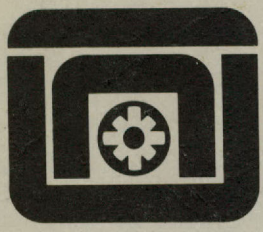


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REGIONAL LOW-LEVEL WASTE DISPOSAL
FACILITY: ECONOMIC ANALYSIS

JANUARY 1984



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REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY:

ECONOMIC ANALYSIS

Texas Low-Level Radioactive Waste Disposal Authority
1300-C East Anderson Lane, Suite 715
Austin, Texas 78752

January 1984

ACKNOWLEDGEMENTS

The authors wish to thank the efforts of Lawrence R. Jacobi, Jr., P.E., Robert V. Avant Jr, P.E., Ruben A. Alvarado, P.E. of the Authority and its staff for their constructive comments and guidance in the completion of this report.

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EXECUTIVE SUMMARY

INTRODUCTION

The Texas Low-Level Radioactive Waste Disposal Authority was created by the 67th Texas Legislature to develop and operate a facility for the disposal of low-level radioactive waste that is generated in Texas. In November 1982, the Authority commissioned a study with Ebasco Services, Inc. for the conceptual design of a radioactive waste disposal facility. This report on a regional waste disposal facility is one of six reports produced as part of that study. The subjects of the other five reports are: Low-Level Radioactive Waste in Texas: Volumes, Characteristics, and Projections, Disposal Facility Conceptual Design, Texas Low-Level Radioactive Waste Facility: Economic Analysis, Transportation Cost Evaluation, and Surface Waste Storage Facility.

The purpose of this regional analysis was to assess the economic impact of having a waste disposal facility accept waste generated in the entire South Central region (Arizona, Arkansas, Kansas, Louisiana, New Mexico, Oklahoma, and Texas). The scope of this study was to use the previous work performed for a Texas waste facility as a reference for consideration of a regional facility. The initial step was to determine a regional waste projection. Next, the necessary modifications to the Texas facility were established to accommodate the increased volume. Then, an economic analysis was performed to assess the economic impact of the increased waste volume.

REGIONAL WASTE PROJECTION

The regional waste generation rate summarized in Table 1 was estimated for the six nearby states (Arizona, Arkansas, Kansas, Louisiana, New Mexico, and Oklahoma) based upon an extensive survey of the open literature. The six state total of 256,000 ft³/year is about twice

the estimated Texas volume of 139,000 ft³/year. Thus, the South Central region has a projected regional waste generation rate of nearly 400,000 ft³/year.

REGIONAL FACILITY

To accommodate the increased waste volume, the following changes to the Texas facility would be necessary:

- | | | |
|-----------------------|---|---|
| Land | - | The 50 acre operational area would be expanded to 70 acres. |
| Property development- | | Roads, grading, fencing, lighting, and security expenses would increase. |
| Building | - | The Administration, Access Control, and Warehouse Building would need to be enlarged along with all the service facilities. |
| Equipment | - | The only major change would be the addition of a 50 ton crane and a third forklift. |
| Personnel | - | The staff would increase by nine persons, to a total of 30. |
| Operations | - | The trenches would be three times as large, 35 feet deep x 100 feet wide x 500 feet long. |

ECONOMIC ANALYSIS

Analyses were performed on two scenarios for operating the regional facility, contractor-operated and Authority-operated. The custom-developed economic model used in this project developed costs on a discounted cash flow basis to determine unit cost. Each scenario assumed 4% inflation, 0% cost of money, and 8.5% discount rate.

The capital cost showed about a 12% increase over the Texas facility. The state administration costs were assumed the same, while the facility operating costs were about 50% higher. Post-operating costs were estimated to be only slightly higher.

The average disposal costs for both cases presented in Table 2 showed a significant economic impact. The calculated results projected that the average cost for the regional facility will drop by over 50% for a 200% increase in waste volume under the conditions assumed.

TABLE 1: Projected Total Regional Low-Level Waste Generation

<u>State</u>	<u>Commercial Nuclear Power</u>	<u>Institution, Industry Government</u>	<u>Total</u>	<u>State/ Texas</u>
Arizona	90,000	5,000	95,000	0.68
Arkansas	39,000	5,600	44,600	0.32
Louisiana	66,000	5,500	71,500	0.51
Kansas	26,000	6,000	32,000	0.23
New Mexico	---	4,900	4,900	0.03
Okahoma	<u>---</u>	<u>8,400</u>	<u>8,400</u>	<u>0.06</u>
	221,000	35,400	256,400	1.8

TABLE 2: Projected Average Cost of the Regional
Waste Disposal Facility

<u>Category</u>	Case #1 Contractor-Operated <u>Facility</u>	Case #2 State-Operated <u>Facility</u>
Average Base Operation Cost	\$ 13.64	\$ 10.52
Post-Operating Fund Surcharge	<u>1.08</u>	<u>0.94</u>
Total Disposal Cost	\$ 14.72	\$ 11.46

Notes

Units are $\$/\text{ft}^3$
Volume: 400,000 ft^3/year
8.5% Discount Rate
0% Cost of Money
4% Inflation Rate
1983 dollars

INTRODUCTION

1.1 Background

The Texas Low-Level Radioactive Waste Disposal Authority (the Authority) was created by the 67th Texas Legislature (Texas Low-Level Radioactive Waste Disposal Authority Act, Article 4590f-1, V.T.C.S.) to develop and operate a facility for the disposal of low-level radioactive waste that is generated in Texas. On November 29, 1982, the Board of Directors of the Authority commissioned a comprehensive study to develop a low-level radioactive waste shallow land burial disposal facility in Texas. This study for the conceptual design of a low-level waste disposal facility in Texas was divided into six distinct tasks, with each task producing a separate report. The six task reports discuss the areas of Low-Level Radioactive Waste Characterization and Volume Projections, Disposal Facility Conceptual Design, Economic Analysis, Surface Low-Level Radioactive Waste Storage Facility, Regional Analysis, and Transportation Cost Evaluation.

The first three subjects were the major emphasis of the study. Thus, this regional analysis builds upon the previous work completed in this study. A conceptual design of a disposal facility was developed for a Texas waste volume projection of approximately 139,000 ft³/year (1,2). This regional study extrapolates the design of the Texas disposal facility, to dispose of regionally generated low-level radioactive wastes.

1.2 Purpose and Scope

The purpose of this report is to investigate the additional steps needed to develop a regional low-level radioactive waste facility over a Texas facility. These steps are mainly associated with design and operational changes associated with an anticipated increase in waste volume. A regional economic analysis was performed with the same financial assumptions used in the earlier economic analysis of the Texas facility to determine the comparative feasibility of a regional versus Texas facility (3).

The scope of this task was to use the Texas facility as a reference from which only necessary modifications were made to develop the regional facility. The initial step was to project the future waste generation in the six states located nearby: Arizona, Arkansas, Kansas, Louisiana, New Mexico, and Oklahoma. Rather than duplicate the details of the Texas facility, this report establishes the additions or changes required to expand that facility to handle regional waste (1). The resulting costs are then analyzed from the regional standpoint using the same financial assumptions developed for the Texas-only facility (3).

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2.0 REGIONAL LOW-LEVEL WASTE GENERATION

2.1 Background

A regional low-level waste generation assessment was performed to evaluate the changes that would need to be incorporated in the site conceptual design to accommodate the additional waste volume. The regional evaluation was performed using the states of Arizona, Arkansas, Kansas, Louisiana, New Mexico, and Oklahoma as a baseline. With the exception of Arizona and Kansas each state noted above is adjacent to the state of Texas. This evaluation complements the assessment made for the state of Texas (1). It does not, however, attempt to identify and correct sources of uncertainty in the reported waste volume generation rates. More specific information characterizing the waste generation and disposal practices of the six states surveyed can be found elsewhere (2-10).

2.2 Regional Waste Generation

The regional low-level waste generation rate was estimated for four types of waste generators. The six states for which the data were evaluated are Arizona, Arkansas, Kansas, Louisiana, New Mexico, and Oklahoma. The generation rates were based on data obtained from open literature and reference sources (2-14). Waste generation rates are discussed for each category of waste generators. The results are summarized in Tables 2-1 and 2-2.

2.2.1 Institutional

Institutional facilities are comprised of hospitals, clinics, community health centers, diagnostic and radiation treatment clinics and may also include private medical offices. Also included under this classification are universities, private and community colleges, and medical schools.

TABLE 2-1: REGIONAL LOW-LEVEL WASTE GENERATION^a

STATE AND GENERATOR	GENERATION RATES (ft ³) ^b					Overall Average
	1978	1979	1980	1981 ^c	1982 ^d	
<u>Arizona</u>						
Institutional	7,100	740	1,600	650	2,900	2,600
Industrial	5,100	1,200	140	60	2,800	1,900
Government	0	0	0	0	-	-
<u>Arkansas</u>						
Comm. Nuclear Power	17,600	9,800	8,300 ^e	52,000	39,000	45,500
Institutional	7,800	2,600 ^f	500	3,100	2,900	3,400
Industrial	4,900	1,700 ^f	35	200	1,900	1,700
Government	0	0	0	0	-	-
<u>Louisiana</u>						
Institutional	15,700	250	950	38	5,400	4,500
Industrial	880	420	810	32	500	530
Government	0	0	35	1	-	-
<u>Kansas</u>						
Institutional	11,300	140	350	240	4,000	3,200
Industrial	5,300	210	2,100	1,420	2,200	2,200
Government	0	0	0	0	-	-
<u>New Mexico</u>						
Institutional	5,000	560	1,130	1,960	2,200	2,200
Industrial	2,600	180	140	240	1,200	870
Government	3,500	2,100	70	120	-	1,400
<u>Oklahoma</u>						
Institutional	10,400	560	1,900	4,700	4,400	4,400
Industrial	10,300	180	600	1,500	3,500	3,200
Government	0	0	0	0	-	-

- a. References 2-14.
- b. All values have been rounded off.
- c. Reference 5, Table 4.26 data. Generation rates for 1981 are based on 1980 distribution among generators for each state.
- d. EG&G low-level waste management 1982 waste projections, computer output dated Jan. 28, 1983, Reference 6.
- e. Arkansas Nuclear Two placed into commercial operation in March, 1980. Unit One operational since 1974, Reference 14.
- f. Based on EG&G low-level waste management base year data, computer output dated Jan. 28, 1983, Reference 6.

TABLE 2-2: ESTIMATED LOW-LEVEL WASTE GENERATION FROM COMMERCIAL NUCLEAR POWER REACTORS^a

STATE ^c AND POWER PLANT	TYPE	RATING MW(e)	ESTIMATED OR ACTUAL COMM. OPERATING DATE	ESTIMATED ^b WASTE GENERATION RATES FT ³ /YR
<u>Arizona</u>				
Palo Verde-1	PWR	1304	December 1983	30,000 ^d
Palo Verde-2	PWR	1304	December 1983	30,000
Palo Verde-3	PWR	1304	May 1986	30,000
<u>Arkansas</u>				
Arkansas Nuclear One	PWR	836	December 1974	19,000
Arkansas Nuclear Two	PWR	836	March 1980	20,000
<u>Louisiana</u>				
Waterford-3	PWR	1151	July 1983	26,000
River Bend-1	PWR	934	December 1985	40,000
River Bend-2	BWR	934	Indefinite Delay	not applicable
<u>Kansas</u>				
Wolf Creek	PWR	1150	May 1984	26,000
<u>Oklahoma</u>				
Black Fox-1	BWR	1150	cancelled June 1983 ^e	not applicable
Black Fox-2	BWR	1150	cancelled June 1983 ^e	not applicable

- a. References 12-15.
- b. Based on 23 ft³ and 43 ft³ per MW(e)-yr for pressurized and boiling water reactors, respectively⁽⁵⁾.
- c. There are no planned reactors in the state of New Mexico.
- d. Values shown have been rounded off.
- e. Reference 13 and 15.

Medical Facilities - Low-level waste generated by medical facilities consist of disposable items such as syringes, vials, test tubes, absorbent materials, and gloves used during clinical and diagnostic procedures. In most cases, specific pharmaceutical drugs are tagged with short lived radionuclide tracers which are then administered to patients and followed through various organs. The radioactivity levels of this type of waste are short-lived and the waste volumes per patient usage are not very large.

Educational Facilities - Educational facilities may generate two basic types of low-level waste. The first type, medical waste, is similar to that of medical facilities, while the other type, research wastes, includes wastes generated as the result of various research activities in such fields as biology, chemistry, and physics, among others. Biological wastes may include animal carcasses into which radioisotopes tracers have been introduced. Research-related waste may be generated from activities involving the study of behavior or kinetics of biochemical and biological systems using radioactive tracer techniques. Other research activities involve tracer techniques in the physical sciences such as physics, chemistry, environmental transport, materials analysis, charged particle accelerators, and research reactors.

In either case, the low-level radioactive waste generated includes disposable items, laboratory ware and equipment, and large volumes of spent liquid scintillation vials and fluids.

As shown in Table 2-1, institutional facilities generated low-level wastes in quantities ranging from 38 to 15,700 ft³/yr across all states reported.

2.2.2 Industrial

The second category of low-level waste generators is the industrial sector. Industrial facilities include manufacturers of radio-pharmaceuticals, testing and industrial research laboratories, and

equipment and instrumentation manufacturers. The type of waste generated by industrial facilities may also be broadly classified into two categories. The first one considers industrial activities which include users of sealed radioactive sources. Sealed sources are incorporated into devices such as gas chromatographs, X-ray fluorescence analyzers, smoke detectors, level detectors, industrial radiography devices, soil density probes, radiation calibration devices, and sealed beta and gamma ray sources.

The second category includes users of non-sealed radioactive sources which generate low-level wastes in large quantities. The waste generated from the use of non-sealed sources involves activities which supply medical facilities with radiopharmaceuticals and academic institutions with radiochemicals. The types of wastes generated are due to process and production activities and include contaminated laboratory ware, equipment, and other contaminated disposable items.

Industrial facilities generated low-level wastes in the range of 32 to 10,300 ft³/yr for the states listed in Table 2-1.

2.2.3 Governmental

Government facilities include federal, state, and local government institutions. Department of Defense facilities are also included, however, wastes from the weapons programs are not included.

The forms of low-level waste generated by government facilities are nearly identical to those waste characteristics described for institutional and industrial generators. The waste forms and volumes produced are, however, more specific since each government facility may use radioactive material within a narrow range of applications. For example, such applications may involve the use of sealed sources incorporated in instrumentation or non-sealed sources in laboratory experiments.

Government facility low-level waste generation was reported by only two states, Louisiana and New Mexico. The waste generation varied from 1 to 3,500 ft³/yr.

2.2.4 Commercial Nuclear Power Plants

The low-level waste generated by nuclear power plants originates from maintenance, refueling activities, and from processing system as well as from the treatment of waste streams. In nuclear power plants that use water as the cooling medium to conduct heat away from the core, the water becomes contaminated with radioactive materials. This radioactive material is the result of either corrosion products from components in the reactor being released into the coolant, or is due to the presence of impurities in the coolant that have become radioactive when exposed to the neutron flux and may also result from the migration of fission products out of the fuel elements into the coolant. Low-level waste is generated by the collection of these radioactive materials in filters, resins, and evaporators from the reactor coolant by purification systems. Additionally, waste is generated during refueling activities and from routine or scheduled maintenance of plant equipment and may consist of contaminated paper, cloth, tools, and irradiated or contaminated parts and equipment.

The low-level waste generation of commercial nuclear power plants is given in Table 2-2. It is anticipated that by 1986 a total of eight reactors will be operational in Arizona, Arkansas, Louisiana, and Kansas. Two power plants were cancelled in Oklahoma and another one was indefinitely postponed in Louisiana. No power plants are being planned in the state of New Mexico.

The low-level waste generation rates for the power plants listed in Table 2-2 were derived using generally accepted industry averages (5). The estimated generation rates take into account the type and designed electrical rating of each power plant. The estimated yearly generation rates vary from 19,000 to 30,000 ft³ for pressurized water reactors and 40,000 ft³ for the only boiling water reactor. The

generation rates shown in Table 2-1 for Arkansas Nuclear One and Two were not used in developing Table 2-2 due to the paucity of joint data for the two power plants.

2.3 Regional Waste Projection

The regional waste generation projection for 1988 is based on the data previously discussed. The baseline data for non-reactor waste generation is grouped to include institutional, industrial, and government facilities as one category. The other being commercial nuclear power plant.

The projected generation rate for institutional, industrial, and government generators is based on the five-year overall average, escalated upward for anticipated economic growth.

The projected growth assumes a yearly economic expansion of two percent for five years, up to 1988. Government generators were included in this category for two reasons: 1) based on the results shown in Table 2-1, there is not enough data to characterize waste generation projection of government facilities, and 2) it is reasonable to assume that the activities of government facilities are generally affected by the same economic trends that subject institutional and industrial facilities.

The generation rates for commercial nuclear power plants are based on the data shown in Table 2-2. The rates reflect industry-wide waste disposal practices and the operational experience of currently operating nuclear power plants. The projected waste generation rates for institutional, industrial, and government facilities and those of commercial nuclear power plants are summarized in Table 2-3 and are discussed below.

Institutional, Industrial, and Government Facilities - The projected waste generation of institutional, industrial, and government facilities for 1988 range from 4,900 to 8,400 ft³ for all six states.

TABLE 2-3: PROJECTED TOTAL REGIONAL LOW-LEVEL WASTE GENERATION

<u>State</u>	<u>ESTIMATED 1988 GENERATION (ft³/yr)</u>			<u>Volume Ratio</u>
	<u>Commercial Nuclear Power</u>	<u>Institution, Industry, Government</u>	<u>Total</u>	<u>State/Texas</u>
Arizona	90,000	5,000	95,000	0.68
Arkansas	39,000	5,600	44,600	0.32
Louisiana	66,000	5,500	71,500	0.51
Kansas	26,000	6,000	32,000	0.23
New Mexico	---	4,900	4,900	0.03
Oklahoma	---	8,400	8,400	0.06
	<u>221,000</u>	<u>35,400</u>	<u>256,400</u>	<u>1.8</u>

As can be noted in Table 2-3, the generation varies within a narrow range, from 4,900 to 6,000 ft³ for all reported states, except Oklahoma, where the projected annual generation is 8,400 ft³.

Commercial Nuclear Power Plant - The low-level waste projection of nuclear power plants is confined to the states of Arizona, Arkansas, Louisiana, and Kansas. As can be noted in Table 2-3, the projected annual generation varies from 26,000 to 90,000 ft³ per state. As was previously noted, the volume of waste generated by power plants in each state is dependent upon the number and type of planned and operating reactors.

2.4 Summary

The regional low-level waste volume projections for each state and the region, in total, are also shown in Table 2-3. The total waste volume projection for states, Arizona, Arkansas, Louisiana, and Kansas are dominated by the contributions from nuclear power plants. New Mexico and Oklahoma individually contribute only a fraction of the waste generated by any of the other four states noted above. The annual regional waste generation volume, excluding the state of Texas, is 256,400 ft³. Based on the projected generation rates, each state surveyed produces less waste than the state of Texas. The estimated annual average generation for the state of Texas has been established at 139,000 ft³ (1). The total annual regional waste generation is, therefore, estimated to be nearly 400,000 ft³.

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3.0 REGIONAL FACILITY

The seven-state South-Central region was projected to generate an average waste volume of about 400,000 ft³ per year, about three times the Texas volume alone. The regional waste composition was assumed the same as Texas waste, 60% Class A, 30% Class B, and 10% Class C. For a regional waste facility located in Texas, it is expected that the same design criteria and performance objectives applicable to the Texas facility would be followed. In essence, the facility would be regulated by the Texas Department of Health. Further details on design criteria are given in the previous conceptual design report. The same hypothetical site used in the previous study was also assumed for this facility.

The basic features of the regional facility are similar to the features developed for the Texas facility. The features of both facilities are:

- . A 200-acre site with a smaller fenced controlled area for disposal.
- . Administration and truckers' waiting buildings outside the controlled area.
- . Water, power, and sewage support facilities outside the controlled area.
- . Access control buildings straddling the fence near the gate to the controlled area.
- . Maintenance facility, truck wash, and equipment parking near the access control building.
- . Evaporation pond at the lowest elevation on the site.
- . System of roads to the disposal area, with drainage ditches and culverts to control water runoff.
- . Separate disposal areas for shallow trench disposal of Class A waste (unstabilized) and Class B/C wastes (stabilized).

Variations in design between the Texas facility and the regional facility are outlined below. The actual cost estimates are presented in the following section.

3.1 Land

It was assumed that a 200-acre square site will be purchased for this facility. The Texas facility had a 50-acre controlled area set in the center of this 200-acre site. The regional facility would require an increase in the size of the controlled area to almost 70 acres. This would provide the space required for enlarged trenches plus the other facilities which are located inside the controlled area.

3.2 Licensing and Property Development

Licensing requirements for a regional facility would not change from the Texas facility requirements. The property development costs for roads, site grading, fencing, environmental monitoring requirements, lighting, and security would increase for the larger site. Impact assistance is expected to remain the same.

3.3 Building and Support Equipment

The truck wash and truckers' waiting facilities would not need to be enlarged to accommodate higher traffic resulting from larger disposal volumes. These facilities were sized to meet minimum requirements for the Texas facility and have the capacity necessary for the regional facility. The administration building would require several more offices and the access control building and site warehouse would need to be enlarged to handle larger site work crews. Finally, all of the service facilities; water, sewer, and power, must be increased to meet the needs of a larger site.

3.4 Equipment

The equipment requirements for a larger regional facility would not be increased proportionately to the volume increase. The major change would be to add a third crane (50 ton tracked), a third forklift, and a fourth pickup truck. These would prevent scheduling problems

associated with the increased traffic to two operating trenches. There would also be increases in security and office equipment requirements.

3.5 Personnel Requirements

The change in personnel at the regional site would be the addition of two radwaste technicians, two equipment operators, two health physics technicians, a quality assurance technician, an accounting clerk, and a secretary. This adds nine personnel to the Texas facility requirements for a total staff of 30. The Texas Authority and State Inspector requirements are not expected to change. The increase in volume of 200% results in an increase in operating personnel of less than 50%. This economy of scale is possible because of the assumption that waste shipment arrivals will be scheduled in advance.

3.6 Operations

Most operating expenses are tied to the volume of waste received or the number of personnel working at the site. These costs would increase accordingly. Trench construction, which is considered a "burial expense," would be contracted once a year. The trenches needed for the regional facility are 35 feet deep x 100 feet wide at the top x 500 feet long. The excavated volume would be three times that required for the Texas facility. Trench capping would use the same techniques as proposed in the Texas facility design. These compacted clay covers would require more clay and time to construct, but would be done by the site operations staff as part of the operating expense.

3.7 Closure and Long-Term Care

The procedure to close the site and prepare it for long-term stability would change little from the Texas facility, though there would be some added expense to decommission the facilities and regrade the site. The long-term institutional care period would remain unchanged.

4.0 ECONOMIC ANALYSIS

4.1 Overview

An economic model of the Texas low-level waste disposal facility was developed earlier to meet the specific conditions and needs of the state of Texas. That model, based on the discounted cash flow methodology, was also used for the regional economic analysis with the input parameters modified for the larger regional facility.

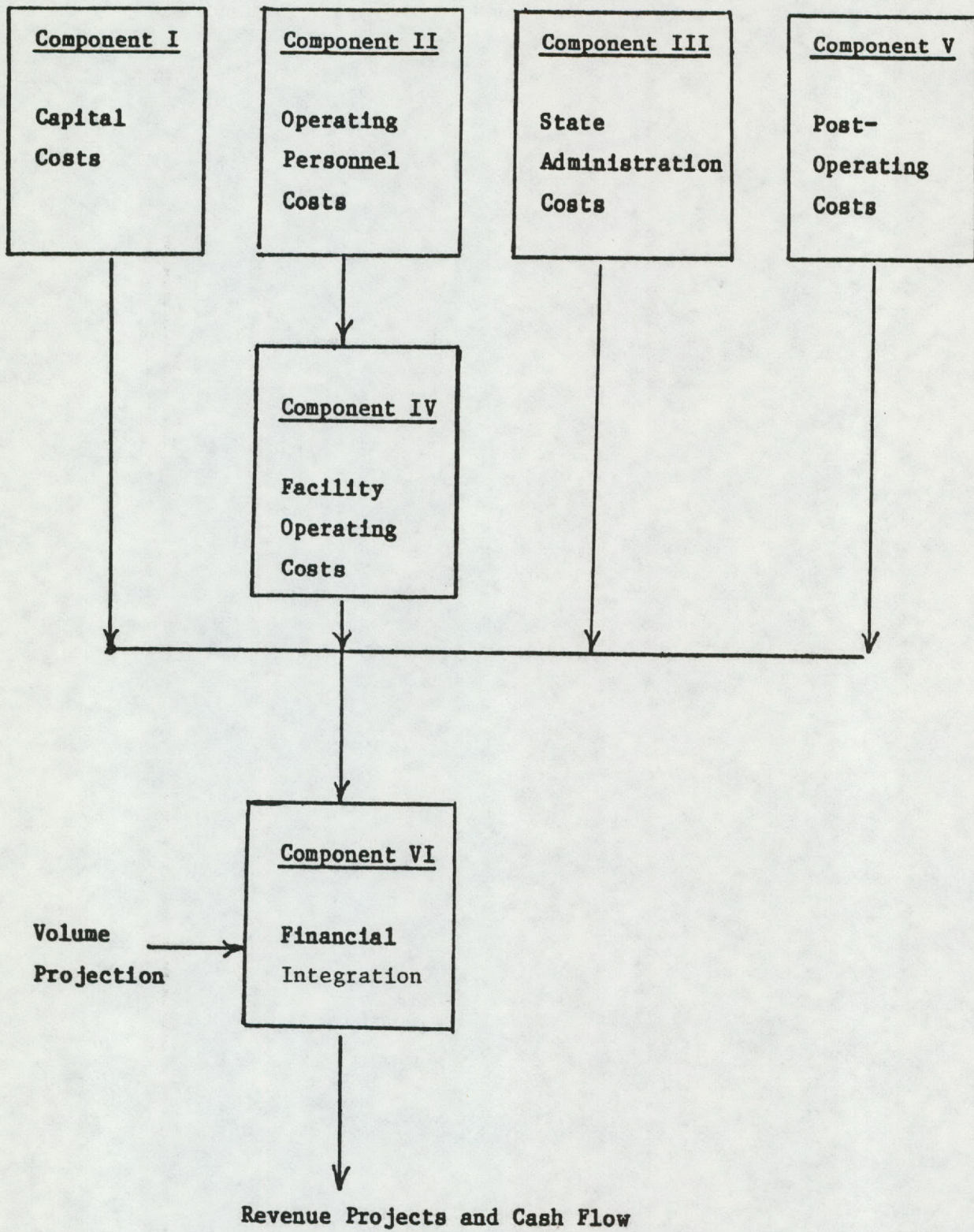
The economic model studied two modes of operating the disposal facility, contractor-operated (Case #1) and Authority-operated (Case #2), similar to the situation in the earlier economic study. The significant financial parameters were 8.5% discount rate, zero cost of money, and 4% inflation rate. The economic model is divided into six components whose final products are average cost, revenue, and cash flow projections. These components are:

- Component I: Capital Costs,
- Component II: Operating Personnel Salary Costs,
- Component III: State Administrative Costs,
- Component IV: Facility Operating Costs,
- Component V: Post-Operating Costs, and
- Component VI: Financial Integration.

Figure 4-1 is a flow chart which depicts the interrelationship of these components to produce the revenue and cash flow projections. The assumed time frame for this facility was composed of the following:

- . Site Development Period - 5 years (1983 - 1987)
- . Site Operation Period - 20 years (1988-2007)
- . Site Closure Period - 5 years (2008 - 2012)
- . Institutional Care Period - 100 years (2013 - 2112)

FIGURE 4-1: ECONOMIC MODEL FLOW CHART



The financial model calculates cash flow, average cost, and projected revenues that meet the following requirements: a) The facility would break even at the end of the operating phase (2007); b) An adequate post-operating fund would be generated to pay closure and long-term institutional care costs. Further information on the basis for these financial assumptions and the economic model was presented in the Texas facility economic analysis report.

4.2 Component I: Capital Costs

An itemized schedule of capital expenditures is shown in Table 4-1. These capital costs (\$9.3 million) show about a 12% increase over the Texas facility. Capital costs include land purchase, licensing, property development, building construction, and equipment purchases. As in the earlier study, a 20% contingency was added. The specific description for each line item is presented in the design and economics reports.

4.3 Component II: Operating Personnel Costs

The regional operating personnel salaries were assumed the same as the Texas facility, though some argument for a higher salary for facility management could be presented because of the larger staff and increased responsibilities. A summary of the operating personnel staffing level during start-up and closure for the regional facility is summarized in Table 4-2. The staffing levels during start-up and closure were assumed the same as for the Texas facility. During operations, a staffing level of 30 persons was assumed as compared to 21 persons for the Texas facility.

4.4 Component III: State Administrative Costs

This component covers the costs associated with the Authority including fringe benefits, and one on-site State Inspector from the Department of Health including his salary, benefits, and overhead.

This state cost was assumed the same as for the Texas facility, though some additional oversight expenses may be incurred.

4.5 Component IV: Facility Operating Costs

Operating costs include salary costs and standard operating expenses, such as direct supplies, fuel, repair and maintenance, monitoring, utilities, equipment rentals, depreciation, auto operating, and office expense. Salary costs were itemized separately in Component II and then passed to the facility operating costs component.

Only certain operating costs are a function of personnel (e.g., salaries), others are a function of the waste volume (e.g., excavation), while selected items are fixed expenses (e.g., auto). On the whole, the regional facility operating expenses are about 50% greater than the Texas facility. A summary of the regional facility operating expenses is shown in Table 4-3 for the contractor-operated base case. The operating expenses for the Authority-operated facility are about the same as shown in Table 4-3 except for the contractor's overhead expense of 35% and profit fee of the 10% of total operating expenses.

4.6 Component V: Post-Operating Costs

This component includes the costs necessary to decommission and stabilize the site and prepare it for the institutional care period, as well as the costs associated with long-term passive maintenance. Closure activities start in the year 2007, one year before termination of facility operations, and extends for five years after operations. The costs include the regrading of the site (removal of roads, culverts, drainage ditches and setting a final 2% grade to control runoff velocities), placement of riprap over the trenches, and removal of all buildings. These costs are assumed only slightly greater than those for the Texas facility. The post-operating cost schedule is given in Table 4-4.

TABLE 4-1: COMPONENT I - CAPITAL COSTS OF THE REGIONAL
LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
LAND		625,000			
LICENSING:					
SITE SCREENING	600,000				
SITE CHARACTERIZATION		750,000			
OPERATOR'S MANUAL			100,000		
DESIGN	150,000		300,000		
CLOSURE PLAN			50,000		
LICENSE FEES			100,000		
LICENSING STUDIES & LEGAL FEES		50,000	50,000	200,000	200,000
SUBTOTAL	750,000	800,000	600,000	200,000	200,000
DEVELOPMENT OF PROPERTY:					
ROADS & SITE GRADING					25,000
FENCES				0	100,000
LIGHTING & SECURITY CAMERAS					50,000
ENVIRONMENTAL MONITORING		56,000			
IMPACT ASSISTANCE		240,000	240,000	240,000	240,000
SUBTOTAL	0	296,000	240,000	240,000	415,000
BUILDINGS:					
ADMINISTRATION & STORAGE AREA					175,000
ACCESS CONTROL BUILDING					200,000
MAINTENANCE & WAREHOUSE					250,000
TRUCK WASH					110,000
TRUCK WASH RECYCLING SYSTEM					25,000
TRUCKER'S BUILDING					26,000
WATER TREATMENT BUILDING					65,000
SANITARY SEWAGE WATER TREATMENT					10,000
POTABLE WATER SYSTEM					100,000
ELECTRICAL SYSTEM					150,000
SUBTOTAL	0	0	0	0	1,111,000
EQUIPMENT:					
FRONT END LOADER					100,000
100 TON CRANE + 50 TON CRANE					1,150,000
20 TON CRANE					95,000
FORKLIFT (3)					105,000
MOBILE RAMP					15,000
VIBRATING COMPACTOR					105,000
VAN (4 WHEEL DRIVE)					15,000
PICKUP TRUCK(4 WHEEL DRIVE)(4)					50,000
FIRE TRUCK					40,000
MISCELLANEOUS EQUIPMENT					70,000
MOTOR GRADER					110,000
BACKHOE WITH BUCKET					50,000
BULLDOZER/SHEEPS FOOT ROLLER					250,000
SECURITY EQUIPMENT					10,000
OFFICE EQUIPMENT					100,000
SUBTOTAL	0	0	0	0	2,265,000
CONTINGENCY @ 20% OF ALL COSTS	150,000	344,200	168,000	88,000	798,200
TOTAL CAPITAL COSTS	<u>900,000</u>	<u>2,065,200</u>	<u>1,008,000</u>	<u>528,000</u>	<u>4,789,200</u>

TABLE 4-2: OPERATING PERSONNEL STAFFING LEVELS

	<u>STARTUP</u>	<u>OPERATIONS</u>	<u>CLOSURE</u>				
	<u>(1987)</u>	<u>(1988-2007)</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
SITE MANAGER	1.0	1.0	1.0	1.0	0	0	0
SITE SUPERVISOR	0.5	1.0	1.0	0	0	0	0
RADWASTE TECHNICIANS	2.0	6.0	4.0	0	0	0	0
EQUIPMENT OPERATOR	1.0	4.0	2.0	0	0	0	0
MECHANIC/CARPENTER	0.5	1.0	1.0	0	0	0	0
QUALITY ASSURANCE SUPR	0.5	1.0	1.0	0	0	0	0
QUALITY ASSURANCE TECH	0.5	2.0	1.0	0	0	0	0
HEALTH PHYSICS SUPR	0.5	1.0	1.0	0	0	0	0
HEALTH PHYSICS TECH	0.5	3.0	1.0	0	0	0	0
SECURITY SUPERVISOR	0.5	1.0	1.0	1.0	1.0	1.0	1.0
SECURITY OFFICER	2.5	5.0	5.0	0	0	0	0
ACCOUNTING CLERK	0.5	2.0	1.0	0	0	0	0
SECRETARY	<u>1.0</u>	<u>2.0</u>	<u>1.0</u>	<u>1.0</u>	<u>0</u>	<u>0</u>	<u>0</u>
TOTAL NUMBER OF PERSONNEL	11.5	30.0	21.0	3.0	1.0	1.0	1.0

TABLE 4-3: COMPONENT IV - OPERATING COSTS FOR THE REGIONAL WASTE DISPOSAL FACILITY, CONTRACTOR-OPERATED

	<u>STARTUP</u> <u>1987</u>	<u>OPERATIONS</u> <u>1989</u>
SALARIES	219,000	531,000
EMPLOYEE BENEFITS (@ 30%)	67,000	159,300
DIRECT SUPPLIES	44,000	44,000
FUEL	25,000	50,000
REPAIRS & MAINTENANCE	20,000	65,000
LICENSE FEE	0	100,000
BOND FEE / INSURANCE	105,000	105,000
LEGAL	0	25,000
CONSULTING	0	14,000
ENVIR. & PERSONNEL MONITORING	175,000	175,000
UTILITIES	39,000	39,000
BURIAL EXPENSE	553,560	553,560
EQUIPMENT RENTAL	7,000	7,000
EMPLOYEE TRAINING	50,000	15,000
PUBLIC INFORMATION		35,000
TRAVEL	15,000	25,000
AUTO OPERATING	3,000	3,000
OFFICE EXPENSE	30,000	60,000
MISCELLANEOUS	100,000	60,000
OVERHEAD @ 35%	507,941	723,051
CONTINGENCY @ 20%	290,252	413,172
SUBCONTRACTOR PROFIT @ 10%	<u>224,945</u>	<u>320,208</u>
TOTAL OPERATING COSTS	2,474,398	3,522,291

TABLE 4-4: COMPONENT V - POST-OPERATING COSTS

	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013-2112</u>
ACTIVE MAINTENANCE PERIOD:							
LICENSE FEE FOR CLOSURE	50,000						
FINAL SITE GRADING		600,000					
FACILITY DECOMMISSIONING		150,000					
STATE ADMINISTRATIVE COSTS		1,038,333	830,667	623,000	415,333	207,667	
OPERATING COSTS		1,817,238	728,206	414,656	354,981	354,981	
CONTINGENCY @ 20%	10,000	150,000	0	0	0	0	
SUBTOTAL	60,000	3,809,571	1,558,872	1,037,656	770,314	562,648	
PASSIVE MAINTENANCE:							
MONITORING/SURVEILLANCE COST	50,000						
ADMINISTRATIVE COSTS							10,000
CONTINGENCY @ 20%							12,000
SUBTOTAL							<u>72,000</u>
TOTAL POST-OPERATING COSTS	60,000	3,809,571	1,558,872	1,037,656	770,314	562,648	72,000

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NOTE: 1983 Dollars

4.7 Component VI: Financial Integration

The financial integration component consists of two calculations, an average operational disposal cost, and a separate surcharge calculation for the post-operating fund. The details of the financial model were described in the earlier economics report. The determination of the average operational disposal price was based on the goal of paying off the development capital costs and the operating costs by the end of the operating life of the site.

The calculated costs presented are not directly comparable to the current prices in the industry for two reasons. First, the prices quoted here are public sector prices. The public sector prices will be considerably lower for the same size site because of the lower cost of money and because the state does not have to pay federal income taxes. Second, the cost calculated is the average cost which includes the base price plus surcharges. The distribution of that average cost between the base price and surcharges is an involved process that must consider several factors such as volume, waste type, radiation level, curie surcharge, and handling fees.

The financial assumptions for Case #1, contractor-operated facility, were identical to those of the earlier study:

. Cost of Money	=	0%
. Discounted Rate	=	8.5%
. Inflation Rate	=	4%
. Contractor Overhead	=	35% of operating cost
. Contractor Profit	=	10% of operating costs
. Cost Figures	=	1983 dollars

Likewise, the financial assumptions for Case #2 (Authority-operated) were similar to Case #1, except the overhead and profit were zero.

4.8 Results

A listing of the input and output of the analyses for Cases 1 and 2 in escalated dollars are provided in Appendices B and C, respectively. The highlights of the results are given below.

4.8.1. Costs

Costs associated with the site are divided into four distinct time periods: site development, operations, closure, and institutional care. Table 4-5 is a presentation of modeled costs projected over the life of the facility for Case #1, contractor-operated facility. The site development cost of \$14.8 million is about 10% higher than the Texas facility. The average yearly operating cost is about 50% greater than the Texas facility. The closure cost of \$7.8 million is slightly greater than the Texas facility. The yearly institutional care cost of \$72,000 is the same as the Texas facility.

Similarly, Table 4-6 summarizes the costs for Base Case #2, Authority-operated facility. The cost comparison for Base Case #2 against the comparable Texas facility situation is qualitatively the same as the above analysis.

4.8.2 Revenues

A summary of the annual revenues and unit disposal costs for both contractor and Authority-operated sites is shown in Table 4-7. The unit disposal cost for a regional facility is about half of the cost for a Texas facility on about a 30% increase in revenue, and a 200% increase in waste volume. Thus, a regional facility shows a definite economic advantage over a Texas facility.

4.8.3 Parameter Sensitivity

Sensitivity of the disposal cost to its component cost are summarized below:

TABLE 4-5: COST SUMMARY FOR A REGIONAL WASTE DISPOSAL FACILITY, CONTRACTOR-OPERATED

<u>Category</u>	<u>Total Site Development Cost (5 Years)</u>	<u>Yearly Operating Cost (20 Years)</u>	<u>Total Closure Cost (5 Years)</u>	<u>Yearly Institutional Care Cost (100 Years)</u>
CAPITAL COSTS				
Land	\$ 625			
Licensing	2,550		\$ 50	
Property Development	1,191		600	
Buildings	1,111		150	
Equipment	2,265			
Contingency (20%)	<u>1,548</u>		<u>160</u>	
Subtotal	9,290		960	
OPERATING COSTS	2,474	3,522	3,725	
STATE ADMINISTRATIVE	<u>3,043</u>	<u>1,300</u>	<u>3,120</u>	<u>72/year</u>
TOTAL	\$14,807	\$4,822/year	\$7,805	\$72/year

TABLE 4-6: COST SUMMARY FOR A REGIONAL WASTE DISPOSAL FACILITY, AUTHORITY-OPERATED

<u>Category</u>	<u>Total Site Development Cost (5 Years)</u>	<u>Yearly Operating Cost (20 Years)</u>	<u>Total Closure Cost (5 Years)</u>	<u>Yearly Institutional Care Cost (100 Years)</u>
CAPITAL COSTS	\$9,290		\$ 960	
OPERATING COSTS	1,572	2,317	2,465	
STATE ADMINISTRATIVE	<u>3,043</u>	<u>1,300</u>	<u>3,120</u>	<u>72/year</u>
TOTAL	\$13,905	\$3,617/year	\$6,545	\$72/year

NOTE: Units in thousands of 1983 Dollars, unescalated.

TABLE 4-7: SUMMARY OF UNIT DISPOSAL COST AND ANNUAL REVENUE

UNIT DISPOSAL COST

	<u>Case #1 Contractor- Operated</u>	<u>Case #2 Authority Operated</u>
Average Base Price	\$ 13.64	\$ 10.52
Post-Operating Surcharge	<u>1.08</u>	<u>0.94</u>
TOTAL	\$ 14.72	11.46

ANNUAL REVENUE

	<u>Case #1 Contractor- Operated</u>	<u>Case #2 Authority Operated</u>
From Yearly Base Price	\$5,456,000	\$4,208,000
From Yearly Post-Operating Surcharge	<u>432,000</u>	<u>376,000</u>
TOTAL	\$5,888,000	\$4,584,000

Notes:

Units are \$/ft³

Volume: 400,000 ft³/yr

8.5% discount rate

0% cost of money

4% inflation rate

1983 dollars

- 1) Volume changes up to 15% from the design volume (400,000 ft³/yr) would result in a comparable opposite percent change in price per cubic foot (e.g., a 10% volume increase results in a 10% price decrease.)
- 2) A capital cost increase of \$700,000 would result in a price increase of \$0.13/ft³; and
- 3) An increase in operating expense of \$100,000 would increase the price by \$0.44/ft³

Delays in the start-up of a disposal facility are normally quite costly. However, a year delay with 0% cost of capital would have minimal effect on the unit cost. A year's delay assuming 8½% cost of money, 8½% discount rate and 4% inflation would increase the average unit price by about \$0.30/ft³.

5.0 CONCLUSION

The study found that a regional waste disposal facility, including Arizona, Arkansas, Kansas, Louisiana, New Mexico, and Oklahoma, would require an increase in capacity of 200%. However, the enlarged waste facility would need only a 30% increase in revenue to accommodate the added waste. Thus, the average disposal cost would drop by over 50%. Therefore, a regional facility shows a definite economic advantage over a Texas facility.

APPENDIX A

BIBLIOGRAPHY

BIBLIOGRAPHY

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APPENDIX B

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

APPENDIX B

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT I: CAPITAL COSTS

CAPITAL COSTS:	1983	1984	1985	1986	1987
-----	-----	-----	-----	-----	-----
LAND		650000			
LICENSING:					
SITE SCREENING	600000				
SITE CHARACTERIZATION		780000			
OPERATOR'S MANUAL			109160		
DESIGN	150000		324480		
CLOSURE PLAN			54080		
LICENSE FEES			108160		
LEGAL FEES		52000	54080	224973	233972
SUBTOTAL	750000	832000	648960	224973	233972
DEVELOPMENT OF PROPERTY:					
ROADS & SITE GRADING					29246
FENCES					116986
LIGHTING & SECURITY CAMERAS					58493
ENVIRONMENTAL MONITORING		58240			
IMPACT ASSISTANCE		249600	259584	269967	280766
SUBTOTAL	0	307840	259584	269967	465491
BUILDINGS:					
ADMINISTRATION & STORAGE AREA					204725
ACCESS CONTROL BUILDING					233972
MAINTENANCE & WAREHOUSE					292465
TRUCK WASH					128684
TRUCK WASH RECYCLING SYSTEM					29246
TRUCKER'S BUILDING					30416
WATER TREATMENT BUILDING					76041
SANITARY SEWAGE WATER TREATMENT					11699
POIABLE WATER SYSTEM					116986
ELECTRICAL SYSTEM					175479
SUBTOTAL	0	0	0	0	1299713
EQUIPMENT:					
FRONT END LOADER					116986
50 TON & 100 TON CRANES					1345337
20 TON CRANE					111137
FORKLIFT(S)					122835
MOBILE RAMP					17548
VIBRATING COMPACTOR					122835
VAN (4 WHEEL DRIVE)					17548
PICKUP TRUCK (4 WHEEL DRIVE) (4)					58493
FIRE TRUCK					46794
MISCELLANEOUS EQUIPMENT					81850
MOTOR GRADER					128684
BACKHOE WITH BUCKET					58493
BULLDOZER & SHEEPSFOOT ROLLER					292465
SECURITY EQUIPMENT					11699
OFFICE EQUIPMENT					116986
SUBTOTAL	0	0	0	0	2649730
CONTINGENCY @ 20% OF ALL COSTS	150000	357968	181709	98988	933781
TOTAL CAPITAL COSTS	900000	2147808	1090253	573928	5602687

APPENDIX B (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT II: PERSONNEL PLAN

PERSONNEL PLAN (NUMBER/ YR)	1983	1984	1985	1986	1987	1988	1989	2008	2009	2010	2011	2012	
CATEGORY:	SALARY(\$):												
SITE MANAGER	40000				1.00	1	1	1	1	0	0	0	
SITE SUPERVISOR	28000				0.50	1	1	1	0	0	0	0	
RADWASTE TECHNICIANS	13000				2.00	6	6	4	0	0	0	0	
EQUIPMENT OPERATOR	18000				1.00	4	4	2	0	0	0	0	
MECHANIC/CARPENTER	19000				0.50	1	1	1	0	0	0	0	
									0				
QUALITY ASSURANCE SUPR	30000				0.50	1	1	1	0	0	0	0	
QUALITY ASSURANCE TECH	18000				0.50	2	2	1	0	0	0	0	
HEALTH PHYSICS SUPR	30000				0.50	1	1	1	0	0	0	0	
HEALTH PHYSICS TECH	18000				0.50	3	3	1	0	0	0	0	
SECURITY SUPERVISOR	24000				0.50	1	1	1	1	1	1	1	
SECURITY OFFICER	12000				2.50	5	5	5	0	0	0	0	
ACCOUNTING CLERK	17000				0.50	2	2	1	0	0	0	0	
SECRETARY	13000				1.00	2	2	1	1	0	0	0	
TOTAL NUMBER OF PERSONNEL	0	0	0	0	11.5	30	30	21	3	1	1	1	
SALARIES (UNINFLATED):													
OPERATIONS	0	0	0	0	67500	197000	197000	135000	0	0	0	0	
REGULATORY	0	0	0	0	48000	150000	150000	96000	0	0	0	0	
SECURITY	0	0	0	0	42000	84000	84000	84000	24000	24000	24000	24000	
ADMINISTRATIVE	0	0	0	0	61500	100000	100000	70000	53000	0	0	0	
TOTAL SALARIES	0	0	0	0	219000	531000	531000	385000	77000	24000	24000	24000	

APPENDIX B (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT III: STATE ADMINISTRATIVE COSTS

STATE ADMINISTRATIVE COSTS:	1983	1984	1985	1986	1987	1988	1989	2008	2009	2010	2011	2012
TEXAS LLRW DISPOSAL AUTHORITY:												
GENERAL & ADMINISTRATIVE	503000	592800	616512	787405	818901	1320068	1372671	2410360	2005420	1564227	1084531	563956
FRINGE BENEFITS						195881	203716	357666	297578	232111	160930	83684
SUBTOTAL	503000	592800	616512	787405	818901	1515950	1576587	2768027	2302998	1796339	1245461	647640
STATE INSPECTOR COSTS:												
SALARY						36193	37641					
BENEFITS @ 23%						8324	8657					
OVERHEAD @ 55%						19906	20702					
SUBTOTAL	0	0	0	0	0	64424	67000	0	0	0	0	0
TOTAL STATE COSTS (% OF SALES)	503000	592800	616512	787405	818901	1580373	1643588	2768027	2302998	1796339	1245461	647640

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APPENDIX B (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT IV: FACILITY OPERATING COSTS

OPERATING COSTS:	1983	1984	1985	1986	1987	1988	1989	2008	2009	2010	2011	2012
SALARIES	0	0	0	0	256199	646043	671864	1026347	213480	69201	71969	74848
EMPLOYEE BENEFITS (230 %)	0	0	0	0	76860	193813	201565	307904	64044	20760	21591	22454
DIRECT SUPPLIES					51474	53533	55674	106633	55449	14417	14994	15593
FUEL					29246	58493	60833	64083	5545	5767	5997	6237
REPAIRS & MAINTENANCE					23397	79082	82246	133292				
LICENSE FEE						121665	126532					
BOND FEE / INSURANCE					122835	127749	132858	279913	149713	86501	89961	93560
LEGAL						48666	31633	119963	124761	129752	59974	62373
CONSULTING						52316	17714	37322	38815	14417	14994	15593
ENVR. & PERSONNEL MONITORING					204725	212914	221431	333230	291109	273920	254890	265085
UTILITIES					45624	47449	49347	90638	66539	28834	29987	31187
BURIAL EXPENSE					647587	673490	700430					
EQUIPMENT RENTAL					8189	8517	8857					
DEPRECIATION												
EMPLOYEE DEVELOPMENT					58493	18250	18980	15995				
PUBLIC EDUCATION						60833	44266	93304	27725	28834	29987	31187
TRAVEL					17548	60833	31633	66646	27725			
AUTO OPERATING					3510	3650	3796	7998	8317			
OFFICE EXPENSE					35096	72999	75919	133292	55449			
MISCELLANEOUS					116986	72999	75919	106633	55449	28834	29987	31187
OVERHEAD @ 35%					594219	914653	914039	1023117	414443	245432	218516	227256
CONTINGENCY @ 20%					339554	522659	522308	584638	236824	140247	124866	129361
SUBCONTRACTOR PROFIT @ 10%					263154	405061	404788	453095	183539	108691	96771	100642
TOTAL OPERATING COSTS (% OF SALES)	0	0	0	0	2894696	4455666	4452673	4984042	2018928	1195606	1064483	1107062
GROSS PROFIT (% OF TOTAL REVENUE) (% OF SUBCONTRACTOR SALES)	0	0	0	0	-2894696	2104360	2369753	-4984042	-2018928	-1195606	-1064483	-1107062

APPENDIX B (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT V: POST OPERATING COSTS

POST-OPERATING MODEL:	2007	2008	2009	2010	2011	2012	2013	2014
COSTS:								
ACTIVE MAINTENANCE PERIOD:								
LICENSE TO CEASE OPERATIONS	128165							
FINAL SITE GRADING		1599502						
FACILITY DECOMMISSIONING		399875						
STATE ADMINISTRATIVE COSTS		2768027	2302998	1796339	1245461	647640		
OPERATING COSTS		4964042	2016928	1195606	1064483	1107062		
CONTINGENCY @ 20%	25633	399875	0	0	0	0		
SUBTOTAL	153798	10151322	4321926	2991945	2309944	1754702		
PASSIVE MAINTENANCE:								
MONITORING/SURVEILLANCE COST							162170	168657
ADMINISTRATIVE COSTS							32434	33731
CONTINGENCY @ 20%							38921	40478
SUBTOTAL							233525	242666
TOTAL POST OPERATING COSTS	153798	10151322	4321926	2991945	2309944	1754702	233525	242866

APPENDIX B (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 1, CONTRACTOR OPERATED

COMPONENT VI: REVENUE PROJECTIONS

REVENUE PROJECTIONS:	1983	1984	1985	1986	1987	1988	1989	2003	2004	2005	2006	2007	2008
VOLUME (CUBIC FEET):													
COMMERCIAL						300504	300504	300504	300504	300504	300504	300504	300504
INDUSTRIAL						23724	23724	23724	23724	23724	23724	23724	23724
INSTITUTIONAL						63264	63264	63264	63264	63264	63264	63264	63264
NRC & FEDERAL FACILITIES						7908	7908	7908	7908	7908	7908	7908	7908
TOTAL VOLUME	0	0	0	0	0	395400	395400	395400	395400	395400	395400	395400	395400
ASSUMPTIONS:													
% TYPE "A" WASTE	0.60												
% TYPE "B" WASTE	0.30												
% TYPE "C" WASTE	0.10												
AVERAGE PRICE PER CUBIC FOOT:													
UNINFLATED (1983):													
BASELINE PLUS SURCHARGES	\$ 13.64	13.64											
INFLATED:													
BASELINE PLUS SURCHARGES	\$ 13.64	14.18	14.75	15.34	15.95	16.59	17.25	29.88	31.07	32.32	33.61	34.95	
FUND:													
CHARGE PER CUBIC FOOT	1.08												
COLLECTIONS PER YEAR	0	0	0	0	0	520057	540859	936593	974057	1013019	1053540	1095682	
CUMULATIVE COLLECTIONS W/INTEREST						520057	1086919	16116222	17876090	19803914	21847649	23881915	14924667

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APPENDIX C

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY

BASE CASE 2: TEXAS AUTHORITY OPERATED

COMPONENT I: INFLATED CAPITAL COSTS

COMPONENT III: STATE ADMINISTRATIVE COSTS

(SAME AS BASE CASE 1)

APPENDIX C (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 2, AUTHORITY OPERATED

COMPONENT II: PERSONNEL PLAN

PERSONNEL PLAN (NUMBER/ YR)	1983	1984	1985	1986	1987	1988	1989	2008	2009	2010	2011	2012
CATEGORY:	SALARY (83):											
SITE MANAGER	36228				1.00	1	1	1	1	0	0	0
SITE SUPERVISOR	26952				0.50	1	1	1	0	0	0	0
RADWASTE TECHNICIANS	13168				2.00	6	6	4	0	0	0	0
EQUIPMENT OPERATOR	15948				1.00	4	4	2	0	0	0	0
MECHANIC/CARPENTER	15948				0.50	1	1	1	0	0	0	0
QUALITY ASSURANCE SUPR	25248				0.50	1	1	1	0	0	0	0
QUALITY ASSURANCE TECH	14964				0.50	2	2	1	0	0	0	0
HEALTH PHYSICS SUPR	25248				0.50	1	1	1	0	0	0	0
HEALTH PHYSICS TECH	14964				0.50	3	3	1	0	0	0	0
SECURITY SUPERVISOR	24000				0.50	1	1	1	1	1	1	1
SECURITY OFFICER	12000				2.50	5	5	5	0	0	0	0
ACCOUNTING CLERK	14964				0.50	2	2	1	0	0	0	0
SECRETARY	12408				1.00	2	2	1	1	0	0	0
TOTAL NUMBER OF PERSONNEL	0	0	0	0	11.5	30	30	21	3	1	1	1
SALARIES (UNINFLATED):												
OPERATIONS	0	0	0	0	63774	185820	185820	127548	0	0	0	0
REGULATORY	0	0	0	0	40212	125316	125316	60424	0	0	0	0
SECURITY	0	0	0	0	42000	84000	84000	84000	24000	24000	24000	24000
ADMINISTRATIVE	0	0	0	0	56118	90972	90972	63600	48636	0	0	0
TOTAL SALARIES	0	0	0	0	202104	466108	466108	355572	72636	24000	24000	24000

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APPENDIX C (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 2, AUTHORITY OPERATED

COMPONENT IV: FACILITY OPERATING COSTS

OPERATING COSTS:	1983	1984	1985	1986	1987	1988	1989	2008	2009	2010	2011	2012
SALARIES	0	0	0	0	236433	591425	615082	947897	201381	69201	71969	74848
EMPLOYEE BENEFITS (23%)	0	0	0	0	54380	136028	141469	218016	46318	15916	16553	17215
DIRECT SUPPLIES					51474	53533	55674	106633	55449	14417	14994	15593
FUEL					29246	58493	60833	66646	5545	5767	5997	6237
REPAIRS & MAINTENANCE					23397	79062	82246	133292	0	0	0	0
LICENSE FEE						121665	126532					
BOND FEE / INSURANCE												
LEGAL						48666	31633	119963	124761	129752	59974	62373
CONSULTING						168385	175120	203670	211817	86501	89761	93560
ENVIR. & PERSONNEL MONITORING					204725	212914	221431	333230	291109	273920	254870	265085
UTILITIES					45624	47449	49347	90638	66539	28834	29967	31187
BURIAL EXPENSE					647587	673490	700430	0	0	0	0	0
EQUIPMENT RENTAL					8189	8517	8857	0	0	0	0	0
DEPRECIATION												
EMPLOYEE DEVELOPMENT					58493	18250	18960	15995				
PUBLIC EDUCATION						60833	44266	93304	27725	28834	29967	31187
TRAVEL					17548	60833	31633	66646	27725			
AUTO OPERATING					3510	3650	3796	7998	8317			
OFFICE EXPENSE					35096	72999	75919	133292	55449			
MISCELLANEOUS					116986	72999	75919	106633	55449	28834	29967	31187
CONTINGENCY @ 20%					306538	497842	503637	528771	235517	136395	120860	125694
TOTAL OPERATING COSTS	0	0	0	0	1839225	2967053	3023024	3172623	1413102	818369	725155	754165
(% OF SALES)						0.59	0.57					
GROSS PROFIT	0	0	0	0	-1839225	2073055	2239488	-3172623	-1413102	-818369	-725155	-754165
(% OF TOTAL REVENUE)						0.41	0.43					

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APPENDIX C (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 2, AUTHORITY OPERATED

COMPONENT V: POST OPERATING COSTS

POST-OPERATING MODEL:	2007	2008	2009	2010	2011	2012	2013	2014
COSTS:								
ACTIVE MAINTENANCE PERIOD:								
LICENSE TO CEASE OPERATIONS	128165							
FINAL SITE GRADING		1597502						
FACILITY DECOMMISSIONING		399875						
STATE ADMINISTRATIVE COSTS		2768027	2302998	1796339	1245461	647640.0		
OPERATING COSTS		3172623	1413102	818369	725158	754165		
CONTINGENCY @ 20%	25633	399875	0	0	0	0		
SUBTOTAL	153798	8339903	3716100	2614708	1970620	1401805.		
PASSIVE MAINTENANCE:								
MONITORING/SURVEILLANCE COST							162170	168657
ADMINISTRATIVE COSTS							32434	33731
CONTINGENCY @ 20%							38921	40478
SUBTOTAL							233525	242866
TOTAL POST OPERATING COSTS	153798	8339903	3716100	2614708	1970620	1401805	233525	242866

APPENDIX C (Cont'd)

REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL FACILITY
CASE 2, AUTHORITY OPERATED

COMPONENT VI: REVENUE PROJECTIONS

REVENUE PROJECTIONS:	1983	1984	1985	1986	1987	1988	1989	2003	2004	2005	2006	2007	2008
VOLUME (CUBIC FEET):													
COMMERCIAL						300504	300504	300504	300504	300504	300504	300504	300504
INDUSTRIAL						23724	23724	23724	23724	23724	23724	23724	23724
INSTITUTIONAL						63264	63264	63264	63264	63264	63264	63264	63264
NRC & FEDERAL FACILITIES						7908	7908	7908	7908	7908	7908	7908	7908
TOTAL VOLUME	0	0	0	0	0	395400	395400	395400	395400	395400	395400	395400	395400
ASSUMPTIONS:													
1/2 TYPE "A" WASTE	0.60												
1/2 TYPE "B" WASTE	0.30												
1/2 TYPE "C" WASTE	0.10												
AVERAGE PRICE PER CUBIC FOOT:													
UNINFLATED (1983):													
BASELINE PLUS SURCHARGES	\$ 10.52	10.52											
INFLATED:													
BASELINE PLUS SURCHARGES	\$ 10.52	10.94	11.38	11.83	12.31	12.80	13.31	23.05	23.97	24.93	25.93	26.96	
FUND:													
CHARGE PER CUBIC FOOT	0.94												
COLLECTIONS PER YEAR	0	0	0	0	0	451767	469837	813606	846151	879997	915197	951805	
CUMULATIVE COLLECTIONS W/INTEREST						451767	944193	13999952	15546101	17203403	18978769	20725714	13422097

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