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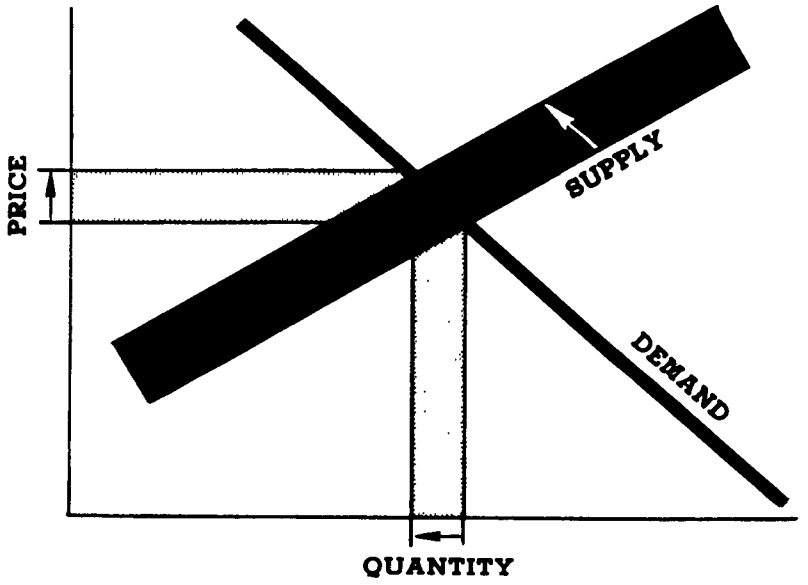
ECONOMIC ANALYSIS OF INTERIM FINAL EFFLUENT GUIDELINES FOR THE HOSPITALS INDUSTRY -- GROUP II



U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Water Planning and Standards
Washington, D.C. 20460

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ECONOMIC ANALYSIS OF INTERIM FINAL EFFLUENT GUIDELINES FOR THE HOSPITALS INDUSTRY – GROUP II

Contract No. 68-01-1541

Task Order No. 39

OFFICE OF WATER PLANNING AND STANDARDS
ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

February 1976

PREFACE

The attached document is a contractor's study prepared for the Office of Water Planning and Standards of the Environmental Protection Agency (EPA). The purpose of the study is to analyze the economic impact which could result from the application of alternative effluent limitation guidelines and standards of performance to be established under Sections 304(b) and 306 of the Federal Water Pollution Control Act, as amended.

The study supplements the technical study, "EPA Development Document," supporting the issuance of proposed regulations under sections 304(b) and 306. The Development Document surveys existing and potential waste treatment control methods and technology within particular industrial source categories and supports proposal of certain effluent limitation guidelines and standards of performance based upon an analysis of the feasibility of these guidelines and standards in accordance with the requirements of sections 304(b) and 306 of the Act. Presented in the Development Document are the investment and operating costs associated with various alternative control and treatment technologies. The attached document supplements this analysis by estimating the broader economic effects which might result from the required application of various control methods and technologies. This study investigates the effect of alternative approaches in terms of product price increases, effects upon employment and the continued viability of affected plants, effects upon foreign trade and other competitive effects.

The study has been prepared with the supervision and review of the Office of Water Planning and Standards of EPA. This report was submitted in fulfillment of Contract No. 68-01-1541, Task Order No. 39 by Arthur D. Little, Inc. Work was completed as of February 1976.

This report is being released and circulated at approximately the same time as publication in the Federal Register of a notice of interim final rule making under Sections 304(b) and 306 of the Act for the subject point source category. The study is not an official EPA publication. It will be considered along with the information contained in the Development Document and any comments received by EPA on either document before or during proposed rule making proceedings necessary to establish final regulations. Prior to final promulgation of regulations, the accompanying study shall have standing in any EPA proceeding or court proceeding only to the extent that it represents the views of the contractor who studied the subject industry. It cannot be cited, referenced, or represented in any respect in any such proceeding as a statement of EPA's views regarding the subject industry.

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This report is one of a series of reports to be prepared by Arthur D. Little, Inc. (ADL) for the Environmental Protection Agency (EPA) under Contract No. 68-01-1541, Task No. 39. The overall objective of this task is the determination of the economic impact that EPA interim final effluent limitations will have on eight point source categories. The primary source of treatment cost information for the Hospitals Industry is the Draft Development Document, dated February 1975, by Roy F. Weston. The EPA plans to name the following industries as point source categories:

Pharmaceuticals (SIC 2831, 2833, and 2834);
Gum and Wood Chemicals (SIC 2861);
Pesticides and Agricultural Chemicals (SIC 2879 and those establishments engaged in manufacturing agricultural pest-control chemicals covered under SIC 281 and 286);
Adhesives (SIC 2891);
Explosives (SIC 2892);
Carbon Black (SIC 2895);
Photographic Processing (SIC 7221, 7333, 7395, 7819); and
Hospitals (SIC 8062, 8063, and 8069).

1.2 PURPOSE AND SCOPE

The purpose of this report is to assess the economic impact on the U.S. hospitals industry (SIC 8062, 8063, and 8069) of the cost of meeting EPA standards for pollution abatement applicable to the discharge of water effluents from point sources directly to navigable waterways.

Compliance with the water pollution abatement standards may require the industry to install new physical facilities in its present operations, modify its current technical operations, or incorporate specialized facilities in new installations. Furthermore, the industry may have to install equipment and facilities capable of three levels of effluent water treatment such that:

- Level I – by 1977, for current industry installations, the best practicable control technology currently available (BPCTCA) is being used to control the pollutant content in the effluent streams discharged by the industry;

- Level II – by 1983, for current industry installations, the best available technology that is economically achievable (BATEA) is being similarly used; and

- Level III – new source performance standards (NSPS) for new industry installations discharging directly in navigable waters to be constructed after the promulgation of applicable guidelines for water pollution abatement, the incorporation of facilities that will be capable of meeting these guidelines.

This report presents the results of technical and economic analyses applied to the Hospitals point source category to determine the economic impact of the interim final effluent limitations.

1.3 CHARACTERIZATION OF THE HOSPITALS INDUSTRY

The American Hospital Association's data for 1974 indicate 7174 hospitals in the United States with total assets of approximately $52 billion. Their total yearly expenses were approximately $41 billion. Because hospitals are typically non-profit institutions, the annual expenses are usually equal to income or yearly "sales."

Average yearly expenses per hospital ranged from $1,680,000 for hospitals in the 50 to 99 bed classification to $23,078,000 for hospitals with 500 or more beds.

1.4 HOSPITALS SUBJECT TO INTERIM FINAL EFFLUENT GUIDELINES

We estimate that 90% of the nation's hospitals are connected to municipal sewage systems and, hence, are not subject to the interim final effluent guidelines. Some small hospitals are using septic tanks and are not covered, but some large, non-urban hospitals are *"direct dischargers"* covered by the regulations.

1.5 EXISTING WASTEWATER REGULATORY REQUIREMENTS AFFECTING HOSPITALS

The hospitals not connected to municipal sewage systems or septic tanks – "direct discharger" hospitals – have not had the option of discharging raw sewage because of many state and local regulations that predate the 1972 amendments to the Water Pollution Control Act. Therefore the "direct discharger" hospitals have been required to have some type of treatment facility that is usually equivalent to secondary sewage treatment.

1.6 WASTEWATER CAPITAL INVESTMENT AND ANNUAL COSTS INCURRED BY "DIRECT DISCHARGER" HOSPITALS

Estimates were made of the additional capital required by "direct discharger" hospitals of different bed sizes to meet the guidelines. Similar estimates were made of the annual treatment costs to be incurred. The additional investment for the BPCTCA level is $54 million and the BATEA level requires an additional investment of $44 million. The cost of both BPCTCA and BATEA levels is $98 million. The corresponding annual cost is $16 million for the BPCTCA level and $11 million for the BATEA level. The total annual cost for both BPCTCA and BATEA levels is $27 million.

1.7 ECONOMIC IMPACT ANALYSIS

As a result of the interim final effluent guidelines for the hospital industry, wastewater treatment costs will be incurred by an estimated 8% of the hospitals in the United States. For the hospitals that do incur these costs, treatment costs will range from 0.6% to 1.3% of total expenses, depending on hospital size (see Table 1.7).

Costs of this kind will not affect the volume of services hospitals are prepared to supply. The market environment for hospital services is generally characterized by inelastic demand – i.e., there is little change in quantity demanded in response to change in price. This is due to the essential nature of the services provided by hospitals and to the fact that an increasingly large proportion of hospital costs is not being borne directly by consumers, but rather by third parties such as government or private insurance companies. Hence, the price of hospital care is cost-determined and cost increases are passed on to third parties. Because of the price inelasticity of demand, there is a long-term tendency to add these costs to hospital rates resulting in no impact on the volume of hospital services supplied or on hospital employment.

For some hospitals treatment costs may be insignificant and too small to be reflected in rate increases.

For the 8% of the hospitals that will incur treatment costs, capital investment for treatment facilities range from 1.39% to 3.3% of total hospital assets (depreciated). (See Table 1.7.) There is no evidence that hospitals – which can finance capital expenditures from private borrowing or bond issues or philanthropic sources – will have difficulty in raising capital for construction of treatment facilities.

TABLE 1.7

COST OF POLLUTION ABATEMENT FOR THE HOSPITALS INDUSTRY

Bed Size Category	Estimated Number of Dischargers	Treatment Cost as a Percent of Operating Expense		Capital Investment as a Percent of Total Assets		Annual Cost		Total Investment	
		BPCTCA (%)	BPCTCA & BATEA (%)	BPCTCA (%)	BPCTCA & BATEA (%)	BPCTCA	BPCTCA & BATEA	BPCTCA	BPCTCA & BATEA
						(in million of dollars)			
50-99	175	0.8	1.3	1.8	3.3	2	4	7	13
100-199	153	0.5	0.8	1.3	2.2	3	5	11	19
200-299	77	0.4	0.7	1.0	1.8	2	4	8	15
300-399	44	0.3	0.5	0.84	1.54	2	3	4	11
400-499	29	0.3	0.5	0.79	1.39	1	2	5	8
500 or more	63	0.4	0.6	1.1	1.9	3	9	18	32
Total	541					16	27	54	98

Notes:

Treatment cost was obtained from the "Development Document," adjusted to 1974 values by use of the *Engineering News Record* Construction Index (1972 = 1780, 1974 = 1994), and scaled to the appropriate flow rates for each bed size category, and reduced by the value of treatment equipment currently in place.

In 1972 dollars the total annual cost is $15 million for BPCTCA and $24 million for both BPCTCA and BATEA.

In 1972 dollars the total investment is $48 million for BPCTCA and $87 million for both BPCTCA and BATEA.

Source: Arthur D. Little, Inc., tabulation of data from Table 2.2 and Table 3.4.3A.

1.8 ECONOMIC IMPACT OF THE INTERIM FINAL EFFLUENT GUIDELINES ON THE HOSPITAL INDUSTRY

Based on our economic impact analysis, we reached the following conclusions:

1) The majority (estimated at over 90%) of U.S. hospitals are not subject to the interim final effluent guidelines, because they are discharging to municipal sewage systems; hence there will be no concomitant economic impact on this group of hospitals.

2) For "direct discharger" hospitals subject to the interim final effluent guidelines (8% of total U.S. hospitals), the cost of achieving the 1977 BPCTCA level ranges from 0.39% to 0.75% of the respective total annual expenses. Achieving the 1983 BATEA level will result in an additional cost that ranges from 0.25% to 0.5% of total annual expenses.

3) The financial burden caused by these increases will not change the quantity of services offered by hospitals.

4) Whatever cost increases these hospitals will incur will be passed on to consumers, private and non-profit insurers, and the Government in the form of higher rates with no significant impact on the volume of hospital services demanded.

5) There will be neither any significant community impact nor any change in hospital employment as a direct result of the interim final effluent guidelines.

6) There is no evidence that hospitals will have difficulty in financing the investments necessary to meet the BPCTCA and BATEA levels.

2.0 CHARACTERIZATION OF THE HOSPITALS INDUSTRY

2.1 GENERAL CHARACTERIZATION

Hospitals do not produce a simple physical "product" in the same sense as a manufacturing or chemical process industry. Rather, hospitals provide a service, the value of which can be quantified in various manners. It is important that the basis used to quantify water pollution control costs is compatible with the basis used to quantify hospital output.

The Development Document provides wastewater treatment cost estimates for the BPCTCA* and BATEA** treatment levels. The cost estimates are put on the basis of "dollars per 1000 occupied beds per year." The Development Document does not define the term "occupied bed," and this leads to some difficulties in using occupied beds as the basis of comparison. There are many interpretations of a hospital "bed," e.g., "inpatient days," "available beds," "inpatient day equivalents," etc. We do not believe that the "occupied bed" is the most useful basis of comparison for the analysis of economic impact.

The most current and complete source of hospital data is "Hospital Statistics, 1975 Edition," which consists of 1974 data compiled from the American Hospital Association annual survey. After reviewing the data contained therein, we concluded that the most appropriate basis of comparison was the total annual wastewater treatment cost for a given size hospital compared to the total yearly hospital expenses for that size hospital. A comparison on a total rather than a unit (per bed) basis eliminates the confusion as to what constitutes an appropriate "bed."

The vast majority of hospitals are non-profit institutions in which expenses are recovered by the charges for hospital services. If temporary funds held aside for special projects, unpaid bills, certain loans, etc., are excluded, total expenses very nearly equal total revenue for any given year. For the purpose of this analysis, we used revenue and expenses interchangeably.

"Hospital Statistics" provides data on hospitals according to bed size categories. We took these data and performed calculations to determine an average value of total assets and total yearly expenses for an average size hospital within each size category. The pertinent data for six different bed size categories are presented in Table 2.1. "Bed size" in this case refers to capacity which, of course, is different from average daily occupancy. In Table 2.1, we calculated an average bed size for each of the hospital size categories, as shown in column C. The

*BPCTCA – Best Practicable Control Technology Current Available

**BATEA – Best Available Technology Economically Achievable

TABLE 2.1

1974 STATISTICAL PROFILE OF THE NATION'S HOSPITALS

Bed Size Category	A Hospitals	B Beds	C Calculated Average Bed Size (B÷A)	D Inpatient Days[1]	E Average Daily Census[2]	F Calculated Average Daily Occupancy Per Hospital (E÷A)	G Percent Occupancy	H Total Yearly Expenses ($1000)	I Calculated Total Yearly Expenses Per Hospital (H÷A) ($1000)	J Total Assets[3] ($1000)	K Calculated Total Assets Per Hospital (J÷A) ($1000)
50-99	1,748	125,613	72	30,132,333	82,676	47	65.8	2,938,081	1,680	3,981,180	2,278
100-199	1,533	217,087	142	57,175,530	156,861	102	72.3	6,313,862	4,119	8,461,876	5,520
200-299	766	185,772	242	52,252,078	143,181	187	77.1	6,227,095	8,129	8,260,222	10,784
300-399	444	151,131	340	43,888,417	120,375	271	79.6	5,447,650	12,269	7,014,790	15,799
400-499	291	130,213	447	38,443,051	105,328	362	80.9	4,708,414	16,180	5,959,657	20,480
500 or more	634	645,792	1,023	192,298,132	526,850	835	81.6	14,562,150	23,078	16,490,392	26,133
U.S. Total	7,174	1,512,684	—	425,877,798	1,167,353	—	77.2	41,406,109	—	51,705,917	—

Source: "Hospital Statistics, 1975 Edition" (1974 Data from the American Hospital Association Annual Survey) American Hospital Association, Chicago, Illinois, 1975.

Notes:
1. "Inpatient Days" is defined as the number of adult and pediatric days of care rendered during the entire reporting period; excludes newborn days of care.
2. "Average Daily Census" is defined as the average number of inpatients receiving care each day during the 12-month period; excludes newborns.
3. "Total Assets" includes land, buildings, equipment, and reserves for construction, improvement and replacement — less depreciation — plus all other assets including endowment fund principal and general and temporary fund balances.
4. *Table excludes hospitals in the less-than-50-bed size category.*
5. Calculated average values are not given for the United States total due to the skewing effect of the large number of smaller hospitals.

average daily occupancy is presented in column F, the average total yearly expenses per hospital in column I, and the average total assets per hospital in column K. It is the average total yearly expenses per hospital and the average total assets against which the treatment costs will be compared.

2.2 HOSPITALS SUBJECT TO INTERIM FINAL EFFLUENT GUIDELINES

Hospitals connected to municipal sewage systems are not subject to the interim final effluent guidelines. The Development Document states that "Most hospitals are located in densely populated areas and discharge their waste to municipal sewer systems." It is obvious, by the very nature of the hospitals and the services they provide, that the geographic distribution of hospital capacity (in terms of available beds) must very closely follow the geographic distribution of the Nation's population. As such, a very high percentage of hospital capacity is located either within or in close proximity to large cities. All large cities in the United States have extensive sanitary sewage systems. This fact, coupled with the compositional similarity between hospital wastewater and sanitary sewage, has facilitated the widespread use of municipal sewage systems for the disposal of hospital wastewater. To our knowledge, there are no readily available statistics giving the percentage of hospital capacity on municipal discharge and the percentage providing their own treatment. Nevertheless, we are in agreement with the Development Document that most hospital capacity is on municipal discharge, and believe that an estimate on the order of 90% municipal discharge would be realistic.

Table 2.2 presents the results of our computations using this 90% estimate. Only those hospitals using their own treatment facilities are affected by the interim final effluent guidelines.

TABLE 2.2*

"DIRECT DISCHARGER" HOSPITALS

Bed Size Category	Total Number of Hospitals	Estimated Number of Hospitals with Own Treatment Facilities
50-99	1,748	175
100-199	1,533	153
200-299	766	77
300-399	444	44
400-499	291	29
500 or more	634	63

***Assumption:** Only 10% of all hospitals in each size category will have its own wastewater treatment facilities.

Source: "Hospital Statistics; 1975 Edition."

3.0 DISCUSSION OF WASTEWATER TREATMENT COSTS FOR HOSPITALS

3.1 COSTS OF MUNICIPAL TREATMENT OF HOSPITAL WASTEWATER

For hospitals, municipal discharge offers the following major advantages over individual on-site treatment.

- Essentially no capital investment,
- Generally much lower overall wastewater disposal cost, and
- Transfer of water pollution control responsibility from the hospital to the municipality.

In light of these advantages, it is reasonable to assume that where a hospital has a choice, it will almost invariably select municipal discharge.

As discussed in the Development Document, hospitals generate certain aqueous wastes, such as spent photographic solutions, that are incompatible with the proper operation of municipal sewage treatment plants. While the presence of high concentrations of such waste could preclude municipal discharge, the Development Document indicates that many hospitals currently practice in-house control procedures that prevent such wastes from entering the general wastewater stream. It appears that such in-house controls are feasible and within the capability of most hospitals.

While the Development Document makes recommendations regarding in-house controls, it does not specify actual contaminant concentration levels for pretreatment prior to municipal discharge. In reality, therefore, pretreatment restrictions will tend to be at the discretion of the individual municipal sewage authorities. We have no reason to believe that the proposed effluent guidelines will, in any way, limit the already widespread use of municipal discharge for the disposal of hospital wastewater.

A municipal sewage system consists of a collection system and a treatment plant. Typically, the total annual cost of the sewage system is allocated among the population served by means of taxes and/or various sewer charges. Whatever form of cost allocation is used, the basic intent of the municipality is to recover the cost of both the investment and the operation of the sewage system.

The cost of municipal sewage collection and treatment (including both amortization and operating costs) to the consumer is approximately $1.00/1000 gallons (calculated at 1974 levels).* We can assume that hospitals on municipal discharge will have to pay approximately $1.00/1000 gallons. Due to the similarity of hospital wastewater to domestic sewage, it is doubtful whether hospitals ever have to pay a surcharge, as do many industries discharging wastewaters of high BOD_5 concentration. The charge of $1.00/1000 gallons can, therefore, be considered a high estimate. As previously stated, hospitals connected to municipal sewage systems are not subject to the interim final effluent guidelines, but for comparison purposes we calculated the annual cost of municipal discharge for the various hospital size categories, and have tabulated these in Table 3.1. We based our calculations on the wastewater generation rate specified in the Development Document, the calculated average bed size for the various size categories, and the $1.00/1000 gallon charge.

As shown in Table 3.1, the cost of wastewater disposal varies between 0.26% and 0.42% of total hospital expenses. The table also indicates that there is essentially no economy of scale involved in municipal discharge, a feature particularly important to small hospitals.

TABLE 3.1

ANNUAL COST OF MUNICIPAL DISCHARGE COMPARED TO TOTAL YEARLY HOSPITAL EXPENSES

Bed Size Category	Calculated Total Yearly Expense per Hospital ($1000/yr)	Yearly Cost of Municipal Discharge per Hospital ($1000/yr)	Yearly Cost of Municipal Discharge per Hospital (% of Total Expenses)
50-99	1,680	5.5	0.33
100-199	4,119	11.9	0.29
200-299	8,129	21.8	0.27
300-399	12,269	31.7	0.26
400-499	10,180	42.3	0.26
500 or more	23,078	97.5	0.42

Notes: 1. Cost is based on March 1974 Dollars (ENR Construction Cost Index – 1994)
2. Hospital wastewater generation rate = 319 gpd per occupied bed
3. Cost of municipal treatment – $1.00/1000 gal
4. Total wastewater flow rates are based on calculated average bed size (Table 2.1)

Source: "Cost to the Consumer for Collection and Treatment of Wastewater," and the Development Document.

* "Cost to the Consumer for Collection and Treatment of Wastewater," Water Pollution Control Research Series, 17090-70/70, U.S. Environmental Protection Agency, pp. 63-66.

3.2 WASTEWATER TREATMENT COSTS

The BPCTCA and BATEA wastewater treatment costs presented in the Development Document are based on a single "model" hospital of 636 occupied beds. This cost model is presented in Table 3.2A. As can be seen from the data which were presented in Table 2.1, a hospital with 636 occupied beds is a rather large hospital. It is misleading to use the costs based on this size directly, because it would not take into account the economies of scale that exist between large and small wastewater treatment facilities. To acknowledge the effect of economies of scale, the original cost model must be adjusted to fit the different bed-size categories.

The capital cost of the type of wastewater treatment facility presented in the Development Document will largely be dependent on the wastewater flow rate (gallons per day) that it is designed to treat. Capital cost is therefore a function of flow rate. Since there are economies of scale in both the equipment and the construction labor that comprise the total capital cost of a wastewater treatment facility, the capital cost does not vary linearly, but rather varies according to approximately the 0.65 power of the flow rate. Thus, a 3 million gpd treatment plant will not cost 3 times as much as a 1 million gpd plant, but will cost only approximately twice as much.

The total annual treatment cost presented in the Development Document consists of approximately 54% capital recovery, 42% operating and maintenance, and 4% energy and power. Operating and maintenance also are affected by economies of scale. Thus, it is reasonable also to apply the 0.65 power rule to the total annual cost.

Using the wastewater generation rate of 319 gpd per occupied bed specified in the Development Document, we calculated the wastewater flow rate for each of the average size hospitals within the various size categories. Using these flow rates, we then adjusted the Development Document costs to account for size in accordance with the previously discussed 0.65 power rule. This was done by means of a "size adjustment factor" based on the ratio of flow rates raised to the 0.65 power. The results are shown in Table 3.2B.

It is important to recognize that the treatment costs presented in Table 3.2B, are for those hospitals that must treat their own wastewaters. Hospitals discharging their wastewaters to municipal sewage systems will incur different costs, but these costs are not attributable to the interim final effluent guidelines because the guidelines do not apply to discharges into municipal systems. Hospitals that already have portions of the required treatment in place will incur only a portion of the total costs as a direct result of the promulgation of the proposed effluent guidelines. There are existing regulatory restrictions currently in effect that require hospitals to have a major portion or the entire recommended treatment already in place.

TABLE 3.2A

WASTEWATER TREATMENT COSTS FOR BPCTCA, BADCT AND BATEA EFFLUENT LIMITATIONS (ENR 1780 – August 1972 Costs)

		Technology Level			
		RWL	BPCTCA	BADCT[2]	BATEA[2]
Average Number of Occupied Beds – 600					
Wastewater Flow –	kL/day	723	723	723	723
	(gpd)	(191,000)	(191,000)	(191,000)	(191,000)
	kL/1000 beds)[3]	1,210	1,210	1,200	1,210
	(gal/1000 beds)[3]	(319,000)	(319,000)	(319,000)	(319,000)
BOD Effluent Limitation[4] –	kg/1000 beds[3]	267	18.7	12.1	12.1
(Design Basis)	(lb/1000 beds)[3]	(587)	(41.1)	(26.6)	(26.6)
	mg/L	221	15	10	10
TSS Effluent Limitation[4] –	kg/1000 beds[3]	174	24.2	12.1	12.1
(Design Basis)	(lb/1000 beds)[3]	(382)	(53.2)	(26.6)	(26.6)
	mg/L	146	20	10	10
Total Capital Costs			$830,000	$169,000	$169,000
Annual Costs					
Capital Recovery plus return at 10% at 10 years			$135,000	$ 27,000	$ 27,000
Operating + Maintenance			105,000	10,000	10,000
Energy + Power			10,000	3,000	3,000
Total Annual Cost			$250,000	$ 40,000	$ 40,000
Cost/1000 Occupied Beds/Year[1]			$393,000	$ 63,000	$ 63,000

1. Cost based on total annual cost
2. Incremental cost over BPCTCA cost
3. Based on occupied beds
4. Long-term average daily effluent

TABLE 3.2B

SIZE-ADJUSTED HOSPITAL TOTAL WASTEWATER TREATMENT COSTS PER HOSPITAL

Bed Size Category	Calculated Average Daily Occupancy	Wastewater Flow Rate (gpd)	Size-Treatment Cost Adjustment Factor	Total Capital Investment per Hospital		Total Annual Treatment Cost per Hospital	
				Size-Adjusted BPCTCA Capital Investment ($1000)	Size-Adjusted BATEA Capital Investment ($1000)	Size-Adjusted BPCTCA Annual Treatment Cost ($1000/yr)	Size-Adjusted BATEA Annual Treatment Cost ($1000/yr)
50-99	47	15,000	0.18	167	34	50.4	8.1
100-199	102	32,500	0.30	279	57	84	13.4
200-299	187	59,700	0.45	419	85	126	20.2
300-399	271	86,400	0.57	530	108	160	25.5
400-499	362	115,000	0.69	642	130	193	30.9
500 or more	835	266,000	1.19	1,107	225	333	53.3
Devel. Doc. Cost Model	636	203,000	1.00	903	189	280	44.8

Notes:
1. BATEA costs are incremental to BPCTCA.
2. All costs adjusted to March 1974 levels – (ENR Construction Cost Index = 1994).
3. Wastewater flow rates were based on a unit wastewater generation rate of 319 gpd per occupied bed, as stipulated in the Development Document.
4. "Size-Treatment Cost Adjustment Factor" is designed to account for the economies of scale that exist between large and small wastewater treatment systems and is based on flow rate ratios raised to the 0.65 power.

3.3 EXISTING WASTEWATER REGULATORY REQUIREMENTS AFFECTING HOSPITALS

As a step in properly determining the economic impact of the proposed effluent guidelines on the hospital industry, we examined the existing wastewater regulatory requirements with which hospitals currently must comply. We compared the existing regulations with the guidelines and calculated the *incremental* treatment costs directly attributable to the guidelines themselves. In this way, a basis for a realistic assessment of the economic impact of the specific proposed effluent guidelines was provided.

As stated in the Development Document, hospital wastewater has characteristics comparable to normal domestic sewage. The reason that hospital wastewater is similar to domestic sewage is simply that a very large component of hospital wastewater is domestic sewage, i.e., human excrement and kitchen and laundry wastewater. The fact that hospital wastewater contains human excrement is of significance with respect to the type of regulatory requirements with which hospitals must comply.

Historically, one of the main purposes of the early water pollution control efforts in this country was to prevent the spread of waterborne communicable diseases such as typhoid. Such diseases can be readily transmitted by the discharge of untreated human excrement into waterways that also serve as potable water supplies. For this reason, many states had regulations limiting the discharge of raw sewage long before the Federal Water Pollution Control Act. The type of regulations governing the discharge of sewage has varied greatly from State to State, and even within different sections of a particular State. The enforcement of local water pollution regulations, especially in earlier years, has also suffered from a lack of uniformity. Nevertheless, there are regulations currently in effect governing the discharge of sewage; and hospitals, as sewage dischargers, are currently being forced to comply with these regulations.

We have examined a number of State water pollution regulations and spoke to pollution control officials in those States to determine the regulatory requirements already affecting hospitals. The study of State regulations confirmed our impression that, even in the absence of the guidelines regulations, hospitals did not have the option of discharging untreated sewage onto the land or into waterways. Therefore, total treatment costs are not chargeable to the guidelines, and incremental costs can only be charged if the guidelines require treatment beyond those required by previous regulations. The following are summaries of some State regulations and of our contacts with State regulatory agencies.

NEW YORK

Water pollution control in New York is under the jurisdiction of the New York State Department of Environmental Conservation. The specific State law pertaining to sewage is Section 17-0509 of the New York Environmental Conservation Law (effective 1972) which reads as follows:

Section 17-0509 – Minimum Treatment Required

1. As used in this section, the term "effective secondary treatment" shall mean the removal of substantially all floating and settleable solids and the removal of at least 85% of suspended solids and at least 85% of BOD_5, or such other standards as may be adopted pursuant to the Act.

2. The minimum degree of treatment required for the discharge of sanitary sewage into the surface water of the State shall be effective secondary treatment, provided, however, that additional treatment may be required consistent with the standards established for specific waters by the department. . .

Our discussion with the Department of Environmental Conservation indicates that the requirement for "effective secondary treatment" is being enforced throughout the State and that wastewater discharge from hospitals definitely comes under the jurisdiction of this regulation.

PENNSYLVANIA

Water pollution control in Pennsylvania is under the jurisdiction of the Department of Environmental Resources, Bureau of Water Quality Management. The specific State law pertaining to sewage is:

Title 25.	Rules and Regulations
Part I.	Department of Environmental Resources
Subpart C.	Protection of Natural Resources
Article II.	Water Resources

95.2 Treatment for Biodegradable Wastes

a. All biodegradable wastes shall be given a minimum of secondary treatment, or its equivalent, for industrial wastes except as otherwise specified in this Chapter.

b. Secondary treatment is that treatment which shall accomplish the following:

(1) Reduce the organic wasteload as measured by the biochemical oxygen demand test by at least 85% during the period May 1 to October 31 and by at least 75% during the remainder of the year, based on a five consecutive day average of values.

(2) Remove practically all of the suspended solids.

(3) Provide effective disinfection to control disease-producing organisms.

(4) Provide satisfactory disposal of sludge.

(5) Reduce the quantities of oils, greases, acids, alkalis, toxic, taste and odor-producing substances, color and other substances inimical to the public interest to levels which shall not pollute the receiving stream.

95.5 Effective Disinfection

Effective disinfection to control disease-producing organisms shall be the production of an effluent which will contain a concentration not greater than 200/100 ml of fecal coliform organisms as a geometric average value, nor greater than 1000/100 ml of these organisms in more than 10% of the samples tested.

From our discussion with Department of Environmental Resources personnel, it appears that most hospitals (not discharging to municipal sewage systems) in the State of Pennsylvania already have, or shortly will have, the equivalent of secondary treatment.

NEW JERSEY

Water pollution control in New Jersey is under the jurisdiction of the New Jersey Department of Environmental Protection, Division of Water Resources. Discussions with personnel at the Division of Water Resources indicated that hospitals will have to have secondary treatment, and that in most cases, State water quality standards would require between 85% and 95% removal of BOD_5. It also appears that direct discharge of wastewater from hospitals is rather rare in New Jersey, as the vast majority of hospitals are connected to municipal sewerage systems.

ILLINOIS

Water pollution control in Illinois is under the jurisdiction of the Illinois Environmental Protection Agency, Water Pollution Control Division. A discussion with Illinois EPA personnel revealed that, for sewage discharges of less than 10,000 population equivalents (approximately 1 million gpd), a BOD_5 restriction of 30 mg/l and a suspended solids restriction of 30 mg/l are being enforced. In certain situations, such as discharge to intermittent streams, it is likely that even tighter restrictions will be applied. Since, according to the Development Document, hospital wastewater typically has a BOD_5 concentration of over 200 mg/l, a 30 mg/l effluent restriction will require at least 85% BOD_5 removal, which would automatically require the use of secondary treatment.

MICHIGAN

Water pollution control in Michigan is under the jurisdiction of the Michigan Department of Natural Resources, Water Resources Commission and Bureau of Water Management. Surface water discharges are controlled under a permit system which closely corresponds to the NPDES permit system. Personnel at the Water Resources Commission felt that secondary treatment would be applied to hospitals in most cases. In addition, there is an interagency agreement between the Water Resources Commission and the Michigan State Health Department in which discharge permits for hospitals and nursing homes are subjected to a joint review.

3.4 ESTIMATION OF THE ACTUAL COST INCURRED BY SOME HOSPITALS AS THE RESULT OF IMPLEMENTATION OF THE INTERIM FINAL EFFLUENT GUIDELINES

We estimate that 90% of the larger U.S. hospitals are on municipal sewage systems and, hence, are not affected by the interim final effluent guidelines. Likewise, many small rural hospitals connected to septic tanks are not affected. However, there are some large hospitals outside of urban areas that have point source discharges that would be covered by the guidelines. For convenience, we have designated the hospitals which are not discharging to municipal sewage plants or septic tanks as "direct discharger" hospitals.

3.4.1 BPCTCA Treatment Level

As previously discussed, there are many State and local regulations already promulgated which restrict wastewater discharged from these "direct discharger" hospitals to a level that generally requires the use of secondary treatment. ("Secondary treatment," as applied to sewage, almost always refers to the use of biological treatment processes such as the trickling filter, the activated sludge process, or the aerated lagoon.) The BPCTCA treatment cost model presented in

the Development Document is based on the activated sludge process, which is considered secondary treatment.

Thus, if secondary treatment is already either in use or in the process of being adopted by most "direct discharger" hospitals, and if such secondary treatment is essentially equivalent to the BPCTCA treatment level of the proposed effluent guidelines, then it follows that the BPCTCA treatment costs set forth in the Development Document are either fully or partially being incurred. It would, therefore, be unrealistic to attribute the total cost of secondary treatment (as specified in the Development Document BPCTCA cost model) to the implementation of the BPCTCA treatment level.

It is important to recognize the fact that all hospitals that already have secondary treatment may not meet the proposed effluent guidelines (or certain State or local regulations). Some hospitals may have undersized, improperly designed and/or operated treatment facilities that will need upgrading to meet the BPCTCA effluent guidelines. The cost of upgrading an existing plant to meet the BPCTCA treatment level can, of course, be directly attributable to the proposed BPCTCA effluent guidelines.

The upgrading of a sewage treatment plant that already has secondary treatment will typically entail adding a second stage to the existing biological treatment system, changing the process configuration, or adding additional capacity to certain treatment units. Such measures usually add very little to existing direct operating costs, and require a capital investment that is far less than that of the original treatment facility.

The Development Document cost model presents treatment costs for a secondary biological waste treatment system that is designed to achieve the stated BPCTCA effluent limitations. Since the vast majority of "direct discharger" hospitals already have the suggested BPCTCA treatment in place, the full BPCTCA treatment cost stated in the Development Document cost model will not actually be incurred. To acknowledge the fact that certain hospital treatment systems may need upgrading to meet the BPCTCA level, we estimated that 75% of the total cost is already being incurred, and that 25% will be incurred as the direct result of the BPCTCA effluent guidelines. To upgrade a biological treatment plant from the 85% removal efficiency already required by many States to the 93% removal suggested by the effluent levels cited in the Development Document, typically, one or more of the following measures would be implemented:

- Adding an additional biological treatment stage onto the end of the existing treatment plant;

- Modifying the individual treatment units within the system so as to improve their efficiency;

- Adding additional capacity to the existing units so as to reduce the loadings and thereby improve removal efficiency.

Such modifications would normally be minor and the resultant increase in total treatment cost ought not exceed 25% of the existing cost.

3.4.2 BATEA Treatment Level

The BATEA treatment level of the proposed effluent guidelines recommends multimedia filtration. Such filtration installed downstream of secondary biological treatment is generally referred to as tertiary treatment. There are few, if any, hospitals currently employing multimedia filtration. The full BATEA treatment cost will, therefore, be incurred by most hospitals that are not on municipal systems.

3.4.3 Total Treatment Cost

Table 3.4.3A shows the "actually incurred" BPCTCA treatment cost; i.e., 25% of the full BPCTCA cost, along with the original full BATEA cost. The costs shown in this table are those that we believe will actually be incurred by "direct discharger" hospitals *as a direct result or promulgation of the interim final effluent guidelines.*

Table 3.4.3B presents the "actually incurred" BPCTCA treatment cost, along with the original BATEA cost, on a nationwide basis rather than on an individual hospital basis.

TABLE 3.4.3A

"ACTUALLY INCURRED" WASTEWATER TREATMENT CAPITAL INVESTMENT AND ANNUAL COST

Bed Size Category	Per Hospital "Actually Incurred" Size-Adjusted BPCTCA Capital Investment ($1000)	BPCTCA Annual Cost ($1000/yr)	BATEA Capital Investment ($1000)	BATEA Annual Cost ($1000/yr)
50-99	41.8	12.6	34	8.1
100-199	69.8	21.0	57	13.4
200-299	105	31.5	85	20.2
300-399	133	40.0	108	25.5
400-499	161	48.3	130	30.9
500 or more	277	83.3	225	53.3

Notes: 1. BATEA capital investment is incremental to BPCTCA capital investment.
2. All costs are adjusted to March 1974 level – (ENR Construction Cost Index = 1994).
3. "Actually Incurred" BPCTCA capital investment = 25% of total BPCTCA capital investment.
4. "Actually Incurred" BATEA capital investment is identical to total BATEA capital investment.

Source: Arthur D. Little, Inc., estimates.

TABLE 3.4.3B

ESTIMATED NATIONWIDE "ACTUALLY INCURRED" TREATMENT COSTS

Bed Size Category	Nationwide BPCTCA Capital Investment ($1000)	Nationwide BPCTCA Annual Cost ($1000)	Nationwide BATEA Capital Investment ($1000)	Nationwide BATEA Annual Cost ($1000)	Nationwide (BPCTCA & BATEA) Capital Investment ($1000)	Nationwide (BPCTCA & BATEA) Annual Cost ($1000)
50 – 99	7,315	2,205	5,950	1,418	13,265	3,623
100 – 199	10,679	3,213	8,721	2,050	19,400	5,263
200 – 299	8,085	2,426	6,545	1,355	14,630	3,981
300 – 399	3,832	1,760	4,752	1,122	10,604	2,882
400 – 499	4,669	1,401	3,770	896	8,439	2,297
500 or more	17,451	3,246	14,175	3,358	31,626	8,606
National Totals	54,051	16,253	43,913	10,399	97,964	26,652

Source: Arthur D. Little, Inc., estimates based on data provided in "1974 Hospital Statistics" and EPA Development Document.

4.0 ECONOMIC IMPACT ANALYSIS OF THE INTERIM FINAL EFFLUENT GUIDELINES ON THE HOSPITALS INDUSTRY

We estimate that 92% of the U.S. hospitals are not subject to the interim final effluent guidelines, because they are discharging to municipal sewage systems or septic tanks; hence there will be no concomitant economic impact on this group of hospitals.

Those hospitals that are not connected to municipal systems and have point source discharges of wastewater will be covered by the guidelines. We designated the latter group of hospitals as "direct discharger" hospitals. It is this group of hospitals that are considered in the economic analysis. The first step of the economic impact analysis is the prescreening process, which was performed for each of the eight separate industry categories selected for study by the EPA.

4.1 PRESCREENING METHODOLOGY

The objective of the prescreen was to provide EPA with sufficient information to permit it to choose which industry subcategories it could eliminate from further study by ADL. Of course, eliminating some of the subcategories would permit a more cost-effective utilization of the available resources for studying the economic impact of the proposed effluent guidelines.

For any prescreen process to be effective, it must:

- Exclude only those subcategories for which there is strong evidence readily available that the economic impact would be insignificant; and

- Not consume a large amount of the available resources.

Initiating the study, ADL interviewed its own experts for each industry category to develop information which characterized the industry, its markets, its pollution control practices, and any consideration the industry expert felt EPA should know about respective industry subcategories. To guide the experts on the kind of information they should provide, we developed an outline in tabular form of the information needed.

The experts were instructed to prepare their comments utilizing only personal knowledge or information that was immediately available to them in completing the information table for their respective industry subcategories. In many instances, there were areas in the information table on which no comment was possible, either because the expert did not have the requisite information immediately available to him, or because the answer was too complex for answering at the prescreen level.

The information contained in the experts' comments and on the information table not only provided the basis for our recommendations concerning the categories EPA should consider eliminating, but also generalized the condition of the industry with respect to the proposed regulations.

In developing our recommendations, we wanted to have a high degree of certainty that any category we recommended for elimination could not, on further study, be shown to be seriously impacted. Thus, we developed four criteria, any one of which, if met by an industry subcategory, would be enough to give a tentative classification as a subcategory for elimination. Before we recommended that EPA consider elimination of a subcategory from further study, we made an overall assessment involving other data known to the industry expert. The criteria are as follows:

(1) The industry subcategory is generating no wastewater.

(2) The ratio of BPCTCA plus BATEA to selling price is less than 2% and/or the ratio of BPCTCA plus BATEA to profits is less than 15%.

(3) Most of the plants in the subcategory are currently discharging into municipal sewage systems and may continue to do so with little or no pretreatment costs incurred.

(4) Most of the recommended treatment facilities have already been installed in most of the plants in the subcategory.

Criterion (1) obviously represents the strongest reason for eliminating an industry from further study. If the industry does not discharge wastewater, water pollution regulations will have no impact upon the industry.

Criterion (2) is based on discussions with ADL economic experts. We decided that, if this criterion were met, the proposed standards would likely not result in a significant economic impact. Often, our experts had no profit margin information available. In those instances, when the ratio of treatment cost to selling price was less than 2%, we still recommended that EPA consider removing the subcategory from further study. However, this recommendation is not so strong as the recommendations made using profit information.

In considering treatment cost/selling price and treatment cost/profit margin ratios, it is important to realize that the treatment costs presented in the Development Document are for a total treatment system and represent the costs incurred by a plant having no wastewater treatment already in place. Most facilities within the eight industries studied under this contract have some form of wastewater treatment already installed.

Criterion (3) also represents a very strong reason for eliminating a subcategory from further study. If the wastewater treatment practice within a subcategory consists mainly of discharging to municipal sewage systems, the cost of that treatment is already being incurred via sewer charges. If the subcategory can continue this practice, be consistent with the pretreatment standards set forth in the Development Document, and yet incur little or no pretreatment cost, then the incremental economic impact to that subcategory will be nil. Since the Development Document does not provide pretreatment costs, Criterion (3) was used to eliminate a category only when it was very clear that pretreatment would be either unnecessary or minimal.

Criterion (4) represents a reason for eliminating an industry from further study on the basis that, should the industry meet Criterion (4), it will not have to expend as much money as the Development Document indicates to meet the proposed standards.

The wastewater treatment already installed to meet other Federal or State regulations may be adequate to meet the requirements of the proposed guidelines. Therefore, the incremental treatment costs attributable to the guidelines may be zero for many facilities.

Tables 4.1A and 4.1B present our estimate of the actually incurred wastewater treatment costs for the Hospitals Industry. The smallest hospital size category, because of economy-of-scale penalties, will have proportionately the highest treatment costs. Using the unit treatment costs for the smallest size category, the Hospitals Industry was subjected to the previously described prescreening process. The various factors that went into the prescreening process are summarized in Table 4.1C.

As can be seen from Table 4.1C, the Hospitals Industry satisfies many of the necessary conditions for prescreening, and therefore will not have to be subjected to detailed economic impact analysis to determine that the economic impact will not be significant.

We considered the following additional factors in performing this prescreen:

- The nature of the demand for hospital services is such that treatment costs would be "passed on" to consumers in the form of higher hospital rates with no impact on the supply of hospital services.

- The market environment for hospital services is generally characterized by an inelastic demand. This is due to the essential nature

TABLE 4.1A

"ACTUALLY INCURRED" WASTEWATER TREATMENT CAPITAL INVESTMENT COMPARED TO TOTAL "DIRECT DISCHARGER" HOSPITAL ASSETS

Bed Size Category	Calculated Total Assets Per Hospital ($1000)	Per Hospital "Actually Incurred" Size-Adjusted BPCTCA Capital Investment ($1000)	(% of Total Assets)	Per Hospital "Actually Incurred" Size-Adjusted BATEA Capital Investment ($1000)	(% of Total Assets)
50 – 99	2,278	41.8	1.8	34	1.5
100 – 199	5,520	69.8	1.3	57	1.0
200 – 299	10,784	105	1.0	85	0.8
300 – 399	15,799	133	0.84	108	0.7
400 – 499	20,480	161	0.79	130	0.6
500 or more	26,133	277	1.1	225	0.8

Notes: 1) BATEA capital investment is incremental to BPCTCA capital investment.
2) All costs are adjusted to March 1974 level – (ENR Construction Cost Index = 1994).
3) "Actually Incurred" BPCTCA capital investment = 25% of total BPCTCA capital investment.
4) "Actually Incurred" BATEA capital investment is identical to total BATEA capital investment.

Source: Arthur D. Little, Inc., estimates.

TABLE 4.1B

"ACTUALLY INCURRED" ANNUAL WASTEWATER TREATMENT COSTS COMPARED TO TOTAL YEARLY "DIRECT DISCHARGER" HOSPITAL EXPENSES

Bed Size Category	Calculated Total Yearly Expenses Per Hospital ($1000/yr)	Per Hospital "Actually Incurred" Size-Adjusted BPCTCA Annual Treatment Cost ($1000/yr)	(% of Total Expenses)	Per Hospital "Actually Incurred" Size-Adjusted BATEA Annual Treatment Cost ($1000/yr)	(% of Total Expenses)
50 – 99	1,680	12.6	0.75	8.1	0.50
100 – 199	4,199	21.0	0.50	13.4	0.33
200 – 299	8,129	31.5	0.4	20.2	0.25
300 – 399	12,269	40.0	0.33	25.5	0.20
400 – 499	16,180	48.3	0.30	30.9	0.19
500 or more	23,078	83.3	0.36	53.3	0.23

Notes: 1) BATEA annual cost is incremental to BPCTCA annual cost.
2) All costs are adjusted to March 1974 level – (ENR Construction Cost Index = 1994).
3) "Actually Incurred" BPCTCA annual cost = 25% of total BPCTCA annual cost.
4) "Actually Incurred" BATEA annual cost is identical to total BATEA cost.

Source: Arthur D. Little, Inc., estimates.

TABLE 4.1C

HOSPITALS INDUSTRY SUMMARY TABLE

Industry Data	Subcategories Single Category
1. Annual Production* (units/yr)	248,097,000 bed-days per year
2. Production Value** ($MM sales)	28,372 $MM/yr
3. Representative Range of Unit Selling Price, ($/bed-day)	$101-$140
4. Estimated Profit Margin (% of selling price)	Mostly non-profit
5. BPCTCA (1977) Treatment Cost† ($/unit of product)	$1.69 per day per bed
6. BATEA (1983) Treatment Cost+ ($/unit of product)	$0.27 per day per bed
Technical and Economic Factors Pertinent to Economic Impact Analysis	
Technical Factors	
7. Possibility of drastically reducing or totally eliminating wastewater flow rate.	Nil
8. Possibility of substantially reducing cost of end-of-pipe treatment via in-plant changes and/or process modifications	High
9. Fraction of plants with substantial wastewater treatment facilities in-place.	High
10. Fraction of plants presently discharging into municipal wastewater treatment facilities.	Very high
11. Frequency or likelihood of plants sharing waste treatment facilities with other manufacturing operations	Nil
12. Degree to which proposed treatment departs from currently employed treatment.	Low
13. Seriousness of other pending environmental control problems (including OSHA).	Low
Economic Factors	
14. BPCTCA plus BATEA unit treatment cost actually incurred as percent of unit selling price.	0.6%-1.3%
15. BPCTCA plus BATEA unit treatment cost as percent of unit profit margin.	Not applicable
16. Would the demand for the industry's product be significantly affected by an increase in price?	No

*Annual "production" is for community hospitals only. Production is based on an average daily in-patient "census" of 679,718 beds per day extended over a 365-day period.

**Based on an average "selling price" of $114.49 for 1973.

†Adjusted to a 200-bed hospital and to 1973 dollars.

+Treatment costs are for hospitals having their own treatment facilities. ADL estimates that the cost for municipal treatment to be no more than $0.32 per bed-day.

Source: "Hospital Statistics, 1975 Edition" (1974 Data from the American Hospital Association Annual Survey) American Hospital Association, Chicago, Illinois, 1975.

of the services provided by hospitals and the fact that an increasingly large proportion of hospital costs is not being borne directly by consumers, but rather by third parties such as government or private insurance companies. Hence, the price of hospital care is cost-determined, so that cost increases are passed on to third parties. The wastewater treatment costs would therefore be reflected in higher rates with no economic impact on the supply of hospital services or on hospital employment.

- For the 8% of the hospitals that may incur increased treatment costs, capital investment for treatment facilities range from 1.39% to 3.3% of total hospital assets (depreciated) (see Table 4.0A). There is no evidence that hospitals – which can finance capital expenditures from private borrowing, bond issues, or philanthropic sources – will have difficulty in raising capital for construction of treatment facilities.

5.0 CONCLUSIONS AS TO THE ECONOMIC IMPACT OF THE INTERIM FINAL EFFLUENT GUIDELINES ON THE HOSPITAL INDUSTRY

Based on our economic impact analysis, we have reached the following conclusions:

1) The majority (estimated at over 90%) of U.S. hospitals are not subject to the interim final effluent guidelines, because they are discharging to municipal sewage systems; hence there will be no concomitant economic impact on this group of hospitals.

2) For "direct discharger" hospitals subject to the interim final effluent guidelines (8% of total U.S. hospitals), the cost of achieving the 1977 BPCTCA level ranges from 0.39% to 0.75% of the respective total annual expenses. Achieving the 1983 BATEA level will result in an additional cost that ranges from 0.25% to 0.5% of total annual expenses.

3) The financial burden caused by these increases will not change the quantity of services offered by hospitals.

4) Whatever cost increases these hospitals will incur will be passed on to consumers, private and non-private insurers, and the Government in the form of higher rates with no significant impact on the volume of hospital services demanded.

5) There will be neither any significant community impact nor any change in hospital employment as a direct result of the interim final effluent guidelines.

6) There is no evidence that hospitals will have difficulty in financing the investments necessary to meet the BPCTCA and BATEA levels.