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THE CLATSOP PLAINS SEWERAGE STUDY: CRITICAL COMMENTS*

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The Clatsop County Board of Commissioners requested my comments on CH2M-Hill's report entitled Clatsop Plains Sewerage Study in a letter dated April 28, 1975 (Appendix A). This paper summarizes the principal critical observations I made orally to the Commissioners on June 16, 1975. These observations derived from a careful study of the report and additional information kindly provided me by CH2M-Hill and the Clatsop County Planning Department.

My observations on the Clatsop Plains Sewerage Study and the paper are divided into four sections. The first section reviews the cost estimation and design techniques used by CH2M-Hill; it concludes that appropriate techniques have been employed in less than optimal fashion because alternative sized sewer systems were not systematically investigated. The second section deals with the reported estimates of interceptor system costs and their inadequacies; it suggests that "incremental" cost estimates for each subsystem would be more helpful data for planning purposes than the data actually provided in the report. The third section indicates why collection system cost estimates in the report cannot be used to determine those areas within the proposed system that can be sewered at particularly high or low costs. The fourth and final section of the paper discusses the recom-

*Support for the review of the Clatsop Plains Sewerage Study was provided by Oregon State University's Sea Grant College Program and Department of Economics. This paper does not represent the views of either the Sea Grant College Program or the Department of Economics, but is a representation of the findings and opinions of only its author.

mended financial plan, corrects errors in CH2M-Hill's assumptions, and presents estimates of the tax levies, assessments, and monthly charges required to finance the proposed system with a balanced budget over its first twenty years of operation.

Appendix B presents a discussion of how sewers influence growth and development; it is taken from a recent annual report of the Council on Environmental Quality. The material in Appendix B is attached to compensate in part for the somewhat narrow focus of the paper; it is intended solely to provide the Clatsop County Board of Commissioners with an accurate, but brief, statement of the major issues involved in the adoption of sewer plans.

Cost, Design, and Evaluation of Proposed System

The cost estimation procedures used by CH2M-Hill are in my judgment adequate, reasonable, and standard. The estimates have been developed from equations commonly employed by professional engineers. They have, however, been adjusted to reflect Pacific Northwest economic conditions in general and CH2M-Hill's extensive experience in sewer system design and construction, particularly along the coast. These adjustments, as well as the one made for anticipated future inflation, were appropriate and appear to have been implemented using easily justified techniques. Therefore, although the cost estimates do not have the accuracy of detailed estimates following final design, their sum probably does indicate the total cost of the entire proposed system reasonably well.

Of course, it is in the nature of such estimates to be more accurate in the aggregate than for particular subsystems. That is, the total system cost estimate of $12,261,000 in Table 20 is expected to be significantly more accurate than the individual cost estimates underlying it.

Similarly appropriate techniques have also been used to design the collection system presented in Chapter 6 of the report. A computer-based system analysis was employed to determine the sizes and locations of major lines, pump stations, etc. Only the locations of certain collection system laterals have not been verified.

From an economist's perspective, however, the most disappointing feature of the report is the absence of cost and design data on alternative sewer systems for the Clatsop Plains area. This is somewhat surprising because CH2M-Hill's cost estimation and design techniques are well-suited to the systemmatic examination of alternatives or options. However, despite the title of Chapter 6, Collection Alternatives, no analysis is presented of alternative sized and located systems. As a consequence, I found no evidence in the report to support either of the two following claims made on page 6-1:

1. Collection system costs have only been included for existing development that can justify sewers.

2. This plan is based on providing the most economical service to the developed and soon-to-be developed areas.

During my discussions with Mr. Madden on May 22, 1975, I pursued these matters by inquiring whether CH2M-Hill had investigated, but not published, the design and costs of alternative sized sewer systems for the Clatsop Plains study area. Mr. Madden indicated that no investigations had been undertaken involving variations in the size of the study area, i.e., variations in sewer system size.

On the basis of the preceding information I reach two conclusions. First, CH2M-Hill's proposed sewer system is cost-effective only in the sense that reasonable design and cost estimation techniques have been

applied to determine the minimum-cost sewer system of a specified type and size. Second, CH2M-Hill has no published or unpublished data to establish that its proposed system is economically justifiable (i.e., total benefits exceed total costs) or economically efficient (i.e., no larger or smaller system would result in larger net benefits to the population affected directly and indirectly).

Interceptor and Pressure System Costs

Tables 15-18 present the estimated interceptor and pressure system costs required within each subsystem to construct CH2M-Hill's proposed sewer system for the Clatsop Plains area. (Interceptor and pressure systems include all major trunk lines and pump stations that lie between subsystem collection sewers and the treatment facilities.) Estimated total costs for the entire proposed system would normally be the sum of all individual subsystem cost estimates.* Of course, the need to have an estimate of total system costs justifies calculation of subsystem costs as reported in Tables 15-18.

From a planning or decision-making perspective, however, total system cost is just one of many pieces of information required to determine the appropriate sewer plan for the Clatsop Plains. Among the cost data, perhaps the most important would be area-by-area estimates of the "incremental or marginal costs" of providing sewers to each area in the Clatsop Plains region. Incremental or marginal costs are defined as only those

*The sum of subsystem interceptor-pressure system costs in Table 18, adjusted upward 35 percent to allow for engineering, administrative, and other costs, does not equal the estimate of total costs for the South Region in Table 20. Inadvertently the estimated $300,000 expenditure required to upgrade the Seaside pumping system was included in the $1,497,000 South Region interceptor cost estimate in Table 20 but not indicated elsewhere in the report.

costs directly attributable to the inclusion of an area within the proposed system; they are measured by the amount that total system costs would decrease if the area was deleted from the proposed system. Therefore, the incremental or marginal cost of providing sewers to an area (1) excludes those costs required to oversize its interceptor system to handle wastes generated by other areas in the proposed system, but (2) includes the costs involved in oversizing other areas' interceptors to handle wastes which it generates.

Knowledge of the size and distribution of incremental costs within a proposed sewer system is extremely important because it provides the appropriate data to establish which areas within the system may be sewered at high or low costs. With incremental cost data, decision-makers can rationally determine the economic merit of different sized sewer systems, of different construction schedules, of different financing methods, etc. Without incremental cost data, however, many basic questions about alternative sewer system plans cannot be answered satisfactorily.

Unfortunately Tables 15-18 do not report either the total or per-anticipated-connection incremental costs of serving each area within CH2M-Hill's proposed system for the Clatsop Plains. As a consequence, the interceptor-pressure system cost estimates in Tables 15-18 are not particularly helpful to decision-makers.

For example, my "scratch-pad" estimate of the costs required to oversize the Hammond-Warrenton interceptor-pressure system to handle wastes generated by Fort Stevens State Park is $52,000. Therefore, my incremental cost estimate for serving Fort Stevens would be approximately $286,000, or 22 percent more than the $234,000 estimate given in Table 15. Similarly, although available data and my scratch-pad method were in-

adequate to estimate the impact of Camp Rilea on other area's interceptor costs, I suspect that the $122,000 cost estimate for Camp Rilea on Table 17 significantly understates its incremental cost, perhaps by as much as $30,000.

On the basis of these estimates, I reach two conclusions. First, the full costs of interceptors to serve Fort Stevens and Camp Rilea are probably closer to $600,000 than to CH2M-Hill's estimate of $480,000. Second, with a 75 percent Federal grant for interceptor construction, the State of Oregon financial contribution for Fort Stevens and Camp Rilea should exceed $150,000, or at least $30,000 more than CH2M-Hill's estimate of $120,000 in Table 20. (The State contribution should be large enough to cover the net incremental costs of serving its facilities, $150,000 = (0.25) ($600,000), plus some fraction of the $200,000 cost involved in expanding the Warrenton treatment facility.)

Of course, financial arrangements with the State are fundamentally less important than decisions with respect to the following questions: What areas should and should not be sewered within the Clatsop Plains region? Where should interceptors be located to protect ground water and yet induce desirable development of the Clatsop Plains area? How many potential connections should be permitted within each collection area and along each interceptor? Etc. Unfortunately, the basic cost and environmental data needed to address these important public policy questions are not provided in a report which (1) does not present incremental cost estimates for the alternative sewer plans associated with alternative development patterns for the Plains area, (2) does not indicate the number of potential connections, and hence development,

by area served, and (3) does not state the extent and degree of ground water protection provided by the proposed plan and its alternatives.

Collection System Costs

The estimated collection system costs in Table 15-18 do not include the costs of connection installations. Therefore, collection system costs in Table 15-18 understate the total collection costs of each subsystem, and the sum of subsystem collection costs in Tables 15-18 is $1,162,000 less than the $3,961,000 lateral collection system cost estimate presented in Table 20.

The implications of the understatement of collection system costs in Tables 15-18 are important and deserve elaboration:

(a) Since connection installation costs vary directly with the predicted number of connections in each subsystem, the absolute size (i.e., total dollars) of the cost understatement for each subsystem varies directly with the population the collection subsystem is designed to serve.

(b) However, since connections cost less than collection lines, the understatement of total collection costs per predicted connection varies inversely with the number of connections predicted in each subsystem.

(c) As a consequence of (a) and (b), no realistic comparisons of subsystem collection costs can be made on the basis of the cost estimates presented in Tables 15-18.

Once again, the report does not provide the appropriate data to establish which areas within the proposed system may be sewered at high or low costs.

Financial Plan

Table 21 presents the estimated annual expense and income for the Clatsop Plains sewer system proposed by CH2M-Hill. The recommended financial plan underlying the estimates in Table 21 is relatively standard. Income would be derived from an annual property tax levy on the assessed value of taxable property within the proposed district, an annual sewer assessment against connected or "connectable" properties (the assessment to be based partly on front footage, partly on area), once-only connection charges, and monthly sewer charges.

The only truly unusual feature of the proposed financing scheme is the absence of an annual payment by the State for services provided to Fort Stevens and Camp Rilea. Although the annual payment by the State would probably be negotiable, such payments should at least cover the incremental operating and maintenance costs associated with the services rendered State properties. Available data did not permit me to estimate, even by "scratch-pad" methods, a reasonable minimum annual charge to the State.

Beyond the omission of an annual charge to the State, however, there are errors in the assumptions and computations that underlie the CH2M-Hill's estimates of the property tax rate, typical propoerty assessment, and monthly sewer charge in Tables 21 and 22. These tables purport to show annual expenses and the tax rate, service charge, and assessment required to balance the budget of the proposed district, but in fact the district would have deficit throughout its first twenty years of operation if the monthly sewer charge was set at $4.50, and/or if the typical property owner paid an annual sewer assessment of $104.00.

The reasons for the deficit are as follows. First and foremost, the initial and ultimate number of sewer connections predicted outside the presently sewered areas in Warrenton and Seaside was significantly over-estimated. This over-estimate occurred in part because of a computational mistake and in part because no growth in connections was predicted for Warrenton and Seaside. Second, system operation and maintenance expenses were estimated for the twentieth year of operation. As a consequence, this overstatement of operating costs slightly reduced but did not eliminate, the predicted deficit during the initial years of system operation.

The following table has been prepared to provide an accurate picture of the levies, charges, and assessments needed to cover system expenses according to CH2M-Hill's proposed financial plan. The first line in the lower third of the table shows that the initial property tax levy of $1.50 per $1,000 True Cash Value could be reduced as the district tax base increases. The second line shows how the monthly sewer charge could be reduced from an initial $6.25 to CH2M-Hill's estimate of $4.50 as the number of connections increases. The last line in the table reveals that CH2M-Hill's over-estimate of potential newly connected properties also led to a low $104 annual sewer assessment; my estimate of the annual assessment against the typical property owner is $131.25.

ESTIMATED ANNUAL EXPENSES AND MEANS OF FINANCE,
PROPOSED CLATSOP PLAINS SEWER SYSTEM[a]
(1977 dollars)

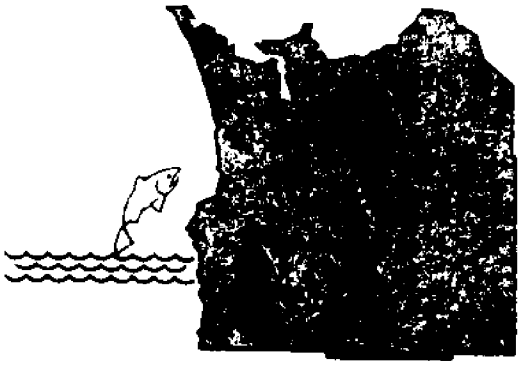
	1978	1987	1997
Annual Expense			
Debt Service on Bonds			
$2,105,000 for 20 yrs. @ 7% - G.O.B.	$199,000	$199,000	$199,000
$3,961,000 for 20 yrs. @ 7% - Bancroft	374,000	374,000	374,000
TOTAL Debt Service	573,000	573,000	573,000
System Operation and Maintenance (O&M)	270,000	286,000	302,000
TOTAL Annual Expense	843,000	859,000	875,000
Numbers of Connections and Property Tax Base			
Connections			
Warrenton & Seaside	2,200	2,500	2,750
Hammond, Gearhart, & Clatsop Plains	1,400	2,100	2,850
TOTAL Connections	3,600	4,600	5,600
Potential New Connections[b]	2,850	2,850	2,850
Assessed Value of Real Property ($mil.)	$133	$148	$163
Tax Levies, Charges, and Assessments to Cover Expenses			
Tax Levy ($/$1,000 True Cash Value) = $199,000	$1.50	$1.35	$1.22
Sewer Service Charge ($/month) = O&M expenses	6.25	5.20	4.50
Property Assessment ($/typical property) = $374,000	131.25	131.25	131.25

Source: CH2M-Hill, Clatsop Plains Sewerage Study, Clatsop County, Oregon, A Report to the Clatsop County Board of County Commissioners, March 6, 1975, Tables 13, 14, 21, and 22.

[a]The postulated growth in numbers and distribution of connections, the assessed value of property, etc. are consistent with various types of evidence and data presented in CH2M-Hill report.

[b]Estimated connections outside presently sewered areas in Warrenton and Seaside.

APPENDIX A



CLATSOP COUNTY

Courthouse . . . . Astoria, Oregon 97103

April 28, 1975

R. Charles Vars, Jr., Associate Professor
Department of Economics
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Dear Professor Vars:

Mr. Bill Rompa, the Clatsop County Extension agent, has informed the Board of County Commissioners and myself that you have done an economic evaluation of sewer projects in Tillamook County and may be willing to review the Clatsop Plains Sewer Plan proposed by CH2M-Hill.

We would most certainly like to have you review the above mentioned plan and give us your comments and reactions to the plan. If through your review you find that it is not feasible for the County to accomplish the entire plan, would you recommend which parts of the plan we should concentrate our efforts on. We would appreciate it if you would review this as soon as possible, as we are in the process of adopting the plan.

We understand through Mr. Rompa that there will be no charge for this review.

Sincerely,

Terry A. Marden, Planning Director

Lyle Ordway, Chairman, County Commissioner

Hiram Johnson, County Commissioner

Al Palmer, County Commissioner

TAM:jgh
cc: Bill Rompa

APPENDIX B

SEWERS INFLUENCE GROWTH PATTERNS

The location and rate of extension of interceptor sewer lines through previously undeveloped areas seem to have more impact on land use than any other set of decisions on wastewater facilities. Interceptor sewers are defined as the major lines that run from the collector sewers to the treatment plant. Because the location of a new interceptor significantly increases the number of buildable lots along its right of way, a key issue is its capacity. There is a general tendency for such lines to be oversized in order to assure the necessary capacity for future development, but the oversizing itself can contribute to the extent of development that occurs. Such oversizing thus becomes a self-fulfilling prophecy.

A related land use impact caused by large interceptor sewers is their tendency to be designed to run for long distances between existing towns before reaching the treatment plant. Such lines open up large areas of what may have been previously undeveloped land between the towns. While this may be in line with overall regional land use planning, it could also run counter to desirable development patterns, particularly if sewers are placed only with an eye toward wastewater treatment efficiency.

In one recent case, a proposed interceptor was slated to run through a large undeveloped coastal area of Delaware that was on the state plan for eventual purchase as recreational land. The proposal would have used public funds to build a sewer that would have substantially raised the purchase cost of the land to the public.

Another phenomenon related to the construction of large interceptors is the tendency for developers to move immediately to the end of the new line in order to take advantage of both the available sewer service and

the low land costs on the far urban fringe. The result is a costly leapfrog and fill-in development pattern, which increases the difficulty of properly planning for timing and size of other public facilities and spreads the urban areas out in a pattern that is wasteful of land and energy resources.

Many of these problems could be avoided if the construction of major interceptor sewers were phased to the extent feasible to coordinate with the extension of other public facilities in accord with a comprehensive land use plan. While annual or biennial extensions of such interceptors might make the sewer cost somewhat higher and the funding mechanism more complicated, it would probably result in overall cost savings to the community and would significantly reduce adverse land use impacts.

Similar issues arise when the analysis shifts from an individual interceptor to the design of an entire wastewater treatment system, including the treatment plant. Once again, cost factors favor the choice of large regional treatment plants with associated sewers. So far as water quality is concerned, these systems present economies of scale in construction and operation and require less monitoring and fewer highly trained personnel than a number of smaller treatment plants. But, as with sewers, the overdesign of capacity in the regional plant becomes a self-fulfilling prophecy.

Coastal and other areas of seasonal home construction may be particularly affected because only a limited amount of land may be available for high density development, and because the potential buyer of a seasonal home or a recreational lot has greater freedom of locational choice than with his primary home. While a series of smaller but individually expandable plants might be more costly in such circumstances, the community could retain more control over development. Such a course would also give com-

munities broader options to coordinate the expansion of wastewater treatment facilities with other public service programs. It is important to assure that such options are considered and the potential land use impacts are recognized prior to Federal funding.

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*U.S. Council on Environmental Quality, The Fifth Annual Report of the Council on Environmental Quality (Washington, D.C.: U.S. Government Printing Office, December 1974), pp. 37-39. (This passage also appears in the O.S.U., Air and Water Resources Institute publication "Oregon's Environment," May 1975, pp. 4-5.)