of the Pasco/Tri-Cities and Moses Lake areas, average costs for drilling one well were:

Table 3

Materials/Permit/Service	Cost
Drilling and casing (to 150 ft.)	$3,375
Drive shoe and surface seal	$ 110
Department of Ecology Permit	$ 100
Total	$3,585

Before an evaluation could be performed, several assumptions were made regarding the economic analysis. It was assumed that one well serves one residence or household and that the base costs are applied equally to each household in every community since the range of costs for each item did not vary widely across the geographic areas surveyed. It was further assumed that this would be a one time cost to each user.

Upon the determination of the base costs, the cost per household is therefore the *MINIMUM* Total Cost to Drill a Well shown in Table 5, col. m. This is the minimum though not total cost since annual operating and maintenance costs were not factored in.

Again, the Minimum Total Cost (col. m) is compared to the 0.6% threshold figures in column o in order to determine if implementing these wells would provide an unusual economic burden on users; the answers are shown in column q. For all communities referenced the total base costs far exceeded the 0.6% threshold level of mean household income.

Therefore, based on this analysis it is not economically feasible to use deep wells as a proposed drinking water source (see column r).

Table 4

Using water from the Bureau of Reclamation - Columbia Basin Irrigation Project as an Economically Feasible Alternative Source of Drinking Water: Comparison of a Community's Minimum Annualized Cost per Household to Mean Household Income Threshold Levels for Determining Economic Feasibility

[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]	[j]	[k]	[l]	[m]	[n]	[o]	[p]	[q]
Community	Population (1992)	Average Household Size	Number of Customers (Households) per Community [b] / [c]	Maximum Water Use (gpd/cust.)	gpd [d] x [e]	MGD	Capital Cost to Install Water Filtration Plant ($)	Capital Cost for Disinfection ($)	Capital Cost for Granular Activated Carbon ($)	Total Capital Base Costs [h]+[i]+[j] ($)	**MINIMUM Annualized Cost per Household ($)**	Mean Household Income MHI - 1989 ($)	0.4% of MHI (col. m) ($)	**0.6% of MHI (col. m) ($)**	Annualized Cost Exceeds 0.6% of MHI? col. l > col. o	Is Proposal Economically Feasible?
Coulee City	598	2 8	214	1,250	267,500	0.27	828,324	46,015	n.a	874,339	**542**	22,429	90	**135**	Yes	No
Moses Lake	15,342	2 8	5,479	543 (gpcd)	8,330,706 [b]x[e]	8 33	7,968,930	415,719	n.a	8,384,649	**203**	27,569	110	**165**	Yes	No
Othello	4,640	2 8	1,657	1,647	2,729,079	2.73	3,492,207	203,142	2,506,209	6,201,558	**496**	28,113	112	**169**	Yes	No
Soap Lake	1 270	2 8	454	1 904	864 416	0 86	1,625,923	96 806	n a	1,722,729	**503**	19,589	78	**118**	Yes	No
Warden	1,685	2 8	602	2 140 est	1,288 280	1 29	2,109,599	125 574	n a	2,235,173	**492**	23,511	94	**141**	Yes	No

NOTES TO TABLE 4

Column

b **Population.** For all cities except Moses Lake the 1992 population figure was used. Source: Fox, James R. and C. Hodgkin. *1995 Washington State Almanac - An Economic and Demographic Overview of Counties and Cities, 9th Edition.* p.118.

For Moses Lake the most representative population figure with respect to drinking water usage was for 1991. Source: Washington State Dept. of Health, Div. of Drinking Water.

c **Average Household Size.** Source: Washington State Dept. of Health, Div. of Drinking Water.

d **Number of Customers Per Community.** This was calculated by taking the Population figure from column b and dividing that figure by 2.8, i.e. the Average Household Size (column c).

e **Maximum Water Use, gpd/customer.** Source: Washington State Dept. of Health, Div. of Drinking Water.

f **Total gpd (gallons per day).** For each community the total gpd is calculated by taking the number of households per community (column d) and multiplying that figure by Maximum Water Use, i.e. gpd/customer (column e).

g **MGD - Millions of Gallons per Day.** This is calculated by dividing the Total gpd (column f) by 1,000,000.

h **Capital Cost to Install Water Filtration Plant.** Source: U.S. EPA, Office of Water. Nov. 1995. *1995 Water Infrastructure Needs Survey - Estimating the Cost of Infrastructure. Equation 23 and* p.2. The equation used for assigning costs to all system sizes is:

$$\text{Cost} = 10^{(6.252187 + 0.632472 * \log10(x) + 0.079027 * \log10(x)^{\wedge}2))}$$

where: x = Treatment capacity in millions of gallons per day (from column [g]) i **Capital Cost for Disinfection.** Source: U.S. EPA, Office of Water. *1995 Water Infrastructure Needs Survey. Equation 21* and p.1. The equation used for assigning costs to all system sizes is:

$$Cost = 10^{(5.027896 + 0.641823 * log10(x))}$$

where: x = Treatment capacity in millions of gallons per day (from column g)

j **Capital Cost for Granular Activated Carbon.** Source: U.S. EPA, Office of Water. *1995 Water Infrastructure Needs Survey. Equation 25* and p.1. The equation used for assigning costs to all system sizes is:

$$Cost = 1.47 * 10^{(5.924799 + 0.664035 * log10(x) + 0.100747 * (log10(x)^2 - 0.022464 * (log10(x)^3))}$$

where: x = Treatment capacity in million of gallon per day (from column g)

k **Total Capital Base Costs.** This is the addition of all of the capital costs described herein, i.e. Capital Cost to Install Water Filtration Plant (column h) + Capital Cost for Disinfection (column i) + Capital Cost for Granular Activated Carbon (column j).

Note that the Total Capital Base Cost figure represents *only* those capital costs described; it does not represent the total of all capital costs that would adequately address the proposal nor does it include any O&M costs. Therefore, the total capital cost figures shown in Table 4 are used to illustrate what is a minimum but not a complete representation of all costs accruing to the proposal.

l **MINIMUM Annualized Cost per Household.** This figure represents the cost per household (within that community) that is necessary to finance the Total Base Capital Costs (column k). In order to calculate the minimum annualized cost, assumptions were made about how the community would finance the capital costs, namely that the community, i.e. the municipal government or utility, would issue a bond in the amount of the total capital costs for that community (from column k); with a term of ten (10) years, bearing an interest rate if six percent (6%). EPA believes these assumptions to be conservative; that is, the resulting figures are low compared to other possible scenarios.

Several issues arise with respect to a community's financing of such projects: (1) the community's ability (statutorily, financially) to issue bonds for this purpose; (2) the bond term may vary; and (3) the interest rate can also vary.

m **Mean Household Income - 1989.** Source: U.S. Census Bureau.

n **0.4% of Mean Household Income.}**
o **0.6% of Mean Household Income.}** Source: U.S. Environmental Protection Agency. 1981. *Sole Source Aquifer Designation: Petitioner Guidance*. EPA 440/6-87-003. p.13.

In EPA's *Petitioner Guidance* it states that after determining the annual system costs to a typical user, "...if this cost exceeds 0.4 to 0.6% of the mean household income in the area, use of the sources can be considered to be economically infeasible."(p.13) While Table 4 shows both the 0.4% and 0.6% values (columns n and o, respectively) of Mean Household Income for illustrative purposes, as the higher of this range the 0.6% level becomes the threshold level; that is, if any proposed system exceeded the 0.6% threshold level it was deemed to be economically infeasible. The comparison is then to see if the MINIMUM Annualized Cost per Household for that proposed system (column l) exceeds the 0.6% threshold level that community as shown in column o. The answer is shown in column p - for every community the answer is "YES".

q **Is This Proposal Economically Feasible?** The answer for all communities is "NO"

Table 5

Drilling to Deeper Aquifers:
Comparison of a Community's Minimum Annualized Cost per Household
to Mean Household Income Threshold Levels
for Determining Economic Feasibility

[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]	[j]	[k]	[l]	[m]	[n]	[o]	[p]	[q]	[r]
Community	Population (1992)	Average Household Size	Number of Customers (Households) per Community [b] / [c]	Maximum Water Use (gpd/cust.)	gpd [d] x [e]	MGD	Drilling & Casing Avg Cost per foot ($)	Average Drilling Depth (ft)	Avg Cost ONLY to Drill a Well ($)	Drive Shoe & Surface Seal Avg Flat Fee ($)	DOE Permit ($)	**MINIMUM Total Cost to Drill a Well ([j] + [k] + [l]) ($)**	Mean Household Income MHI - 1989 ($)	0.4% of MHI (col.n) ($)	**0.6% of MHI (col. n) ($)**	Well Drilling Exceeds 0.6% of MHI? col. m > col. p	Is This Proposal Economically Feasible?
Coulee City	598	2 8	214	1,250	267,500	0 27	22.50	150	3,375	110	100	**3,585.00**	22,429	90	**135**	Yes	No
Moses Lake	15,342	2 8	5,479	543 (gpcd)	8,330,706 [b]x[e]	8.33	22 50	150	3,375	110	100	**3,585.00**	27,569	110	**165**	Yes	No
Othello	4,640	2 8	1,657	1,647	2,729,079	2.73	22 50	150	3,375	110	100	**3,585.00**	28,113	112	**169**	Yes	No
Soap Lake	1,270	2 8	454	1,904	864,416	0 86	22 50	150	3,375	110	100	**3,585.00**	19,589	78	**118**	Yes	No
Warden	1,685	2 8	602	2 140 est	1,288,280	1 29	22 50	150	3 375	110	100	**3,585.00**	23,511	94	**141**	Yes	No

NOTES TO TABLE 5

<u>Column</u>

b thru g see NOTES TO TABLE 4.

h **Drilling & Casing/Average Cost per foot.** Based on a telephone survey of four (4) drilling companies in the Moses Lake/Pasco area. The costs for drilling and casings ranged from $20.00 to $25.00 per foot; average cost is $22.50 per foot.

i **Average Drilling Depth.** The survey indicated that a typical depth would range from 130 feet to 170 feet; average depth is 150 feet.

j **Average Cost ONLY to Drill a (150 foot) Well.** This calculation takes the average cost per foot for drilling and casing (column h $22.50) multiplied by the average drilling depth of 150 feet (column i), equals $3,375.

k **Drive Shoe & Surface Seal Average Flat Fee.** Based on telephone survey of drilling companies; average fee of $110.

l **Department of Ecology Permit.** Based on telephone survey of drilling companies. This is a flat fee of $100.

m **MINIMUM Total Cost to Drill a Well.** The figure of $3,585 is constant for all communities and is calculated by adding columns j ($3,375) + k ($110) + l ($100).

The assumption here is that this is a one-time cost to the household. If we were to assume that this cost would be personally financed by the household over five years at say 12%, the annual cost to the household would still be close to $1,000 per year, which still exceeds the 0.6% threshold level in column [p]..

n thru q see NOTES TO TABLE 4 for corresponding column explanations, i.e. col. n, Table 5 corresponds to column m of Table 4; column o to column n; column p to column o; and column q to column p, respectively.

p **Is This Proposal Economically Feasible?** Since the purpose of the economic feasibility test is to see if the proposed system costs do not exceed the 0.6% threshold level of column p, and we see that column q indicates that for all communities the annualized costs do exceed the 0.6% threshold level, then for each community the answer "NO"; **the proposed system is not economically feasible**.

Appendix A

Economic Feasibility Test Guideline:

Response to the Application and Range of the EPA Guideline for Testing Economic Feasibility for Drinking Water Systems

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Question:

Is the EPA guideline used for determining the economic feasibility of a drinking water system appropriate, both in application and range?[7]

Answer:

Application

In order to determine if any project should proceed from conception to the planning stage, it is necessary to establish if sufficient funding is available for all costs associated with that project. In the case of a capital improvement project such as installing a drinking water system, both capital and O&M (operating and maintenance) costs are involved.

If we are to assume that all costs have been adequately accounted for, then the planner must also determine if that project can be financed. With respect to a drinking water system serving most or all of a community where the local utility may have responsibility for primary financing of the system and assuming that the utility can finance the proposed system, the utility would be expected to pass along these new costs to its users (i.e. the households) as increased rates. If the proposed drinking water system is a well for each household within a community, then the burden for financing that new well directly falls on that household.

Examples of:

Capital Costs	O&M Costs	Other Costs
Transmission system	Labor	Architectural fees
Rights-of-way	Equipment	Engineering fees
Land	Utilities	Legal fees
Relocation of Utilities	Parts	Administration
Storage	Monitoring	
Water Treatment Plant	Analyses	

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7 U.S. Environmental Protection Agency. 1987. *Sole Source Aquifer Designation: Petitioner Guidance*. EPA 440/6-87-003.

In either case, the household ultimately pays the costs. For a household to determine if it can afford a proposed project, it must rely on its income, assets and borrowing capacity. From income the household must take care of its overhead or fixed costs, i.e. mortgage payment, other loan payments, food, utilities, education, medical/dental, etc.. The balance of income remaining, i.e. the households disposable income, is then allocated by each household as that household deems appropriate (i.e. so much to savings, contingencies, recreation, etc.).

In evaluating its income, assets, current and future financial health for the purpose of determining if it could afford a new purchase (or project), the household:

(1) may be able to afford that new project by utilizing savings only;
(2) may be able to afford that new project by selling some assets(s);
(3) may be able to afford that new project by borrowing;
(4) may be able to afford that new project by a combination of (1), (2) and (3); or
(5) may *not* be able to afford that project, i.e. has little or no savings, assets, limited income and/or no borrowing capacity.

Also, while we do not have any knowledge about each household's unique financial situation we do have the data for a given community's mean (i.e. average) household income. The availability of this data provides a method by which one can compare the proposed project to that income level as a means test would be an appropriate approach for determining the economic feasibility of a proposed project that serves most or all of the households in that community.

Determining Economic Feasibility

If a proposed project is to be deemed economically feasible from the perspective of affordability to the household, the proposed project should be calculated so that it can be financed at or below some level of the mean household income of that community. From an earlier study EPA found that typical water supply costs taken as a percentage of average household income ranged from 0.1 percent to 0.3 percent.[8]

Therefore, having national data for average costs for a specific type of project, in this case a water supply system, and also having average household income at the community level, provides a basis for utilizing the EPA guidance range of 0.4 percent to 0.6 percent of mean household income as an economic feasibility test. This approach

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[8] U.S. EPA. 1986. *GUIDELINES FOR GROUND-WATER CLASSIFICATION UNDER THE EPA GROUND-WATER PROTECTION STRATEGY.* Final Draft. Office of Ground Water Protection, Office of Water. p.G-7.

does not appear to be unreasonable. A more conservative approach would be to use the upper range figure of 0.6% as a threshold level, i.e. any project cost exceeding this 0.6% threshold figure would be considered economically infeasible.

The determination if any annualized project costs figures actually place an unusual burden on a particular household cannot be readily answered due to the numerous variables that would have to be addressed but where data is not available.

In the specific case of using irrigated water as a primary source of drinking, comparing (from Table 4) the annualized cost per household of this proposal to mean household income shows a range of from 0.8% (Moses Lake) to 2.8% (Soap Lake). It must be emphasized that this is using the *minimum* costs reflecting only the capital costs for the water treatment plants and disinfection and not the total costs for the entire system. This means that when all capital costs (water treatment plants, disinfection, transmission, rights-of-way, pumping, reservoir, etc.) **plus the O&M costs** are factored in**, then the entire proposed system's annualized cost per household would be considerably greater than shown**. When comparing the latter figures as a percentage of mean household income, then those percentages would also be considerably higher. There is the likelihood that this proposal would be placing an unusual burden on the households in each community.