RECON: A Computer Program for Analyzing Repository Economics

Documentation and User's Manual

L. L. Clark
B. M. Cole
G. W. McNair
M. E. Schutz

May 1983

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Richland, Washington 99352

SUMMARY

From 1981 through 1983 the Pacific Northwest Laboratory has been developing a computer model named RECON to calculate repository costs from parametric data input. The objective of the program has been to develop the capability to evaluate the effect on costs of changes in repository design parameters and operating scenario assumptions.

This report documents the development of the model through March of 1983. Included in the report are: 1) descriptions of model development and the underlying equations, assumptions and definitions; 2) descriptions of data input either using card images or an interactive data input program; and 3) detailed listings of the program and definitions of program variables.

Cost estimates generated using the model have been verified against independent estimates and good agreement has been obtained.

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1.0 INTRODUCTION

In 1981, the Office of Nuclear Waste Isolation commissioned the Pacific Northwest Laboratory to prepare a consistent set of cost estimates for constructing and operating nuclear waste repositories in different media. To aid in accomplishing this task, a computer model named RECON was created to parametrically calculate repository costs. During 1982, the model was further developed under the direction of the Office of National Waste Terminal Storage (NWTs) Integration. This report presents the documentation and user's manual for the RECON model developed from these efforts.

In the following sections the model is described in general terms, the flow of calculations in the model is shown, the structure and equations used in the various subroutines are defined, and a detailed set of input instructions is provided in a user's manual. Two appendices list all the model variable descriptions and list the complete program.

2.0 GENERAL RECON MODEL DESCRIPTION

The RECON Model is a computer program designed to estimate costs of mined geologic repositories based on parametric data input. Using the model, preliminary cost estimates of the impact of design changes can be made. Although the model generates estimates with less precision and detail than would be generated by an architect engineer, it can generate first-order estimates much more quickly and cheaply and can be used to focus attention on areas where more detailed design efforts are cost effective and necessary.

It must be emphasized that the model described in this document is undergoing further modification, improvement, and verification. Attempts to use RECON without a thorough understanding of repository design limitations could lead to erroneous results and conclusions. The authors recommend, therefore, that they be consulted first by anyone desiring to implement the model.

As previously mentioned, RECON uses parametric data input to describe the repository. Basic model input parameters describe facilities, construction times, shafts, mine design, emplacement limitations, waste flows available for disposal, waste processing parameters (labor, materials, utility, and equipment requirements), facility construction costs and unit labor, materials, utility and equipment costs. Using this information, the model determines the facility requirements for receiving, packaging, transporting, and emplacing the wastes. Based on the facility requirements, the model calculates labor, material, and equipment requirements. Labor requirements are calculated in shifts based on available working days. From the shifts and days worked, utility requirements are calculated. Equipment replacement requirements are calculated based on equipment life (stated in years or units processed) and processing rates. All of the above requirements are calculated year by year for each waste type thereby simulating actual repository operations.

Excavation of the mine is modeled assuming initial shaft, shaft pillar, and main corridor excavations followed by room excavations needed to emplace waste volumes received the following year. Hoisting, surface storage, and

offsite disposal tonnages are also calculated. The user has the option of allowing the model to calculate requirements and costs for mining labor materials and equipment for the above operations or he can input unit costs for the above rock operations. Mine excavation requirements are based on input data describing room, panel and corridor dimensions and spacings. Density of waste emplacement in rooms is calculated by the model based on minimum waste spacing (determined by very-near-field thermal criteria or by rock strengths), waste package thermal densities, and far-field and near-field limiting thermal densities. Annual excavation requirements are then calculated for each waste type using the emplacement density, annual waste units requiring disposal, and room and corridor dimensions.

Backfilling operations are modeled using input data that determine startup of these operations and annual backfilling rates. The model alternatively uses the annual rock hoisting (lowering) capacity as a default rate if no backfilling rate is specified (obviously a specified rate should be less than the default rate). Based on excavated volumes, the model determines the annual rock mass backfilled and the duration of backfilling operations if these extend beyond waste emplacement operations. Cost calculation methodology is specified by the same option governing the other rock logistics calculations.

Startup of decommissioning and sealing operations is dynamically determined by either the end of waste operations or the end of backfilling operations. Waste operations cease either at the end of an input time period or when the total underground area requirement exceeds a maximum size. Backfilling operations end when all excavated rooms are backfilled. During decommissioning operations, the remaining corridors and shaft pillar areas are backfilled, the shafts are sealed and the surface facilities are decommissioned. Backfilling costs are determined as previously explained. The model uses unit sealing costs together with shaft diameters to calculate total sealing costs. Decommissioning costs are calculated based on an input percentage of total surface facility costs.

Also included in the costs, but not specified above are land, licensing, site preparation, and startup costs. Land, licensing, and site preparation costs are input determined, while startup costs are based on an input percentage of total construction costs.

Contingencies account for unidentifiable costs of labor, materials, and equipment and other unspecified items. These are calculated by multiplying input percentages by construction costs, waste operations costs, rock operations costs, and decommissioning costs.

Output tables show summaries of total construction, waste operations, rock operations, and decommissioning costs by waste type. Further breakdowns of costs within these categories are shown in backup tables as a function of time. Levelized unit costs are calculated per unit mass, unit volume, and per package using an input-specified discount rate. Supporting tables show summaries of emplacement descriptions, rock logistics, waste operations logistics, and backfilling logistics.

3.0 FLOWCHART DESCRIPTION

This section outlines the sequence of operations given in the general model descriptions. This sequence is shown graphically in Figure 3.1. The controlling calculational routine is called HUB. This routine calls subroutines that model operations in the various repository components and calculate costs. The figure shows the sequence of operations necessary to provide the data needed for each subroutine. Table 3.1 lists the subroutines and describes the main operations in each subroutine.

Data generated in preceding subroutines are combined with input data to provide the data for calculations in subsequent subroutines. This data sequence is listed in Table 3.2. Following Table 3.2, a more detailed explanation of each subroutine is given in Section 4.0.

FIGURE 3.1. Calculational Flow for the RECON Model

TABLE 3.1. General Subroutine Descriptions for the RECON Model

Subroutine	Main Operations
INPUT	A. Read all Input Data
WASTOP	<p>A. Calculate Modules for:</p> <ul style="list-style-type: none"> RH and CH Packaging RH and CH Transport RH and CH Emplacement RH Emplacement Excavations RH and CH Waste Shafts <p>RH = Remote Handled CH = Contact Handled</p> <p>B. Calculate Shift Requirements for RH Waste Operations CH Waste Operations</p> <p>C. Calculate Labor Requirements for Waste Operations and Material Requirements including package materials for Waste Operations</p> <p>D. Calculate Emplacement Configurations and Area Requirements</p> <p>E. Determine Year When Repository is Full</p> <p>F. Determine Equipment Requirements for Waste Operations</p> <p>G. Calculate and Sum Labor, Materials, and Equipment Costs for Each Waste Operation</p>
MINDEV	<p>A. Calculate Rock Volume and Mass Mined</p> <p>B. Calculate Labor, Materials and Equipment Requirements for Mining</p> <p>C. Calculate Backfilling Done During Waste Operations</p> <p>D. Calculate Other Rock Operations Logistics During Waste Operations</p>
RECEVE	<p>A. Calculate Rail and Truck Shipments Received</p> <p>B. Calculate Number of Receiving Modules Required</p> <p>C. Calculate Receiving and Packaging Facility Costs</p>
SHAFT	<p>A. Calculate Shaft Usage for Waste and Mined Rock Hoisting Shafts</p> <p>B. Calculate Number of Rock Hoisting Shafts Required</p>

TABLE 3.1. (contd)

<u>Subroutine</u>	<u>Main Operations</u>
ROCKOP	<ul style="list-style-type: none"> A. Calculate Backfilling Masses and Resource Requirements B. Calculate Rock Masses Hoisted and Lowered and Associated Resource Requirements C. Calculate Surface Rock Storage and Handling Logistics and Associated Resource Requirements
UTILTY	<ul style="list-style-type: none"> A. Calculate Electricity, Steam, Water, and Diesel Fuel Requirements B. Calculate Electricity, Steam, Water, and Diesel Fuel Costs
SURFST	<ul style="list-style-type: none"> A. Distribute Capital Costs over Time and Waste Type for: <ul style="list-style-type: none"> Support Facilities Underground Facilities Transportation Capital Rock Operations Capital Emplacement Capital B. Calculate Support Facility Equipment Replacement Costs C. Calculate Site Preparation Costs D. Calculate Labor and Materials Requirements for Support Facilities
PREOP	<ul style="list-style-type: none"> A. Calculate Costs for: <ul style="list-style-type: none"> Land Acquisition Licensing Architect-Engineer Services Startup Operations
POSTOP	<ul style="list-style-type: none"> A. Calculate: <ul style="list-style-type: none"> Shaft Sealing Cost Facility Decommissioning Costs Surveillance Costs
WAFAM	<ul style="list-style-type: none"> A. Calculate Cost Allocation Factors
REPLAS	<ul style="list-style-type: none"> A. Calculate Equipment Replacement Requirements
FUNCTIONS:	
HOLDC	<ul style="list-style-type: none"> A. Functional Form for Calculating Hole Drilling Costs
HOLMC	<ul style="list-style-type: none"> A. Functional Form for Calculating Costs for Engineered Barriers in Boreholes
SKFUNC	<ul style="list-style-type: none"> A. Functional Form for Estimating Shaft Construction and Sealing Costs

TABLE 3.2. Sequences of Parameter Derivation and Subsequent Usage

Subroutine	Data	Subsequent Routines Used
INPUT	All input data	All input data used in subsequent sub-routines is read in this subroutine.
WASTE OPERATIONS (WASTOP)	Waste Emplacements Rooms required Operations period Receiving and Pack- aging Modules Area requirements Number of shifts	HUB, RECEVE, SHAFT, UTILITY HUB, MINDEV All subroutines RECEVE MINDEV, UTILITY, POSTOP MINDEV, ROCKOP
MINE DEVELOPMENT (MINDEV)	Rock hoisted Rock mined Rock backfilled Rock stored Rock shipped offsite Rock excavated for shafts Unbackfilled rooms Unbackfilled volume	HUB, ROCKOP HUB, UTILITY, ROCKOP, WAFAM HUB, ROCKOP HUB, ROCKOP HUB HUB UTILITY, ROCKOP ROCKOP
WASTE ALLOCATION (WAFAM)	Waste Allocation Factors	HUB, MINDEV, ROCKOP, SHAFT, UTILITY SURFST, PREOP, POSTOP
RECEIVING (RECEVE)	Total cask shipments received Receiving and Packaging facility Capital Costs	RECEVE, UTILITY, POSTOP HUB
SHAFT DEVELOPMENT (SHAFT)	Number of rock hoisting shafts Shaft lining cost Shaft sinking cost Shaft water control cost Total cost per shaft	ROCKOP OUTPUT OUTPUT OUTPUT HUB
ROCK OPERATIONS (ROCKOP)	Backfilling labor Backfilling materials Rock mass backfilled Other material backfilled Rock mass hoisted Rock hoisting labor Rock hoisting materials	HUB HUB HUB, OUTPUT HUB HUB HUB HUB

TABLE 3.2. (contd)

<u>Subroutine</u>	<u>Data</u>	<u>Subsequent Routines Used</u>
	Rock handling and storage labor	HUB
	Rock handling and storage materials	HUB
	Rock mass stored on surface	OUTPUT
UTILITIES (UTILTY)	Annual utilities cost	HUB
	Diesel fuel cost	OUTPUT
	Electric Power cost	OUTPUT
	Steam Cost	OUTPUT
	Water Cost	OUTPUT
FACILITY CONSTRUCTION (SURFST)	Support facility capital costs	HUB
	Underground facility capital costs	HUB
	Transportation capital costs	HUB
	Emplacement excavation capital costs	HUB
	Rock operations capital costs	HUB
	Site preparations costs	HUB, OUTPUT
PRE-CON- STRUCTION (PREOP)	Cost of A-E services	HUB, OUTPUT
	Cost of licensing	HUB, OUTPUT
	Cost of land	HUB, OUTPUT
	Startup costs	HUB
DECOMMISS- SIONING AND SEALING (POSTOP)	Shaft sealing cost	HUB
	Facility decommissioning cost	HUB
	Surveillance cost	HUB

4.0 DETAILED SUBROUTINE DESCRIPTIONS AND EQUATION DEFINITIONS

This section describes in detail the operations performed in each subroutine and function and defines the general equations used to perform the calculations.

THE INPUT SUBROUTINE

This subroutine reads in all of the data required to perform the calculations. Because the user's manual in Section 5.0 describes each of the input variables and the data options, this routine is not discussed further in this section.

THE WASTOP SUBROUTINE

Definitions - The waste operations subroutine (WASTOP) calculates the parameters and costs of waste operations at the repository. These operations are defined to include the following components: waste receiving, waste packaging, waste transport within the repository, waste emplacement, and excavations in the rooms for waste emplacement.

Calculations performed in WASTOP use the concept of a modular unit of operation. The capital cost, capacity, equipment parameters, labor parameters, and materials parameters for each modular unit of operation are read in as input variables. The following module definitions are used for each waste operations component:

- Receiving - This is a facility module including receiving bays, shipping container decontamination stations, unloading facilities and equipment, and waste transfer and surge storage facilities and equipment. Remote and contact-handled modules are specified independently in the model.
- Packaging - This is a remote-operations facility module and includes a hot cell, transfer ports, and equipment to perform desired operations such as decanning, removal and insertion of waste,

welding, leak testing, decontamination and movement of packaged waste to the waste shaft. This facility is only used for remote-handled waste.

- Transportation – This is an equipment module consisting of a single transporter that moves the packaged waste from the shaft stations underground to the emplacement area. Remote- and contact-handled modules are specified separately.
- Emplacement – This is an equipment module consisting of a single piece of equipment to place the waste package in its final emplacement location. Some designs incorporate transportation and emplacement in a single piece of equipment. Remote- and contact-handled modules are specified separately.
- Emplacement Excavation – This is an equipment module consisting of a single piece of excavation equipment with associated equipment to transfer excavated media to holding areas. Excavation modules are not needed if all wastes are simply placed in rooms.

The data input associated with each module is described in Section 5.0 and includes the following:

- labor – requirement and wage level
- materials – requirement and unit price
- equipment – capacity per shift, lifetime, and unit cost
- capital cost.

Calculations – The WASTOP subroutine first calculates annual module capacities for receiving and packaging. Receiving module capacity is calculated as follows:

$$\text{Receiving module capacity} = \sum_{K=1}^{NWT} DPY \left(\frac{RCCAP(K) * CRRAIL(K,I)}{TTTR(K)} + \frac{TCCAP(K) * (1 - CRRAIL(K,I))}{TTTK(K)} \right) \quad (1)$$

where DPY = days per shift-year the repository operates

RCCAP = rail-cask capacity (in waste units)

TCCAP = truck cask capacity (in waste units)

CRRAIL = percentage of cask shipments made by rail

TTTR = the average facility turnaround time for rail casks for the entire receiving module assuming 100% rail cask usage and 1 shift-per-day operation

TTTK = the average facility turnaround time for truck casks for the entire receiving module assuming 100% truck cask usage and 1 shift-per-day operation

K = waste type index (NWT = total number of waste types)

I = year index

The relationship between the receiving module capacity calculated above and facility design is inherent in the turnaround time variables. For example, adding an additional dock, receiving station, etc., would reduce the average facility turnaround time since casks could be processed simultaneously. The relationship between facility design, turnaround time and facility cost must be determined externally by the user. A first-order approximation in determining facility turnaround times may be to divide the cask turnaround time (normally 4 to 5 days) by the number of receiving-facility process lines. Packaging module capacity is independent of receiving module capacity and is read in as an input variable in terms of waste units packaged per shift.

After determining the module capacities, for the above modules (including transportation, emplacement, etc.) WASTOP calculates the number of modules needed to satisfy the waste input requirements according to the following equation:

$$\text{Number of modules (M,I)} = \frac{\left(\frac{\text{total waste receipts (M,I)}}{\text{module capacity per shift year}} \right)}{\text{maximum number of shifts operated}} \quad (2)$$

where M = either remote- or contact-handled wastes

The model compares the number of modules calculated with the maximum number of modules allowed (input). If the maximum is exceeded, the number of waste units available for disposal is proportionately reduced and the module calculations are redone. This operation is done sequentially for receiving and packaging.

Shift requirements are calculated separately for remote- and contact-handled wastes based on the following:

$$\text{Shift requirement (M,I)} = \frac{\text{total waste receipt (M,I)}}{\text{number of modules per shift-year (M,I)} \times \text{capacity per module (M)}} \quad (3)$$

where M = either remote- or contact-handled wastes

Shift requirements for the packaging facility are assumed to be the same as for remote-handled receiving.

WASTOP next calculates the number of shifts required to transfer the wastes underground in the waste shafts according to the following equation:

$$\text{Shaft shift requirement (M,I)} = \frac{\text{number of packages (M,I)}}{\text{NPKPT(M)} \times \text{MTRPSD(M)} \times \text{DPY}} \quad (4)$$

where NPKPT = number of packages per trip

MTRPSD = maximum trips per shift

DPY = days per year

M = remote- or contact-handled waste

I = year index

The model logic allows the user to specify the number of waste shafts to be used (in which case the waste processed per year is reduced if the shaft capacity is exceeded) or the program to calculate the number of shafts used (in which case additional waste shafts are installed if shaft capacity is exceeded). The user can also choose which type of waste shafts should be used (remote or contact or both). If a remote waste shaft is specified but no contact-handled waste shaft is specified, the program uses the largest shaft

shift value calculated above to represent the combined waste shaft. If the number of shifts required for shaft operation is within the maximum, but greater than shift requirements for receiving and packaging, the largest shift requirement is used for all components. The model assumes that all subsequent underground operations are governed by this shift requirement.

The module requirements for transportation, emplacement and emplacement excavation are based on the following equation:

$$\text{Modules (K,I)} = \frac{\text{units processed (K,I)}}{\text{equipment capacity (M)} * \text{shifts operated} * \text{days per year}} \quad (5)$$

Manpower requirements are developed from the shifts operated for each module component based on the following.

$$\text{Labor requirement in man-years (I,L)} = \text{WOLBRR} * \text{SFTR(L)} * \text{NRMR (I)} \quad (6)$$

where WOLBRR = labor requirement per module per shift

SFTR = fraction of shift operated

NRMR = number of modules required

L = shift operated

I = year index

K = waste type index

Materials requirements for each component are calculated from the following:

$$\text{Materials requirements (K,I)} = \text{materials required per process unit} * \text{number of process units} \quad (7)$$

All of the above calculations have been done for just one year of operation. Next, the model determines the waste emplacement density and the resulting area requirements. The total area requirements are summed year by year and compared with a maximum emplacement area allowable. The allowable emplacement area is the total underground area less the central pillar, main corridor, and exclusion areas. The exclusion area is an input percentage of

the total underground area. When the maximum area allowable has been exceeded, the model recalculates the waste emplacements and area requirements for that year and stops emplacement operations. The waste emplacement density is calculated from the number of rows per room (input) and proposed pitch (input) as follows:

$$\text{Number of packages per room (K,I)} = \frac{\text{room length(K)}}{\text{pitch(K,I)}} * \text{rows per room(K)} \quad (8)$$

where K = waste type

I = year

The near-field and far-field heat loads are calculated using the following relationships:

$$\text{Near-field heat load} = \sum_{K=1}^{\text{NWT}} \text{NPKGPR(K,I)} * \text{TDPP(K)} * \frac{\text{XRASHO(K)} * \text{M2ACRE}}{\text{RMLN(K)} * \text{RMWTH(K)}} \quad (9)$$

where NPKGPR = number of packages per room

TDPP = thermal density per package in kilowatts

XRASHO = extraction ratio (i.e., room width/centerline distance between rooms)

M2ACRE = square meters per acre constant

RMLN = room length

RMWTH = room width

K = waste type index (NWT = total number of waste types)

I = year index

$$\text{Far-field heat load} = \sum_{K=1}^{\text{NWT}} \frac{\text{XRASHO(K)} * \text{M2ACRE}}{\text{RMWTH(K)} * \text{PANWTH}} \text{NPKGPR(K)} * \text{TDPP(K)} \quad (10)$$

where PANWTH = panel width

If the near-field or far-field heat loads exceed the near- or far-field thermal limits (input), the program recalculates the pitch between canisters and the resulting emplacement density such that the thermal limit is met.

The WASTOP routine then calculates equipment requirements for the waste operations components. These calculations employ a subroutine named REPLAS. The number of equipment modules needed each year are calculated (see Equation (5)) and fed, along with the units processed, the equipment capacity and the equipment life, to REPLAS. The REPLAS subroutine keeps track of the usage of each piece of equipment during the period of waste operations and determines, based on equipment life, when replacements are needed. These requirements are then fed back to the subroutine calling REPLAS.

In calculating labor, equipment and materials requirements for emplacement excavation operations, one of three emplacement methods can be employed: 1) hole drilling in room floors, 2) simple placement in rooms and 3) trenching in room floors. Current model modifications also allow a fourth emplacement method: boreholes in rock pillars between rooms. The method of emplacing each waste type is specified by the user. For the hole drilling methods, two cost calculation options are available. Option 1 is similar to previous calculations in that the user must specify the unit equipment, labor, and material requirements and costs for the hole drilling operations. (Emplacement methods 2 and 3 must use this type of input.) In option 2, the user specifies that a unit hole drilling cost be calculated. This unit cost is then multiplied by the units requiring hole emplacement to develop the total hole drilling cost. The unit cost calculated in option 2 is based on a functional relationship (built into the model) which was developed from previous unpublished hole drilling cost estimates. This functional relationship is shown below. A separate functional form is shown for salt, since a better fit to the data was found using this form.

Basalt and Granite Media

$$\text{Unit hole drilling cost in dollars per meter of depth} = A * d^B \quad (11)$$

		<u>Basalt</u>	<u>Granite</u>
where A and B = constants with values:	A =	1507	1435
d = hole diameter	B =	1.31	1.31

Salt Medium

$$\text{Unit hole drilling cost in dollars per meter of depth} = C * e^{kd} \quad (12)$$

where C and k = constants with values: C = 36.9
k = 1.16

d = hole diameter

*Note: constants A and C above are derived to give costs in 1981 dollars.
Multiplying these constants by 1 + escalation rate will give costs in current-year dollars.

The above unit costs are multiplied by hole depth in meters to develop the final unit hole drilling cost. The hole diameters used above are calculated in the model using the relationship below:

$$\text{Hole diameter} = \text{package diameter} + 2 * (\text{water barrier thickness} + \text{sleeve thickness} + \text{backfill thickness}) \quad (13)$$

The water barrier, sleeve, and backfill thicknesses are specified by the user.

The rock masses excavated for hole drilling or trenching are calculated and later added to the rock masses mined in excavating shafts, rooms, and corridors to develop total rock masses mined.

The final calculations in WASTOP determine the labor, materials, and equipment costs for each waste operations component using the requirements developed above, in the equations shown below:

$$\text{Labor cost}_N(K,I) = \sum_{L=1}^{IS} (\text{labor requirement}_N(I,L) * \text{labor cost}_N * \text{shift cost differential (L)} * \text{overhead factor} * \text{LCAF}(K,I)) \quad (14)$$

where N = waste operations component (e.g., receiving, packaging, etc.)

K = waste type index

I = year index

L = shift

IS = number of shifts

LCAF = labor cost allocation factor = units processed by waste
type/total units processed by year

$$\text{Materials cost}_N(K,I) = \text{materials requirements}_N(K,I) \\ * \text{materials costs}_N(K,I) \quad (15)$$

$$\text{Miscellaneous materials cost (K,I)} = \text{waste operations labor} \\ \text{requirement (K,I)} * \text{FLUMM} \quad (16)$$

where FLUMM = miscellaneous materials cost per man-year (input)

$$\text{Equipment cost}_N(K,I) = \text{new equipment requirements}_N(K,I) \\ * \text{unit equipment cost}_N \quad (17)$$

The above cost calculations for waste operations are transferred to the HUB subroutine, which performs the various summations.

THE MINDEV SUBROUTINE

Definitions – The mine development subroutine (MINDEV) calculates the mine excavation requirements prior to operations and during operations. Excavations prior to operations include mining of the shafts, shaft pillar corridors, and all main corridors. Excavations during operations assume that side drifts and rooms are excavated such that sufficient emplacement area is available to meet waste emplacement requirements after a specified lag period in years (input). The model logic calculates waste emplacements separately for each waste type and assumes that rooms are dedicated solely to each waste

type. MINDEV calculates the rock logistics during waste operations for mining, hoisting, surface storage, offsite disposal, and backfilling. The following definitions are used for these rock operations' components:

- Mining – This operation includes mining the rock face, mucking, haulage of mined rock to storage bins, rock bolting, water control, and any other operations necessary to prepare the corridors and rooms for usage.
- Hoisting – This operation includes loading the rock skips from the storage bin and hoisting the rock to the surface. Lowering rock to finish backfilling the repository is also included in this operation.
- Surface Storage – This operation includes moving the mined rock from the hoisting shaft to the surface storage site, placing the rock at the site and covering the storage pile (if needed). Recovery of rock and movement to the shaft for backfilling purposes is included in this operation.
- Offsite Disposal – This operation includes loading the railcars from the storage pile, transporting the rock and disposing of the rock offsite.
- Backfilling – This operation includes transporting the rock from the shaft to the backfilling area, and backfilling the required volume. If backfilling is done during waste operations, only the filled rooms and associated drift corridors are assumed to be backfilled.

MINDEV includes calculation of labor, materials, and equipment requirements for the mining component. Calculations of requirements for other components is done in the ROCKOP subroutine since these operations may extend over a longer time period than waste emplacement operations.

Calculations – The MINDEV subroutine first calculates rock masses mined during waste emplacement operations using the following equations:

$$\begin{aligned} \text{Rock mass mined (K,I)} &= (\text{room volume (K,II)} + \text{corridor volume (K,I)}) \\ &\quad * \text{rock density} \end{aligned} \tag{18}$$

where K = waste type index

I = year index

II = year waste emplaced

and

$$\text{Room volume (K,II)} = \text{rooms filled with waste (K,II)} * \text{room length} * \text{room width} * \text{room height} \quad (19)$$

$$\text{Corridor volume} = \sum_{M=1}^{\text{NCOR}} (\text{corridor length}^{(M)} * \text{corridor width}^{(M)} * \text{corridor height}^{(M)} * \text{NCORPP}^{(M)} * \text{number of panels filled with waste}) \quad (20)$$

where NCOR = number of different corridor types in each panel

NCORPP = number of corridors per panel of each type

M = corridor type

Next, the MINDEV subroutine calculates the rock masses mined during shaft and main corridor excavation as follows:

$$\text{Rock excavation for shafts (K,I)} = \sum_{L=1}^{\text{NST}} \left[\left(\text{SFTXR}(L) + \frac{\text{SFTDD}(L)}{2} \right)^2 (\pi) (\text{shaft depth}(L)) \right] \frac{1}{(\text{ALL}(K))(\text{SCSKD}(I)(\text{rock-density})} \quad (21)$$

where SFTXR = incremental shaft radius excavated for creep allowance

SFTDD = shaft design diameter

ALL = waste type allocation factor = rock mined in waste operation (K,I)/total rock mined in waste operations(I)

SCSKD = shaft construction schedule

L = type of shaft

K = waste type (NST = number of shaft types)

I = year index

π = pi

$$\text{Rock excavation for corridors (K,I)} = \text{shaft pillar corridor rock mass (K,I)} \\ + \text{main corridor rock mass (K,I)} \quad (22)$$

and

$$\text{Shaft pillar corridor rock mass (K,I)} = \text{shaft pillar corridor length} \\ * \text{width} * \text{height} * \text{rock density} \\ * \text{ALL(K)} * \text{PORMDF1(I)} \quad (23)$$

$$\text{Main corridor rock mass (K,I)} = \text{main corridor length} * \text{width} * \text{height} \\ * \text{rock density} * \text{ALL(K)} * \text{PORMDF2(I)} \quad (24)$$

where PORMDF1 and 2 = Pre-operational-mining time distribution factors for
shaft pillar and main corridor mining, respectively

Mining resource requirements are calculated as follows:

$$\text{Mining machines (I)} = \frac{\text{total rock mined (I)}}{\text{equipment capacity} * \text{number of shifts} \\ * \text{days per year}} \quad (25)$$

where total rock mined (I) = (Eq. 18 + Eq. 22 + Eq. 23 + Eq. 24)

$$\text{Mining labor (K,I)} = \text{mining machines(I)} * \text{labor requirement per machine} \quad (26) \\ \text{in man-years} * \text{shifts} * \frac{\text{Total Rock Mined (K,I)}}{\text{Total Rock Mined (I)}}$$

$$\text{Mining materials(K,I)} = \text{material units per tonne} * \text{rock mass mined (K,I)} \quad (27)$$

where K = waste type index

I = year index

The number of shifts operated is assumed to be 3 for pre-operational mining and is the same as the waste operations shifts worked for mining during waste operations. Replacement of mining machines is calculated similarly to equipment replacements described in waste operations.

The MINDEV subroutine next calculates backfilling requirements during operations. This is done by keeping track of the rooms and corridors mined and the associated volumes. Each year the program checks to see if backfilling operations can start. If backfilling operations are not allowed to commence during waste operations, then all backfilling is done after the specified waiting period in the ROCKOP subroutine. If backfilling operations commence during waste operations a backfilling efficiency is calculated as follows:

$$\text{Backfilling efficiency} = \text{percentage of room filled} / \text{rock expansion factor} \quad (28)$$

Using the efficiency, the volume of rock mined in waste operations that year, and the percentage of supplementary backfill material needed (if any), the program calculates the number of rooms and associated corridors that can be backfilled. (Rock stored on the surface is not used for backfill during this period.) The total number of room-corridor units backfilled is summed every year and compared to the total rooms filled with waste. When the two are equal, backfilling of rooms in subsequent years is limited to rooms filled with waste in that year. If the rooms backfilled do not "catch up" with rooms filled with waste during the waste operations period, the number of unbackfilled rooms is sent to ROCKOP where backfilling after waste operations is calculated.

Lastly, the MINDEV subroutine calculates the rock masses associated with hoisting, surface storage and offsite disposal during waste operations. Hoisting requirements are the difference between mining and backfilling requirements each year. Surface storage requirements are the sum of the hoisting requirements. If the input variable defining surface rock storage area is zero, the program simply calculates the area requirement and stores all rock on the surface. If a limiting rock storage area is specified, the program calculates and sums the total storage area required until it is equal to the limiting area. Rock sent to the surface in excess of this is sent to offsite transportation and disposal.

THE RECEVE SUBROUTINE

The waste receiving subroutine (RECEVE) calculates the number of remote-handled, contact-handled and total waste shipments received at the repository. This is done using the following equation:

$$\text{Waste shipments (K,I)} = \frac{\text{waste units received (K,I)}}{\text{rail cask capacity (K) * \% by rail(K,I)} + \text{truck cask capacity(K) * \% by truck(K,I)}} \quad (29)$$

where K = waste type index

I = year index

The RECEVE subroutine also uses the receiving and packaging module requirements calculated in WASTOP to calculate the total number of modules needed and the total receiving and packaging facility costs, using the relationship:

$$\text{Facility cost} = \text{unit module cost} * \text{maximum number of modules} \quad (30)$$

Distributions of these costs over time and waste type are calculated in HUB.

THE SHAFT SUBROUTINE

The shaft subroutine determines the number of shafts needed to hoist excavated rock from the mine. Rock is assumed to be hoisted in a section of the men and materials shaft. If additional capacity is needed, mine production (rock hoisting) shafts are excavated. The number of rock hoisting shafts is determined as follows:

$$\text{Number of shafts (integer)} = \frac{\text{sum of all rock hoisted (I)} - \text{MMSCAP}}{\text{MPSCAP}} + 0.999 \quad (31)$$

where MMSCAP = men and materials shaft rock hoisting capacity per year

MPSCAP = mine production shaft rock hoisting capacity per year

I = year index

Rock hoisting capacities for the shafts are calculated from the number of tonnes per trip, the number of trips per shift-year and the number of shifts operated per day (3 maximum).

Shaft costs for sinking, lining, and water control are calculated as functions of shaft diameter, depth, and medium using relationships derived from previously published data (Parsons 1978). These relationships are linear functions of shaft diameter and are shown below.

$$\text{Cost in millions of \$ per meter of depth} = A + B * (\text{shaft diameter} + 2 * \text{INCRAD}) \quad (32)$$

		<u>sinking</u>	<u>lining</u>	<u>water control</u>
where	Salt A =	15,320	-4,264	-2,800,000
	B =	352	2,474	1,660,000
	Basalt A =	14,000	616	150,000
	B =	93	0	19,000
	Granite A =	21,800	1,180	1,050,000
	B =	90	0	27,000

INCRAD = incremental shaft radius excavated due to creep problems

These relationships should be used with caution since the data were derived based on generic formation descriptions and may give erroneous results when applied to specific site locations or rock formations.

After the sinking, lining and water control costs are calculated they are summed together with shaft equipment costs (input) to develop total shaft costs for each shaft. This information is then fed to HUB.

THE ROCKOP SUBROUTINE

The ROCKOP subroutine calculates rock mass logistics for backfilling, hoisting and surface storage operations that occur between the end of waste operations and the start of decommissioning. In addition this routine calculates the labor, materials and equipment resource requirements for the above operations over the entire operating period.

ROCKOP begins by determining the backfilling rate to use after waste operations have ended. This rate is specified by the user or as a default (if the rate specified is zero) the program uses the combined rock lowering rates of the men and materials shafts and any mine production shafts. Next, the program determines if backfilling operations have commenced during waste operations. If so, the remaining unbackfilled room volume is divided by the backfilling rate to determine the time period for continuing backfill operations, and the annual backfill volumes of rock and any supplementary material are calculated. If backfilling operations have not commenced during operations, the program calculates the starting year for backfilling operations using the following relationship:

$$\text{Backfilling starting year index} = \text{IBYR} + \text{IYRPRO} - \text{IYRCON} + 1 \quad (33)$$

where IBYR = the number of years after waste operations startup that backfilling begins

IYRPRO = the calendar year of waste operations startup

IYRCON = the calendar year in which repository construction begins

The program then uses the total rooms excavated, the room unit volume and the backfill efficiency to calculate total backfill requirements. These requirements are divided by the backfilling rate previously calculated to determine the time period (from the start of backfilling) required to backfill the rooms and corridors.

The ROCKOP subroutine then calculates backfilling requirements during the decommissioning period (which immediately follows the backfilling period calculated above). These requirements include backfilling of the main corridors and shaft pillar area. Filling of the shafts is assumed to be included in the shaft sealing costs and requirements. The backfilling data are then used to generate the rock lowering and surface storage logistics using the same logic as explained in MINDEV.

Based on the above rock logistics, the model then calculates equipment, labor and materials requirements for the backfilling, hoisting, and surface storage operations using the REPLAS subroutine and equations similar to Equations (6) and (7) in WASTOP.

THE UTILITY SUBROUTINE

The UTILITY subroutine generates approximate utility requirements and costs for electricity, steam, water and diesel fuel used in repository operations. This is accomplished by defining the following:

- average electrical requirements for facilities with significant electrical loads
- water usage requirements for the repository as a whole
- diesel fuel requirements for rail operations, other surface usage and underground usage.
- unit costs for electricity, steam and diesel fuel

Electricity usage in surface facilities is calculated as a function of operating time. Equation (34) below shows a typical calculation.

$$\begin{aligned} \text{Receiving facility electricity requirements} &= \text{facility load} * \text{number of modules} \\ &\quad * \text{number of shifts/day} * 8 \text{ hr/shift} \\ &\quad * \text{days per year} \end{aligned} \quad (34)$$

Other electricity requirements such as for mine ventilation and air conditioning assume constant usage throughout the year. Electricity for mining operations is a function of the rock mass mined.

Steam requirements are functions of underground area for heating and process capacity for waste processing. The equation for the latter usage is shown below.

$$\begin{aligned} \text{Waste processing steam requirement} &= \text{requirement per module per year} \\ &\quad * \text{number of modules} \\ &\quad * \text{waste type allocation factor} \end{aligned} \quad (35)$$

Diesel fuel requirements are calculated as a function of working days per year for surface operations, as a function of packages processed for underground transportation, and as a function of shipments received for rail operations. Water requirements are assumed to be constant from year to year.

Each of the above requirements are summed by type of resource each year and multiplied by the unit resource costs (input). Costs are summed for all resources and sent to HUB.

THE SURFST SUBROUTINE

This subroutine calculates construction costs for surface and underground support facilities. Site preparation costs and support facility equipment replacement costs are also calculated in this routine. Equation (36) shows a typical facility cost calculation.

$$\text{Facility construction cost (K,I)} = \sum_{L=1}^{NSC} \text{facility cost (L)} \\ * \text{WAFMV(K)} * \text{SFCS (I)} \quad (36)$$

where WAFMV = waste type allocation factor based on mined rock volumes

SFCS = surface facility construction schedule (input)

NSC = number of surface facilities described

K = waste type index

I = year index

L = facility index

The support facility cost calculation sums the costs according to the breakdown supplied by the user. This allows the user to use substantial cost detail, if available, or simple aggregate numbers if this is all that is known. Capital costs for facilities to support specific operations underground such as emplacement, transportation and rock operations are calculated separately by equations similar to Equation (36). Support facility equipment cost replacement is assumed to be a function of time rather than facility throughput. Because of this, a separate piece of logic is used in SURFST to calculate these replacements. This logic compares the equipment

life (or multiples of this life) specified for each support facility with the current operation year. When a match is found, costs are incurred for new equipment purchases. Support facility labor and materials costs are calculated using input requirements per facility and equations similar to equations 14 and 15.

Site preparation costs are a simple multiple of costs per acre (input) and the surface operations area. All of the above cost calculations are then fed to the HUB subroutine.

THE PREOP SUBROUTINE

The preoperations subroutine (PREOP) calculates costs (other than construction costs) which are incurred prior to the start of waste operations. These include costs for land purchase, licensing, architect-engineer (A-E) services and facility startup. Land and licensing costs are specified as input variables and are simply multiplied by waste allocation and timing factors in the program to develop costs as functions of time and waste type. Startup and A-E services are calculated as functions of total field costs. Equation (37) below show the calculation of A-E services.

$$\text{A-E cost} = \text{AECON1} + \text{AECON2} * (\text{FIELD COST}) \quad (37)$$

where $\text{AECON1} = 63 \times 10^{-6}$ in millions of \$

$$\text{AECON2} = 0.0106$$

$$\begin{aligned} \text{FIELD COST} = & \text{surface facility costs} + \text{underground facility costs} \\ & + \text{shaft costs} + \text{site preparation costs} \end{aligned}$$

The values of the constants used in the equation were derived from plots of A-E costs as functions of field costs in the Commercial Waste Management GEIS (DOE 1978)

THE POSTOP SUBROUTINE

The post-operations subroutine (POSTOP) calculates costs associated with decommissioning of surface facilities, sealing of shafts and surveillance of the sealed repository. Facility decommissioning costs are calculated as an input percentage of total surface facility construction costs. Shaft sealing costs are calculated using the following relationship:

$$\text{Shaft sealing costs} = \text{SSCON1} + \text{SSCON2} * (\text{shaft diameter}) \quad (38)$$

where SSCON1 = shaft sealing constant 1

SSCON2 = shaft sealing constant 2

The above functional relationship was assumed since it seems intuitive that sealing costs will vary as some function of the shaft diameter. Sufficient data are not yet available, however, to substantiate this function.

Surveillance costs are based on an input constant surveillance cost each year and an input surveillance period. After calculation these costs are all sent to HUB.

THE HUB PROGRAM

The main program (HUB) calls each of the previous subroutines in proper sequence and performs cost calculations and summations from each subroutine's output. HUB then calculates contingency costs and sums the previous cost calculations to develop total costs and unit costs. Finally, HUB calls the OUTPUT subroutine to print the results of the calculations. The following subsections describe the operations performed in HUB on data from the foregoing subroutines followed by an explanation of the total and unit cost calculations.

INPUT - The only operation performed following this subroutine is the calculation of the present worth factor (PWF) for use in leveling unit costs. This factor is calculated as follows:

$$\text{Present worth factor (I)} = \frac{1}{(1 + \text{real discount rate})^{I+IDL}} \quad (39)$$

where I = year index

IDL = base year index for discounting (input)

WASTOP - Following WASTOP, the HUB routine calculates total waste operations labor requirements, sums the labor and equipment requirements over waste type, and sums the equipment and labor costs for all waste operations. HUB then calculates total operations costs for each operation as shown below:

$$\begin{aligned} \text{Total operations cost}_N (K,I) = & \text{receiving cost}_N (K,I) \\ & + \text{materials cost}_N (K,I) \\ & + \text{equipment cost}_N (K,I) \end{aligned} \quad (40)$$

where N = waste operation index
K = waste type index
I = time index

MINDEV - No additional operations are performed after this subroutine.

RECEVE - After the RECEVE subroutine, HUB calculates remote-handled receiving, contact-handled receiving and packaging facility costs as functions of time and waste type. The program logic identifies when each facility module is needed and then distributes the construction cost over the construction period immediately prior to module startup. The general equation describing the cost calculation is as follows:

$$\begin{aligned} \text{Facility cost}_N (K,I) = & \text{number of new modules needed}_N (I) \\ & * \text{module cost}_N * \text{construction schedule (I)} \\ & * \text{WAF (K)} \end{aligned} \quad (41)$$

where N = module type index
K = waste type index
I = year index

WAF = waste type allocation factor based on waste units processed

SHAFT - Using the shaft costs developed in the SHAFT subroutine, the HUB program develops total shaft costs as functions of time and waste type according to the relationship below.

$$\begin{aligned} \text{Total shaft cost (K,I)} = & \sum_{L=1}^{NST} (\text{shaft cost (L)} * \text{number of shafts (L)} \\ & * \text{shaft construction schedule (I)} * \text{WAF (K)}) \end{aligned} \quad (42)$$

where NST = number of shaft types

L = shaft type index

K = waste type index

I = year index

WAF = waste type allocation factor (varies with type of shaft)

ROCKOP - The HUB subroutine uses the rock mass logistics and resource requirements developed in MINDEV and ROCKOP to calculate the costs associated with each type of rock operation. Costs may be calculated by one of two options defined by the value of the variable MSWTCH. If MSWTCH equals zero, costs are calculated by multiplying the rock masses associated with each operation by a cost per unit mass (input). If MSWTCH equals one or more, total costs and a unit cost are calculated in the program using the resource requirements and unit resource costs as shown below.

$$\begin{aligned} \text{Total rock operations cost}_N = & \sum_{I=1}^{LE} \sum_{K=1}^{NWT} \left[\text{labor}_N(K,I) * \text{labor cost}_N \right. \\ & + \text{materials}_N(K,I) * \text{materials cost}_N \\ & + \text{equipment}_N(I) * \text{equipment cost}_N \\ & \left. * \text{WAFMV}(K) \right] + \text{capital costs}_N \end{aligned} \quad (43)$$

$$\text{Unit rock operations cost}_N = \frac{\text{Total rock operations cost}_N}{\sum_{I=1}^{LE} \sum_{K=1}^{NWT} \text{rock mass}_N(K,I)} \quad (44)$$

where N = rock operation index

LE = time period of rock operation

NWT = number of waste types

I = year index

K = waste type index

WAFMV = waste type allocation factor using mined volume

The unit rock operations cost is then multiplied by the rock operations mass to develop the rock operations costs as functions of waste type and time. These cost arrays are then added over waste type to develop rock operations costs as a function of time.

UTILITY – No additional operations are performed after this subroutine.

SURFST – After the SURFST subroutine, HUB sums the facility costs into two categories – surface and underground. Surface facility costs include receiving, packaging, support facilities and support facilities equipment replacement. Underground facilities include transportation support facilities, emplacement support facilities, and emplacement excavation support facilities (if any). Calculations of these summations are shown below:

$$\begin{aligned}\text{Surface facility costs (K,I)} &= \text{support facility costs (K,II)} \\ &\quad + \text{support facility equipment} \\ &\quad \quad \text{replacement (K,I)} \\ &\quad + \text{receiving facility cost (K,II)} \\ &\quad + \text{packaging facility cost (K,II)}\end{aligned}\tag{45}$$

$$\begin{aligned}\text{Underground facility costs (K,I)} &= \text{transport facility cost (K,II)} \\ &\quad + \text{emplacement facility cost (K,II)} \\ &\quad + \text{emplacement excavation facility} \\ &\quad \quad \text{cost (K,II)}\end{aligned}\tag{46}$$

where K = waste type

I = waste operation and construction year

II = construction year

PREOP – No additional operations are performed after this subroutine.

POSTOP – No additional operations are performed after this subroutine.

After completion of the above calculations, HUB sums the equipment costs over waste type and time for the output tables. Following this, the routine calculates contingency costs for preoperations (i.e., construction, licensing, etc.), rock operations, waste operations, and backfilling and decommissioning

operations. This is accomplished by multiplying the cost summations in these categories by the relevant contingency factor as shown below:

$$\begin{aligned}\text{Contingency cost for preoperations} = & \text{CONFAC}(1) * [\text{landcost} \\ & + \text{licensing cost} \\ & + \text{site preparation cost} \\ & + \text{shaft cost} \\ & + \text{surface facilities cost} \\ & + \text{underground facilities cost} \\ & + \text{A-E costs} + \text{startup costs}] \quad (47)\end{aligned}$$

$$\begin{aligned}\text{Contingency cost for rock operations} = & \text{CONFAC}(2) * [\text{mining cost} \\ & + \text{hoisting cost} \\ & + \text{surface storage cost} \\ & + \text{offsite disposal cost}] \quad (48)\end{aligned}$$

$$\begin{aligned}\text{Contingency cost for waste operations} = & \text{CONFAC}(3) * [\text{receiving cost} \\ & + \text{packaging cost} \\ & + \text{transportation cost} \\ & + \text{emplacement cost} \\ & + \text{emplacement excavation cost} \\ & + \text{utilities cost}] \quad (49)\end{aligned}$$

$$\begin{aligned}\text{Contingency cost for decommissioning operations} = & \text{CONFAC}(4) \\ & * [\text{backfilling cost} \\ & + \text{sealing cost} \\ & + \text{decommissioning cost} \\ & + \text{surveillance cost}] \quad (50)\end{aligned}$$

where CONFAC = the contingency factor for each operation class above

*Note: All of the above variables except CONFAC are dimensioned by waste type and time.

HUB next calculates total costs by summing each cost component over waste type. The components are then summed into the four general categories shown in the contingency calculations above, and the general categories are summed to develop the total costs.

The levelized cost calculations are developed using the cost components as functions of time and waste type, the discount factor and waste masses, volumes, and package units. The general equation used for these calculations is shown below.

$$\text{Levelized unit cost}_N(K) = \frac{\sum_{I=1}^{LE} [\text{cost component } (K,I) * \text{PWF}(I)]}{\sum_{I=1}^{LE} [\text{throughput}_N(K,I) * \text{PWF}(I)]} \quad (51)$$

where N = type of throughput (i.e., waste mass, waste volume, package)

K = waste type index

I = year index (LE = entire calculation period)

PWF = present worth factor

The levelized cost components are then summed to develop the subtotals and totals, and the final subroutine OUTPUT is called.

THE OUTPUT SUBROUTINE

This subroutine prints the tables showing the repository requirements and costs. The only calculations made in this subroutine are a few table summations and an adjustment of dollar units to correspond to the dollar units shown on the table (i.e., all costs calculated in the body of the model are in dollars. Many tables show results in millions or billions of dollars necessitating adjustment of the values calculated).

OTHER SUBROUTINES AND FUNCTIONS

Another subroutine named WAFAM and another function named HOLMC are used in the model in addition to those previously mentioned. The WAFAM subroutine is a central calculating place for all of the waste type allocation fractions

used in the programs. The HOLMC function is used to calculate material costs for emplacement when package or hole barrier dimensions are varied without varying the package cost. The function calculates the incremental volume of material required (+ or -) and ratios the reference package or barrier cost (input) by this volume to develop the new cost.

5.0 RECON INPUT VARIABLES AND FORMATS

RECON is designed to run on the UNIVAC 1110 or CDC CYBER Series computers. The program reads an input data file created either by an interactive preprocessor (described in Section 6.0) or by reading batch card images. Only two format types are used for reading the data file: four-character alpha-numeric, and free-field (real or integer). Data for input into the free-field real or free-field integer format must exist (i.e., if a value of zero is required, it must be input as zero and not blank). Blanks are used as data field separators and at least one must exist between each data item. If card images are used, a one-to-one correspondence must always be maintained between the data on the cards and the data requirements for input. Table 5.1 lists the input variable names, descriptions and formats. The card images and sequences are also shown to aid the user in setting up a card deck if this input method is chosen. A complete listing of a sample case is shown in Appendix B.

TABLE 5.1. INPUT INSTRUCTIONS

Card	Variable	Function/Variable Description	Format
<u>GENERAL INFORMATION</u>			
1	DATYPE	Data Category Description	20A4
2	TITLE	Case Description	20A4
3	RPTYP	Repository Type, Description	4A4
	PLACE	Repository Location, Description	4A4
	TEKNEK	Mining Technique, Description	4A4
4	IYRCON	Calendar Year Construction Begins	Free-Integer
	IYRPRO	Calendar Year Production Begins	Free-Integer
	LASTYR	Calendar Last Year of Waste Receipts	Free-Integer
	IYDOL	Calendar Year for Discounting	Free-Integer
	IDDYR	Number of Years of Decommissioning	Free-Integer
	NWT	Number of Waste Types in this Case	Free-Integer
	DRATE	Discount Rate, Fraction	Free-Real
5	DEPTH	Repository Depth, meters	Free-Real
	DENSTY	Repository Rock Density, g/cm ³	Free-Real
	SPUC	Site Preparation Cost, \$/acre	Free-Real
	CONFAC(1)	Contingency Factor-Site Preparation, fraction	Free-Real
	CONFAC(2)	Contingency Factor-Rock Operations, fraction	Free-Real
	CONFAC(3)	Contingency Factor-Waste Operations, fraction	Free-Real
	CONFAC(4)	Contingency Factor-Backfilling + Decommissioning, fraction	Free-Real
6	SFTNUM(1)	Number of Men and Materials Shafts	Free-Integer
	SFTNUM(2)	Number of Mining Ventilation Shafts	Free-Integer
	SFTNMM(3)	Number of Remote-Handled-Waste Shafts (if = -1 code will calculate)	Free-Integer
	SFTNUM(4)	Number of Contact-Handled-Waste Shafts (if = -1 code will calculate)	Free-Integer
	SFTNUM(5)	Number of Mining-Exhaust Shafts	Free-Integer
	SFTNUM(6)	Number of Waste-Exhaust Shafts	Free-Integer
7*	WSTYP	Waste Type Description	3A4
	PKGDS1	Package Description, Output Line One	4A4
	PKGDS1	Package Description, Output Line Two	4A4
	PKGDS1	Package Description, Output Line Three	4A4
	*	Card 7 repeated for each Waste Type (NWT)	
8	KIND(k)	Waste Type Definition (where K = 1, NWT) 1 = Remote Handled Waste 2 = Contact Handled Waste	Free-Integer
	UNTMAS(K)	Waste Unit Mass, kgU (where K = 1, NWT)	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
<u>WASTE OPERATIONS (Page 4.1)</u>			
1	DATYPE	Data Category Description	20A4
2	SIZE	Repository Size, acres	Free-Real
	CPA	Central Pillar Area, acres	Free-Real
	PANLEN	Panel Length, meters	Free-Real
	PANWTH	Panel Width, meters	Free-Real
	GXEFL	Geometric Exclusion Factor, fraction	Free-Real
	NFTL	Near-Field Thermal Limit, kW/acre	Free-Real
	FFTL	Far-Field Thermal Limit, kW/acre	Free-Real
	NALSH	Maximum Number of Shifts Allowed to Work	Free-Integer
	NRHRMA	Maximum Number of Remote-Handled Waste Receiving Modules Allowed	Free-Integer
	NCHRMA	Maximum Number of Contact-Handled-Waste Receiving Modules Allowed	Free-Integer
	WRKYR	Number of Work Days Per Year	Free-Real
	MTRPSD	Maximum Trips Per Shift for Remote-Handled-Waste Shaft	Free-Integer
	MTCPSD	Maximum Trips Per Shift for Contact-Handled-Waste Shaft	Free-Integer
	SHCFAC(1)	Shift Differential-Shift 1, (1.0)	Free-Real
	SHCFAC(2)	Shift Differential-Shift 2, 1+ fraction of shift 1	Free-Real
	SHCFAC(3)	Shift Differential-Shift 3, 1+ fraction of shift 1	Free-Real
	OVRHDF	Overhead Factor, 1+ fraction of salaries	Free-Real
	FLUMM	Maintenance Materials, fraction of labor in man-years	Free-Real
3	WUPP(K)	Number of Waste Units Per Package (where K = 1, NWT)	Free-Real
	WVOLPU(K)	Waste Volume Per Unit, m ³ (where K = 1, NWT)	Free-Real
4	TTTR(K)	Average Turnaround Time-Rail Cask Receiving, days (where K = 1, NWT)	Free-Real
	TTTK(K)	Average Turnaround Time-Truck Cask Receiving, days (where K = 1, NWT)	Free-Real
5	RCCAP(K)	Rail Container Capacity, waste units/container (where K = 1, NWT)	Free-Real
	TCCAP(K)	Truck Container Capacity, waste units/container (where K = 1, NWT)	Free-Real
6	PKGCAP(K)	Packaging Module Capacity, waste units/shift per module (where K = 1, NWT)	Free-Real
	NPKPT(K)	Packages Per Trip in Waste Shaft (where K = 1, NWT)	Free-Integer

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
7	RMLN(K)	Room Length, meters (where K = 1, NWT)	Free-Real
	RMWTH(K)	Room Width, meters (where K = 1, NWT)	Free-Real
8	CLSEMP(K)	Closest Emplacement to Corridor, meters (where K = 1, NWT)	Free-Real
	XRASHO(K)	Extraction Ratio (room/room + pillar), fraction (where K = 1, NWT)	Free-Real
9	HPMIN(K)	Minimum Hole Pitch, meters (where K = 1, NWT)	Free-Real
	PKGPUP(K)	Packages Per Unit Pitch (where K = 1, NWT)	Free-Real
	NBSPPA(K)	Number of Boresections Per Panel	Free-Integer
10*	WSTSUP(I)	Waste Quantity Available for Processing, units/year (where I = 1, LASTYR-IYRCON + 1)	Free-Real
	*	Card 10 Repeated for Each Waste Type (NWT)	
11*	TDWI(I)	Thermal Density of Remote-Handled-Waste Received, kW/waste unit (where I = 1, LASTYR-IYRCON + 1)	Free-Real
	*	Card 11 Repeated for Each Waste Type (NWT)	
12*	CRRAIL(I)	Portion of Waste Received by Rail, fraction (where I = 1, LASTYR - IYRCON + 1)	Free-Real
	*	Card 12 Repeated for Each Waste Type (NWT)	
<u>Remote-Handled-Waste Receiving Module Data</u>			
13	WOCST(1)	Capital Cost, \$/module	Free-Real
	WOLBRR(1)	Labor Requirement, man-years/shift/module	Free-Real
	WOLBRC(1)	Labor Cost, \$/man-year	Free-Real
	WOEQPL(1)	Equipment Life, receiving units	Free-Real
	WOEQPC(1)	Equipment Capacity, receiving units/equipment unit/shift	Free-Real
	WOECST(1)	Equipment Cost, \$/equipment unit	Free-Real
14	WOMATU(1,K)	Materials Requirement, material unit/module (where K = 1, NWT)	Free-Real
	WOMATC(1,K)	Materials Cost, \$/material unit (where K = 1, NWT)	Free-Real
<u>Contact-Handled-Waste Receiving Module Data</u>			
15	WOCST(2)	Capital Cost, \$/module	Free-Real
	WOLBRR(2)	Labor Requirement, man-years/shift/module	Free-Real
	WOLBRC(2)	Labor Cost, \$/man-year	Free-Real
	WOEQPL(2)	Equipment Life, receiving units	Free-Real
	WOEQPC(2)	Equipment Capacity, receiving units/equipment unit/shift	Free-Real
	WOECST(2)	Equipment Cost, \$/equipment unit	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
16	WOMATU(2,K)	Materials Requirement, material unit/module (where K = 1, NWT)	Free-Real
	WOMATC(2,K)	Materials Cost, \$/material unit (where K = 1, NWT)	Free-Real
<hr/> Waste Packaging Module Data <hr/>			
17	WOCST(3)	Capital Cost, \$/module	Free-Real
	WOLBRR(3)	Labor Requirement, man-years/shift/module	Free-Real
	WOLBRC(3)	Labor Cost, \$/man-yr	Free-Real
	WOEQPL(3)	Equipment Life, packaging units	Free-Real
	WOEQPC(3)	Equipment Capacity, packaging units/equipment unit/shift	Free-Real
	WOECST(3)	Equipment Cost, equipment unit	
18	WOMATU(3,K)	Materials Requirement, material unit/module (where K = 1, NWT)	Free-Real
	WOMATC(3,K)	Materials Cost, \$/Material Unit (where K = 1, NWT)	Free-Real
<hr/> MINE DEVELOPMENT (Page 4.9) <hr/>			
1	DATYPE	Data Category Description	20A4
2	LEAD	Time Lag Between Room Excavation and Waste Emplacement, years	Free-Integer
	RMHMIN	Minimum Room Height, meters	Free-Real
	NCOR	Number of Access and Ventilation Corridor Types	Free-Integer
	TCPCLN	Total Central Pillar Corridor Length, meters	Free-Real
	PCTFIL	Portion of Each Room Backfilled, fraction	Free-Real
	XPANFC	Expansion of Rock Volume After Mining, 1+ fraction	Free-Real
	MSA	Mined Rock Storage Area, acres (if MSA = 0, code will calculate)	Free-Real
	TONPAR	Rock Stored Per Unit Surface Area, tons/acre	Free-Real
	OFTADC	Offsite Transportation and Disposal Cost, \$/tonne	Free-Real
	NBYR	Time Lag for Backfilling, years	Free-Integer
	OTHBFL	Portion of Backfill Volume Not of Original Mined Rock, fraction	Free-Real
	OTBDEN	Density of Other Backfill Material, g/cm ³	Free-Real
	BKRATE	Backfill Rate, tonnes/year (if = "0," uses shaft capacity)	Free-Real
3	CORDSC(1)	Corridor Description "MAIN CORRIDOR"	12A4
4	CORWTH(1)	Main Corridor Width, meters	Free-Real
	CORLEN(1)	Main Corridor Length, meters	Free-Real
	CORHT(1)	Main Corridor Height, meters	Free-Real
	DUMMY	"0"	Free-Integer

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
5*	CORDSC	Miscellaneous Corridor Description (access, ventilation, etc.)	12A4
6*	CORWTH	Miscellaneous Corridor Width, meters	Free-Real
	CORLEN	Miscellaneous Corridor Length, meters	Free-Real
	CORHT	Miscellaneous Corridor Height, meters	Free-Real
	NCORPP	Number of Corridors of This Type Per Panel	Free-Integer
	*	Card Set 5 and 6 Repeated for Each Corridor Type (NCOR)	
7	DEL RHT(k)	Delta Room Height, meters (where k = 1, NWT)	Free-Real
	PKGLN(k)	Package Length, meters (where k = 1, NWT)	Free-Real
	NRWSPR(k)	Number of Rows Per Room (where k = 1, NWT)	Free-Integer
8	PORMDF(1,I)	Central Pillar Area Mining Annual Distribution Factor, fraction (where I = 1, IYRPRO-IYRCON)	Free-Real
	PORMDF(2,I)	Main Corridor Area Mining Annual Distribution Factor, fraction (where I = 1, IYRPRO-IYRCON)	Free-Real
	SCSKD(I)	Shafts Excavation Annual Distribution Factor, fraction (where I = 1, IYRPRO-IYRCON)	Free-Real
9	SFTDD(1)	Men and Materials Shaft Diameter, meters	Free-Real
	SFTXR(1)	Men and Materials Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(1)	Men and Materials Shaft Excavated Depth, meters	Free-Real
	SFTDD(2)	Mining Ventilation Shaft Diameter, meters	Free-Real
	SFTXR(2)	Mining Ventilation Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(2)	Mining Ventilation Shaft Excavated Depth, meters	Free-Real
	SFTDD(3)	Remote-Handled-Waste Shaft Diameter, meters	Free-Real
	SFTXR(3)	Remote-Handled-Waste Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(3)	Remote-Handled-Waste Shaft-Excavated Depth, meters	Free-Real
	SFTDD(4)	Contact-Handled-Waste Shaft Diameter, meters	Free-Real
	SFTXR(4)	Contact-Handled-Waste Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(4)	Contact-Handled-Waste Shaft Excavated Depth, meters	Free-Real
	SFTDD(5)	Mining Exhaust Shaft Diameter, meters	Free-Real
	SFTXR(5)	Mining Exhaust Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(5)	Mining Exhaust Shaft Excavated Depth, meters	Free-Real
	SFTDD(6)	Waste Exhaust Shaft Diameter, meters	Free-Real
	SFTXR(6)	Waste Exhaust Shaft Incremental Excavated/Radius, meters	Free-Real
	SFTXD(6)	Waste Exhaust Shaft Excavated Depth, meters	Free-Real
	SFTDD(7)	Rock Hoisting Shaft Diameters, meters	Free-Real

TABLE 5.1 (Contd)

<u>Card</u>	<u>Variable</u>	<u>Function/Variable Description</u>	<u>Format</u>
	SFTXR(7)	Rock Hoisting Shaft Incremental Excavated Radius, meters	Free-Real
	SFTXD(7)	Rock Hoisting Shaft Excavated Depth, meters	Free-Real
10	MSWTCH	Rock Operations Cost Input Data Selection Switch "0" = Input is Unit Price Data "1" = Input is Detailed Cost Data	Free-Integer
Where MSWTCH = 0			
11	VARMC	Variable Mining Cost, \$/tonne	Free-Real
	RCKHC	Rock Hoisting Cost, \$/tonne	Free-Real
	SURFDC	Surface Disposal Cost, \$/tonne	Free-Real
	BKFLC	Backfilling Cost, \$/tonne	Free-Real
Where MSWTCH = 1			
11	ROCST(1)	Excavation and Haulage Capital Cost, \$	Free-Real
	ROLBRR(1)	Excavation and Haulage Labor Requirement, man-years/equipment unit/shift	Free-Real
	ROLBRC(1)	Excavation and Haulage Labor Cost, \$/man-year	Free-Real
	ROEQPL(1)	Excavation and Haulage Equipment Life, tonnes/unit	Free-Real
	ROEQPC(1)	Excavation and Haulage Equipment Capacity, tonnes/unit/shift-yr	Free-Real
	ROECST(1)	Excavation and Haulage Equipment Cost, \$/unit	Free-Real
	ROMATU(1)	Excavation and Haulage Material Requirement, material unit/tonne	Free-Real
	ROMATC(1)	Excavation and Haulage Material Cost, \$/material unit	Free-Real
Where MSWTCH = 1			
12	ROCST(2)	Hoisting Capital Cost, \$	Free-Real
	ROLBRR(2)	Hoisting Labor Requirement, man-years/unit/shift	Free-Real
	ROLBRC(2)	Hoisting Labor Cost, \$/man-year	Free-Real
	ROEQPL(2)	Hoisting Equipment Life, tonnes/unit	Free-Real
	ROEQPC(2)	Hoisting Equipment Capacity, tonnes/unit/shift	Free-Real
	ROECST(2)	Hoisting Equipment Costs, \$/unit	Free-Real
	ROMATU(2)	Hoisting Material Requirement, material unit/tonne	Free-Real
	ROMATC(2)	Hoisting Material Cost, \$/material unit	Free-Real
Where MSWTCH =1			
13	ROCST(3)	Rock Stockpile Capital Cost, \$	Free-Real
	ROLBRR(3)	Rock Stockpile Labor Requirement, man-years/unit/shift	Free-Real
	ROLBRC(3)	Rock Stockpile Labor Cost, \$/man-year	Free-Real
	ROEQPL(3)	Rock Stockpile Equipment Life, tonnes/unit	Free-Real
	ROEQPC(3)	Rock Stockpile Equipment Capacity, tonnes/unit/shift	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
	ROECST(3)	Rock Stockpile Equipment Costs, \$/unit	Free-Real
	ROMATU(3)	Rock Stockpile Material Requirement, material unit/tonne	Free-Real
	ROMATC(3)	Rock Stockpile Material Cost, \$/material unit	Free-Real
Where MSWTCH = 1			
14	ROCST(4)	Offsite Disposal Capital Cost, \$	Free-Real
	ROLBRR(4)	Offsite Disposal Labor Requirement, man-years/unit/shift	Free-Real
	ROLBRC(4)	Offsite Disposal Labor Cost, \$/man-year	Free-Real
	ROEQPL(4)	Offsite Disposal Equipment Life, tonnes/unit	Free-Real
	ROEQPC(4)	Offsite Disposal Equipment Capacity, tonnes/unit shift	Free-Real
	ROECST(4)	Offsite Disposal Equipment Costs, \$/unit	Free-Real
	ROMATU(4)	Offsite Disposal Material Requirement, material unit/tonne	Free-Real
	ROMATC(4)	Offsite Disposal Material Cost, material unit/tonne	Free-Real
Where MSWTCH = 1			
15	ROCST(5)	Backfilling and Haulage Capital Cost, \$	Free-Real
	ROLBRR(5)	Backfilling and Haulage Labor Requirement, man-year/unit/shift	Free-Real
	ROLBRC(5)	Backfilling and Haulage Labor Cost, \$ man-year	Free-Real
	ROEQPL(5)	Backfilling and Haulage Equipment Life, tonnes/unit	Free-Real
	ROEQPC(5)	Backfilling and Haulage Equipment Capacity, tonnes/unit/shift	Free-Real
	ROECST(5)	Backfilling and Haulage Equipment Cost, \$/unit	Free-Real
	ROMATU(5)	Backfilling and Haulage Material Requirement, material unit/tonne	Free-Real
	ROMATC(5)	Backfilling and Haulage Material Cost, \$/material unit	Free-Real
RECEIVING OPERATIONS (Page 4.14)			
1	DATYPE	Data Category Description	20A4
	NRBPRM	Number of Receiving Bays Per Module R-H	
	NRCBPRM	Number of Receiving Bays Per Module C-H	
2	RMCWS1(L)	Remote-Handled-Waste Receiving Module Construction Schedule Prior to Operations, fraction (where L = 1, IYRPRO-IYRCON)	Free-Real
	RMCWS2(L)	Remote-Handled-Waste Receiving Module Construction Schedule During Operations, fraction (where L = 1, IYRPRO-IYRCON)	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
3	RMNWS1(L)	Contact-Handled-Waste Receiving Module Construction Schedule Prior to Operations, fractions (where L = 1, IYRPRO-IYRCON)	Free-Real
	RMNWS2(L)	Contact-Handled-Waste Receiving Module Construction Schedule During Operations, fraction (where L = 1, IYRPRO-IYRCON)	Free-Real
UNDERGROUND OPERATIONS			
1	DATYPE	Data Category Description	20A4
2	TOCST(1)	Remote-Handled-Waste Transportation, Capital Cost, \$	Free-Real
	TOLBRR(1)	Remote-Handled-Waste Transportation Unit Labor Requirement, man-years/equipment unit	Free-Real
	TOLBRC(1)	Remote-Handled-Waste Transportation Unit Labor Cost, \$/man-year	Free-Real
	TOEQPL(1)	Remote-Handled-Waste Transportation Unit Equipment Life, packages	Free-Real
	TOEQPC(1)	Remote-Handled-Waste Transportation Unit Equipment Capacity, packages/equipment-unit/shift	Free-Real
	TOECST(1)	Remote-Handled-Waste Transportation Unit Equipment Cost, \$/equipment unit	Free-Real
3	TOMATU(1,K)	Remote-Handled-Waste Transportation Unit Material Requirement, material units/package (where K = 1, NWT)	Free-Real
	TOMATC(1,K)	Remote-Handled-Waste Transportation Unit Materials Cost, \$ (where K = 1, NWT)	Free-Real
4	TOCST(2)	Contact-Handled-Waste Transportation Capital Cost \$	Free-Real
	TOLBRR(2)	Contact-Handled-Waste Transportation Unit Labor Requirement, man-years/equipment unit	Free-Real
	TOLBRC(2)	Contact-Handled-Waste Transportation Unit Labor Cost, \$/man-year	Free-Real
	TOEQPL(2)	Contact-Handled-Waste Transportation Unit Equipment Life, packages	Free-Real
	TOEQPC(2)	Contact-Handled-Waste Transportation Unit Equipment Capacity, packages/equipment unit/shift	Free-Real
	TOECST(2)	Contact-Handled-Waste Transportation Unit Equipment Cost, \$/equipment unit	Free-Real
5	TOMATU(2,K)	Contact-Handled-Waste Transportation Unit Material Requirements, material units/package (where K = 1, NWT)	Free-Real
	TOMATC(2,K)	Contact-Handled-Waste Transportation Unit Materials Cost, \$ (where K = 1, NWT)	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
7	IDET	Materials Cost Input Data Selection Switch "0" = Input is Costs "1" = Input is Reference Cost Factors	Free-Integer
	IUHDCM	Hole Drilling Cost Calculation Method Switch "0" = Input is Cost "1" = Input is Unit Cost Functional Relations	Free-Integer
7a	TRCHWD(K)	Trench Width, meters ("0" if IMET $\neq$ 3)	Free-Real
8*	NPKPEU	Number of Packages Per Emplacement Relations	Free-Integer
	PKG DIA	Package Diameter, meters	Free-Real
	REF DIA	Reference Diameter Used to Describe Package Costs, meters	Free-Real
	HOLDEL	Hole Depth Delta, meters	Free-Integer
	IMET	Emplacement Method "1" = Hole Drilling "2" = Room Emplacement "3" = Trenching	Free-Integer
	*	Card 8 is Repeated for Each Waste Type (NWT)	
9	UOCST(1)	Remote-Handled-Waste Emplacement Capital Cost, \$	Free-Real
	UOLBRR(1)	Remote-Handled-Waste Emplacement Labor Requirement, man-years/equipment unit	Free-Real
	UOLBRC(1)	Remote-Handled-Waste Emplacement Labor Cost, \$/man-year	Free-Real
	UOEQPL(1)	Remote-Handled Waste Emplacement Unit Equipment Life, packages	Free-Real
	UOEQPC(1)	Remote-Handled-Waste Emplacement Unit Equipment Capacity, packages/equipment unit/shift	Free-Real
	UOECST(1)	Remote-Handled-Waste Emplacement Unit Equipment Cost, \$/equipment unit	Free-Real
Where	IDET = "0"		
10*	UOMATU(1)	Remote-Handled-Waste Barrier Material Unit Requirement, material unit/emplacement unit	Free-Real
	UOMATC(1)	Remote-Handled-Waste Barrier Unit Material Cost, \$/material unit	Free-Real
	*	Card 10 Repeated for Each Remote-Handled-Waste Type	
11	UOCST(2)	Contact-Handled-Waste Emplacement Capital Cost, \$	Free-Real
	UOLBRR(2)	Contact-Handled-Waste Emplacement Labor Requirement, man-years/equipment unit	Free-Real
	UOLBRC(2)	Contact-Handled-Waste Emplacement Labor Cost, \$/man-year	Free-Real
	UOEQPL(2)	Contact-Handled-Waste Emplacement Unit Equipment Life, packages	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
	UOEQPC(2)	Contact-Handled-Waste Emplacement Unit Equipment Capacity, packages/equipment unit/shift	Free-Real
	UOECST(2)	Contract-Handled-Waste Emplacement Unit Equipment Cost, \$/equipment unit	Free-Real
Where IDET = "0"		If no waste type of 2, skip card 12	
12*	UOMATU(2)	Contact-Handled-Waste Emplacement Material Unit Requirement, material unit/emplacement unit	Free-Real
	UOMATC(2)	Contact-Handled-Waste Emplacement Unit Material Cost, \$/material unit	Free-Real
	*	Card 12 Repeated for Each Contact-Handled-Waste Waste Type	
Where IDET = "1"			
13*	REFMAT	Reference Hole Liner Material Cost, \$/package	Free-Real
	REFSLV	Reference Sleeve Cost, \$/sleeve	Free-Real
	REFBKF	Reference Backfill Material Cost, \$/hole	Free-Real
14*	WABATH	Water Barrier Material Thickness, meters	Free-Real
	SLEETH	Sleeve Thickness, meters	Free-Real
	BCKFTH	Backfill Material Thickness, meters	Free-Real
	CAPLEN	Shield Plug Length, meters	Free-Real
	REFDEP	Reference Depth for Reference Costs, meters	Free-Real
15*	CHMTEM	Contact-Handled-Waste Materials Cost, \$/Unit Pitch	Free-Real
	PKGPRK	Packages Emplaced Per Rack	Free-Real
	RCKCST	Rack Cost, \$/rack	Free-Real
	*	Card Set 13, 14, and 15 are Repeated for Each Waste Type (NWT)	
Where IUHDCM = "0"			
16	EECST(1)	Hole Drilling Capital Cost, \$	Free-Real
	EELBRR(1)	Hole Drilling, Labor Requirement, man-years/emplacement unit/shift	Free-Real
	EELBRC(1)	Hole Drilling Labor Cost, \$/man-year	Free-Real
	EEEQPL(1)	Hole Drilling, Unit Equipment Life, boreholes/equipment unit	Free-Real
	EEQPL(1)	Hole Drilling, Unit Equipment Life, boreholes/equipment unit	Free-Real
	EEEQPC(1)	Hole Drilling Unit Equipment Capacity, packages equipment unit/shift	Free-Real
	EEECST(1)	Hole Drilling Unit Equipment Cost, \$/equipment unit	Free-Real
	EEMATU(1)	Hole Drilling Material Requirement, material units/package	Free-Real
	EEMATC(1)	Hole Drilling Material Cost, \$/material Unit	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
Where IUHDCM = "1"			
16	EELBRC(1)	Hole Drilling Unit Labor Cost, \$/man-year	Free-Real
	EEECST(1)	Hole Drilling Unit Equipment Cost, \$/equipment unit	Free-Real
	EEMATC(1)	Hole Drilling Materials Cost, \$/material unit	Free-Real
	HDLCFC	Portion of Hole Drilling Unit Cost Attributed to Labor, fraction	Free-Real
	HDECFC	Portion of Hole Drilling Unit Cost Attributed to Equipment, fraction	Free-Real
	HDMCFC	Portion of Hole Drilling Unit Cost Attributed to Materials, fraction	Free-Real
	HDCON1	Hole Drilling Cost Function Constant A (see page 4.8)	Free-Real
	HDCON2	Hole Drilling Cost Function Constant B (see page 4.8)	
	NTYP	Hole Drilling Cost Functional Form (0 = Power, 1 = Exponential)	Free-Integer
17	EECST(2)	Room Emplacement Capital Cost, \$	Free-Real
	EELBRR(2)	Room Emplacement Labor Requirement, man-years/emplacement unit/shift	Free-Real
	EELBRC(2)	Room Emplacement Labor Cost, \$/man-year	Free-Real
	EEEQPL(2)	Room Emplacement Unit Equipment Life, packages/equipment unit	Free-Real
	EEEQPC(2)	Room Emplacement Unit Equipment Capacity, packages/equipment unit/shift	Free-Real
	EEECST(2)	Room Emplacement Unit Equipment Cost, \$/equipment unit	Free-Real
	EEMATU(2)	Room Emplacement Material Requirement, material units/package	
	EEMATC(2)	Room Emplacement Material Cost, \$/material unit	Free-Real
18	EECST(3)	Trenching Capital Cost, \$	Free-Real
	EELBRR(3)	Trenching Labor Requirement, man-years/emplacement unit/shift	Free-Real
	EELBRC(3)	Trenching Labor Cost, \$/man-year	Free-Real
	EEEQPL(3)	Trenching Unit Equipment Life, packages/equipment unit	Free-Real
	EEEQPC(3)	Trenching Unit Equipment Capacity, packages/equipment unit/shift	Free-Real
	EEECST(3)	Trenching Unit Equipment Cost, \$/equipment unit	Free-Real
	EEMATU(3)	Trenching Material Requirement, material units/package	Free-Real
	EEMATC(3)	Trenching Material Cost, \$/material unit	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
SHAFT OPERATIONS (Page 4.14)			
1	DATYPE	Data Category Description	20A4
2	MXMPRH	Maximum Trips Per Shift-Mine Production Shaft	Free-Integer
	MXMMRH	Maximum Trips Per Shift-Men and Materials Shaft	Free-Integer
	TNPT1	Rock Hoisting Capacity-Mine Production Shaft, tonnes/trip	Free-Real
	TNPT2	Rock Hoisting Capacity-Men and Materials Shaft, tonnes/trip	Free-Real
	SCCON1	Shaft Sinking Cost Function Constant A (see page 4.15)	Free-Real
	SCCON2	Shaft Sinking Cost Function Constant B (see page 4.15)	Free-Real
	IEQTP1	Sinking Cost Functional Form (1 = linear, 2 = exponential)	Free-Integer
	CCCON1	Shaft Lining Cost Function Constant A (see page 4.15)	Free-Real
	CCON2	Shaft Lining Cost Function B (see page 4.15)	Free-Real
	IEQTP2	Lining Cost Functional Form (1 = linear, 2 = exponential)	Free-Integer
	WCCON1	Water Control Cost Function Constant (see page 4.15)	Free-Real
	WCCON2	Water Control Cost Function Constant (see page 4.15)	Free-Real
	IEQTP3	= Water Control Cost Functional Form (1 = linear, 2 = exponential)	Free-Integer
3	SFTLD(1)	Men and Materials Shaft Lined Depth, meters	Free-Real
	SFTLD(2)	Mining Ventilation Shaft Lined Depth, meters	Free-Real
	SFTLD(3)	Remote-Handled-Waste Shaft Lined Depth, meters	Free-Real
	SFTLD(4)	Contact-Handled-Waste Shaft Lined Depth, meters	Free-Real
	SFTLD(5)	Mining Exhaust Shaft Lined Depth, meters	Free-Real
	SFTLD(6)	Waste Exhaust Shaft Lined Depth, meters	Free-Real
	SFTLD(7)	Rock-Hoisting Shaft Lined Depth, meters	Free-Real
4	SFTHE(1)	Men and Materials Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(2)	Mining Ventilation Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(3)	Remote-Handled-Waste Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(4)	Contact-Handled-Waste Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(5)	Mining Exhaust Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(6)	Waste Exhaust Shaft Hoisting Equipment Cost, \$	Free-Real
	SFTHE(7)	Rock Hoisting Shaft Hoisting Equipment Cost, \$	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
5	SFTSS(1)	Men and Materials Shaft Station Cost, \$	Free-Real
	SFTSS(2)	Mining Ventilation Shaft Station Cost, \$	Free-Real
	SFTSS(3)	Remote-Handled Waste Shaft Station Cost, \$	Free-Real
	SFTSS(4)	Contact-Handled Waste Shaft Station Cost, \$	Free-Real
	SFTSS(5)	Mining Exhaust Shaft Station Cost, \$	Free-Real
	SFTSS(6)	Waste Exhaust Shaft Station Cost, \$	Free-Real
	SFTSS(7)	Rock Hoisting Shaft Station Cost, \$	Free-Real
6	NPKPTR(K)	Remote-Handled-Waste Shaft Transport Rate, packages/trip (where K = 1, NWT)	Free-Integer
<u>SURFACE FACILITY REQUIREMENTS (Page 4.18)</u>			
1	DATYPE	Data Category Description	20A4
2	SFCS(L)	Surface Facility Construction Schedule, fraction/year (where L = 1, IYRPRO-IYRCON)	Free-Real
3	NSC	Number of Support Facility Descriptions	Free-Integer
	SOA	Surface Site Operations Area, Acres	Free-Real
4*	SFTITL	Support Facility Name	12A4
5*	SFCST	Support Facility Capital Cost, \$	Free-Real
	SFLBRR	Support Facility Labor Requirement, man-years/facility/shift	Free-Real
	SLBR	Number of Shifts Per Facility (if = -1, code uses Remote-Handled-Waste Operations Shift Requirements) (if = -2, code uses Contact-Handled-Waste Operations Shift Requirement)	Free-Real
	SFLBRC	Support Facility Labor Cost, \$/man-year	Free-Real
	SFEQPL	Support Facility Equipment Life, years	Free-Real
	SFECST	Support Facility Equipment Cost, \$/facility	Free-Real
	SFMATU	Support Facility Material Requirements, material costs/facility	Free-Real
	SFMATC	Support Facility Material Cost, \$/material unit	Free-Real
	*	Card Set 4 and 5 Repeated for Each Facility Description (NSC)	
<u>UTILITY DATA (Page 4.17)</u>			
1	DATYPE	Data Category Description	20A4
2	UPC	Electricity Unit Cost, mills/kWh	Free-Real
	STMC	Steam Unit Cost, \$/10 ³ lb	Free-Real
	DWTRC	Demineralized Water Unit Cost, \$/10 ⁶ liters	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
	WTRC	Potable Water Unit Cost, $\$/10^6$ liters	Free-Real
	DSLCL	Diesel Fuel Unit Cost, $\$/liter$	Free-Real
3	RAPP	Electrical Load-Receiving, and Packaging, kW/module	Free-Real
	SFSP	Electrical Load-Lag Storage Pool, kW	Free-Real
	OWHP	Electrical Load-Waste Handling Building, kW	Free-Real
	SFP	Electrical Load-Support Facilities, kW	Free-Real
	MROP	Electrical Load-Rock Operations, kW/tonne	Free-Real
	RVP	Electrical Load-Mine Ventilation, kW/acre	Free-Real
	ACP	Electrical Load-Air Conditioning, kW	Free-Real
	HEATS	Steam Requirement-Underground Heating, 10^3 lb/acre	Free-Real
	RAPS	Steam Requirement-Receiving Facility Heating, 10^3 lb/module	Free-Real
	ORS	Steam Requirement-Other Facilities, 10^3 lb	Free-Real
4	VOLW	Potable Water Requirement, 10^6 liters	Free-Real
	VOLDW	Demineralized Water Requirement, 10^6 liters	Free-Real
	SUD	Diesel Fuel Requirement-Surface, liters/day	Free-Real
	UGD	Diesel Fuel Requirement-Underground, liters/waste unit	Free-Real
	RED	Diesel Fuel Requirement-Rail Use, liters/shipping container	Free-Real
<hr/> PRE-OPERATIONS (Page 4.19) <hr/>			
1	DATYPE	Data Category Description	20A4
2	SCDF(L)	Startup Cost Annual Distribution Factor, fraction/year (where L = 1, IYRPRO-IYRCON)	Free-Real
	CLNDF(L)	Annual Land Cost Distribution Factor, fraction/year (where L = 1, IYRPRO-IYRCON)	Free-Real
	CLCDF(L)	Annual Licensing Cost Distribution Factor, fraction/year	Free-Real
3	TCLAND	Land Cost, $\$$	Free-Real
	TCLICE	Licensing Cost, $\$$	Free-Real
	STPCT	Start-Up Cost, fraction of field cost	Free-Real
	AECON1	A-E Cost Function Constant (see page 4.19)	Free-Real
	AECON2	A-E Cost Function Constant (see page 4.19)	Free-Real
	IEQTP4	A-E Cost Functional Form (1 = linear, 2 = exponential)	Free-Integer
<hr/> POST OPERATIONS (Page 4.19) <hr/>			
1	DATYPE	Data Category Description	20A4
2	DBDF(I)	Annual Decommissioning Backfill Distribution Factor, fraction (where I = 1, IDDYR)	Free-Real

TABLE 5.1 (Contd)

Card	Variable	Function/Variable Description	Format
3	SSDF(I)	Annual Shaft Sealing Distribution Factor, fraction (where I = 1, IDDYR)	Free-Real
4	FDDF(I)	Annual Facility Decommissioning Distribution Factor, fraction (where I = 1, IDDYR)	Free-Real
5	SSCON1	Shaft Sealing Cost Function Constant (see page 4.20)	Free-Real
	SSCON2	Shaft Sealing Cost Function Constant (see page 4.20)	Free-Real
	IEQTP5	Shaft Sealing Cost Functional Form (1 = linear, 2 = exponential)	Free-Integer
	DCOMCF	Support Facility Decommissioning Cost, fraction of construction cost	Free-Real
	SURCST	Annual Surveillance Cost, \$	Free-Real
	ITSURV	Surveillance Time Period, years	Free-Integer
6*	NDDC	Enter "0" (zero)	Free-Integer
	DDFRAC	Enter "0" (zero)	Free-Real
7*	SCCST	Enter "0" (zero)	Free-Real
	SCLBRR	Enter "0" (zero)	Free-Real
	SCLBRC	Enter "0" (zero)	Free-Real
	SCEQPC	Enter "0" (zero)	Free-Real
	SCMATU	Enter "0" (zero)	Free-Real
	SCMATC	Enter "0" (zero)	Free Real

* These variables reserved for future development.
Input zeros for proper run termination.

6.0 THE INTERACTIVE PREPROCESSOR

Because of the large amount of input data required for RECON, an interactive program named the PREPROCESSOR was written to aid the user in developing data input. This section describes the operation and use of the PREPROCESSOR.

The PREPROCESSOR is a menu-driven program that creates an input data file written in the correct format for execution by the RECON model. The data file may be created using data from either an existing case, a reference data library or from all new data entered via the terminal. Following data entry the user has the option of verifying (and changing if necessary) data in a newly developed case or exiting and writing the file to disc storage prior to execution by RECON.

PROGRAM DESCRIPTION

The PREPROCESSOR is written in standard ASCII Fortran on the UNIVAC 1170 computer. Figure 6.1 shows the main program segments and the flow of logic. The PREPROCESSOR user is first asked to choose one of four menu options. If the user is developing a new case, he has the option of using a previously defined library file (see program use section for information on defining input and output files) or no file. The user is then asked to select a series of options that define how many and which data categories will be changed. The data descriptions and values on the input file will be listed for each data section chosen. After making the appropriate changes in a data category, the user is asked if additional categories need to be changed. If yes, the user proceeds until all changes are made. When all changes are made and the user answers no to the previous question, he is returned to the main menu to either verify the data or exit the PREPROCESSOR. When exiting, the user is given the opportunity to create a new data library file from the data base just developed. The PREPROCESSOR then writes the appropriate files, indicates that the user can now execute RECON, and the program terminates.

FIGURE 6.1. Program Logic and Flowsheet for the PREPROCESSOR

The main advantage of using the PREPROCESSOR for data input instead of card files is that: like data is grouped in one place making input variables easier to find, and all of the necessary data items in the variable input arrays are called for. This avoids the problem of forgetting some data inputs when changing the number of waste types or the number of years of operation, for example.

When writing the output data files, the PREPROCESSOR uses the same array names as used in the RECON read file. This facilitates tracing of data from the PREPROCESSOR input into RECON, should this be necessary.

INSTRUCTIONS FOR USING THE PREPROCESSOR

This section contains instructions for executing the PREPROCESSOR and describes in more detail the input options and screen messages.

Before the PREPROCESSOR is executed, certain files must be assigned for proper execution. These are discussed below.

File 7 is an output file generated by the PREPROCESSOR to give the user a hard copy of input data values described by name. This file can be printed or destroyed depending upon the user's choice after the PREPROCESSOR has completed execution. This file, however, represents the only complete input data listing as RECON does not list all of the input data.

File 8 is an output file designed to receive the newly generated case. This file can either be a temporary or a permanent file depending on the user's requirements. The data sequence on this file is an exact image of the data sequence read by RECON. This is the file usually submitted for execution as an input data file for RECON2.

Other files necessary for proper execution of the PREPROCESSOR will depend upon which option will be chosen within the PREPROCESSOR during execution. The user must, therefore, decide before execution which option he wishes to activate.

The options available within the PREPROCESSOR are as follows:

1. Develop data for a new case

Within this main option there are two suboptions:

a. Develop a new case from an existing library

In addition to files 7 and 8, file 9 must be assigned and contain an existing data library. The user is given the choice of entering all data or specific categories

b. Develop a new case without the use of an existing library

Only files 7 and 8 need be assigned with this suboption. The program automatically requires that all data categories be reviewed

2. Update an existing case

In addition to files 7 and 8, file 11 must also be assigned. File 11 must contain a previously created case that the user wishes to modify and it must be in the proper data format. The user may choose to enter all new data or specific categories

3. Verify data in newly developed case

This option is activated after a case is created via option 1 or 2 for the purpose of verifying the current data. The user can review either all data or specific categories. This option is used to review or revise data entries on the proper file when option 1 with all entry was selected.

4. Exit from the PREPROCESSOR

When the user activates this option, the PREPROCESSOR will question the user about creating a new data library. If the users response is yes, the PREPROCESSOR will write a new data library to

file 10 that must have been previously assigned. Control is then passed to the output routines where files 7 and 8 are written.

The user may wish to assign only the necessary files or he may assign all the files listed above, which will give the user the freedom of executing more than one variation during an execution of the PREPROCESSOR.

After an option is chosen, the PREPROCESSOR gives the user the choice of entering all data for a new case or only data pertaining to specific areas for options 1a, 2 and 3. If the option to enter data for only specific areas is chosen, the PREPROCESSOR then lists all categories and requests the user to choose one. If the category chosen contains a further subdivision by section within that category, the PREPROCESSOR will then list all sections pertaining to that category and request the user to enter section codes he wishes to update or verify. The PREPROCESSOR will only update or verify one category at a time. However, multiple sections can be entered for updating within each category. If the user has requested a category or section that deals with data that differs by waste type, the PREPROCESSOR will request the user to choose an individual waste type index number(s) or will allow the user to default to the waste type index numbers that reside in the reference data base. The outline below shows the organization of the data into categories and sections in the order used in the PREPROCESSOR:

Categories:

1. General Systems data
 - a. Site Parameters
 - b. Constraints
 - c. Repository Timing and Waste Source Term Schedules
 - d. Construction and Cost Expenditure Schedules
 - e. Miscellaneous Cost Parameters
2. Waste Handling Systems
 - a. General Waste Descriptions
 - b. Receiving Data
 - c. Packaging Data

- d. Transfer Data
- e. Emplacement Operations Data
- 3. Repository Systems
 - a. General Mine Layout Data
 - b. Corridor Descriptions
 - c. Room Descriptions
- 4. Shaft Description Data
 - a. Men and Material Shaft Data
 - b. Remote-Handled Waste Shaft Data
 - c. Contact-Handled Waste Shaft Data
 - d. Mine Ventilation Shaft Data
 - e. Waste Exhaust Shaft Data
 - f. Rock Hoisting Shaft Data
 - g. Shaft Functions Shaft Data
- 5. Rock Handling and Disposal Descriptions and Costs
 - a. General Description
 - b. Rock Excavation
 - c. Rock Hoisting
 - d. Disposal
 - e. Backfilling
- 6. Support Facilities
- 7. Utilities
- 8. Pre-Operation Support
- 9. Decommissioning and Surveillance

After receiving the requested category and sectional code options, the PREPROCESSOR stores this information in a category option matrix. As the PREPROCESSOR continues execution, the category option matrix is queried when a new section is reached in the programming. If the matrix does not contain a value in the position reserved for the current section, the coding will bypass that section and jump to the next section where the process is repeated. Only when the option matrix contains a value, for the current section, will the PREPROCESSOR begin to list the descriptions of the variables with the default values from the reference data base or an old case. Care should be taken when

viewing values on the screen, because the values are written with a G15.5 format. This format was chosen because of the wide range of values for data. If the user wishes to change the value, he simply enters the correct value. The input is read as character data, so the user is not required to follow any restrictive formats. After reading the value, the PREPROCESSOR will make the correct conversion to either real or integer, using the DECODE function, depending on the variable type. If the user wishes to retain the referenced data base value as his current value, he simply depresses the return key on the keyboard.

When the PREPROCESSOR completes the category chosen, control is passed back to the menu where the user may wish to select another category. If no further categories need updating, control is passed back to the main option menu. When the user has completed all data entry and selects the option to exit from the PREPROCESSOR, only then are the new data listings and the new case files (files 7 and 8) created with values that are current. The new case file that is created is in the required format for execution with the RECON code. After exiting, the PREPROCESSOR asks the user if a new data library is to be created on file 10. If the reply is yes (file 10, of course, must have been assigned beforehand), the PREPROCESSOR creates a new library by writing array values into a file that contains data locations for all RECON options. (The basic difference between the data library file and a data case file is that the case file contains only data for the RECON input options selected for that case, while the library file contains data locations for all RECON input data options.) After completing creation of the necessary files, the PREPROCESSOR indicates that RECON may now be executed and ends.

APPENDIX A

MODEL VARIABLE DESCRIPTIONS

APPENDIX A

MODEL VARIABLE DESCRIPTIONS

The following tables list descriptions of all model variables with the variable names and units and show where the variables are used in the model. Where no units are shown, the variable is either unitless or is an alphanumeric. All variables are shown in alphabetic order.

RECON VARIABLE LISTING

Variable Name	Description	Units	Location
A	Dummy variable	--	HOLDC, HOLMC, SKFUNC
ABDCST	Annual backfilling and decommissioning cost	\$/yr	OUTPUT, PROCED
AC	Annual capacity (dummy variable)	waste units/year	REPLAS
ACONTG	Annual contingency cost	\$/year	HUB, OUTPUT
ACP	Air conditioning building load	kW	INPUT, UTILITY
ACPOW	Air conditioning power requirement	kWh	UTILITY
AECON1	Constant used to estimate A-E costs	--	INPUT, PREOP
AECON2	Constant used to estimate A-E costs	--	INPUT, PREOP
AESERV	A-E costs	dollars	PREOP
AMLBCT	Annual emplacement labor cost	\$/year	WASTOP
ANBFCT	Annual backfilling cost	\$/year	HUB, OUTPUT
ANQPTY	Annual mining capacity	tonnes/yr	MINDEV, PROCED
ANDDCT	Annual decommissioning cost	\$/year	OUTPUT, POSTOP, PROCED
ANEQCF	Annual equipment capacity (dummy variable)	units/year	MINDEV, ROCKOP
ANFILD	Annual rooms filled with waste	--	MINDEV
ANNEX	Annual rooms excavated	--	MINDEV
ANPAR	Annual panel area required	acres/year	WASTOP
ANSLCT	Annual shaft and tunnel sealing cost		OUTPUT, POSTOP, PROCED, WASTOP
ANUTC	Annual utilities cost	\$/year	HUB, UTILITY, WAFAM
APLBCT	Annual packaging labor cost	\$/year	WASTOP
AREAPP	Area per panel	acres/panel	WASTOP
ARLBCT	Annual receiving labor cost	\$/year	WASTOP
ASHIFT	Annual shifts worked at repository	--	OUTPUT

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
ASPC	Annual site preparation cost	\$/year	HUB, SURFST
ATLBCT	Annual transportation labor cost	\$/year	WASTOP
AVLRPA	Available repository area	acres	WASTOP
AXLBCT	Annual labor cost for emplacement excavation		HUB, OUTPUT, PROCED, WASTOP
B	Dummy variable	--	OUTPUT, HOLDC, HOLMC, SKFUNC
BCKFTH	Backfill material thickness	meters	INPUT, PROCED, WASTOP
BEGPA	Beginning panel area available	acres	WASTOP
BFLEFF	Backfilling efficiency (percentage of theoretical room volume filled)	--	MINDEV
BFLMCS	Backfill materials cost	\$	HOLMC
BKFLBR	Backfilling labor required	man-years	HUB, PROCED, ROCKOP
BKFLC	Backfilling cost	\$m ³ (\$/MT)	HUB, INPUT, PROCED
BKFLYR	Last year of backfilling	integer	ROCKOP
BKFYRS	Backfilling materials required	tonnes	HUB, PROCED, ROCKOP
BKFMAT	Starting year of backfilling	integer	ROCKOP
BKRATE	Backfilling rate	tonnes/yr	HUB, INPUT, PROCED, ROCKOP
BKSHFT	Work shifts for backfilling after waste operations are ended	--	PROCED, ROCKOP
BSFILD	Boresections filled with emplaced waste	--	WASTOP
C	Dummy variable	--	HOLMC, OUTPUT
CAPCTY	Equipment capacity (dummy variable)	--	WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
CAPLEN	Cap length	meters	INPUT, PROCED, WASTOP
CAREW	Cumulative emplaced area by waste type	acres	MINDEV, OUTPUT, PROCED
CCCON1	Lining cost function constant	--	INPUT, PROCED, SHAFT
CCCON2	Lining cost function constant	--	INPUT, PROCED, SHAFT
CFSPCT	Contact handling floor space percentage	fraction	PROCED
CHMTEM	CH waste materials cost	\$/unit pitch	INPUT, PROCED, WASTOP
CHRECU	CH receiving units	waste units	WAFAM
CHRECW	CH receiving units by waste type	waste units	PROCED, WAFAM
CHRLBR	CH receiving labor requirement	man-years	PROCED, WASTOP
CLCDF	Time distribution factors for licensing costs	--	INPUT, PREOP, PROCED
CLNDF	Time distribution factors for land costs	--	INPUT, PREOP, PROCED
CLSEMP	Closest emplacement to corridor	meters	INPUT, PROCED, WASTOP
CMCAP	CH waste receiving module capacity	waste units	OUTPUT, PROCED, WASTOP
CMMAX	Contact-handled waste receiving module capacity	waste units/year	WASTOP
CONFAC	Contingency factor	fraction	HUB, INPUT, PROCED
CONTGY	Contingency costs	\$	HUB, PROCED
CORARA	Main corridor area	acres	OUTPUT, MINDEV, PROCED, ROCKOP, UTILITY, WASTOP
CORDSC	Corridor descriptions	--	INPUT, OUTPUT, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
CORHT	Corridor height	meters	INPUT, MINDEV, OUTPUT, PROCED, ROCKOP
CORLEN	Corridor length per room	meters/room	INPUT, OUTPUT, PROCED
CORMAS	Corridor rock mass mined	tonnes	MINDEV, PROCED
CORVOL	Corridor rock volume mined	m ³	MINDEV, PROCED
CORVR	Corridor volume per room	m ³	MINDEV
CORWTH	Corridor width	meters	INPUT, MINDEV, OUTPUT, PROCED, ROCKOP, UTILITY, WASTOP
COSTLC	Annual licensing costs by waste type	\$/year	HUB, PREOP, PROCED
COSTLD	Annual land costs by waste type	\$/year	HUB, PREOP, PROCED
CPA	Central pillar area	acres	INPUT, OUTPUT, PROCED, WASTOP
CPCMM	Central pillar corridor rock mass mined	tonnes	MINDEV, PROCED
CRRAIL	Percent of container shipments by rail	fraction	INPUT, OUTPUT, PROCED, RECEVE, WAFAM, WASTOP
CSTAE	Cost of A-E services by year and waste type	\$	OUTPUT, PREOP, PROCED
CSTBKF	Annual backfilling costs by waste type	\$/year	HUB, PROCED
CSTHST	Annual rock hoisting costs by waste type	\$/year	HUB, PROCED
CSTLIC	Cost of licensing by year and waste type	\$	OUTPUT, PREOP, PROCED
CSTLND	Cost of land by year and waste type	\$	OUTPUT, PREOP, PROCED
CSTOSD	Cost of offsite disposal	\$	HUB, PROCED
CSTOT	Annual total construction costs	\$	OUTPUT, PROCED
CSTSF	Annual surface facility construction costs	\$	HUB, OUTPUT, PROCED
CSTSHS	Annual rock surface handling costs by waste type	\$	HUB, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
CSTSHT	Cost of shafts by year and waste type	\$	HUB, PROCED, OUTPUT
CSTSP	Annual site preparation costs	\$	OUTPUT, PREOP, PROCED, SURFST
CSTSU	Annual startup costs	\$	OUTPUT, PREOP, PROCED
CSTUGF	Cost of underground facilities by year and waste type	\$	HUB, OUTPUT, PROCED
CUMBKF	Cumulative rock backfilled by year	tonnes	MINDEV
CUMFLD	Cumulative rooms filled	--	MINDEV, PROCED
CUMPAR	Cumulative panel area	acres	OUTPUT, PROCED, WASTOP
D	Diameter	meters	HOLDC, HOLMC, OUTPUT, POSTOP, SHAFT, SKFUNC
DA	Today's date	--	HUB, OUTPUT, PROCED
DATE	Internal date function in computer	--	HUB, OUTPUT
DATYPE	Subroutine data name	--	INPUT
DBDF	Decommissioning backfill distribution factor	--	INPUT, PROCED, ROCKOP
DCOMCF	Facility decommissioning cost factor	fraction	INPUT, POSTOP, PROCED
DDCST	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDEQPC	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDFRAC	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDLBRG	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDLBRG	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDMATC	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DDTITL	Variable defined for future usage (not currently used)	--	INPUT, PROCED
DECOMC	Decommissioning cost by year and waste type	\$	HUB, POSTOP, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
DELRHT	Delta room height	meters	INPUT, MINDEV, PROCED
DENSTY	Rock density	tonnes/m ³	INPUT, MINDEV, PROCED, ROCKOP, WASTOP
DEPTH	Mine depth	meters	INPUT, OUTPUT, PROCED
DIESEL	Diesel fuel requirements by waste type and time	liters	OUTPUT, PROCED, UTILITY
DNEMPU	Number of emplacement units (dummy variable)	--	WASTOP
DPY	Days per standard work-year	--	MINDEV, PROCED, ROCKOP, SHAFT, WASTOP
DRATE	Discount rate	--	HUB, INPUT, OUTPUT, POSTOP, PROCED
DRECNT	Dummy variable for receiving and packaging waste quantities		WASTOP
DSLC	Diesel fuel unit cost	\$/liter	INPUT, PROCED, UTILITY
DSLCST	Diesel fuel cost	\$/year	OUTPUT, PROCED, UTILITY
DSMINE	Unit diesel fuel use in mining	liter/tonne	UTILITY
DSRAIL	Unit diesel fuel use in rail operations	liter/arrival	UTILITY
DSRKHT	Dummy variable for annual rock hoisted	tonnes/year	ROCKOP
DSURF	Unit diesel fuel use in waste operations	liter/shipment	UTILITY
DUMPKG	Number of packages (dummy variable)	--	WASTOP
DWTRC	Unit demineralized water cost	\$/10 ⁶ liters	INPUT, PROCED, UTILITY
E	Dummy variable	--	HOLMC, OUTPUT
ECOST	Annual emplacement excavation costs by waste type	\$/year	HUB, OUTPUT, PROCED

RECON VARIABLE LISTING (Contd)

<u>Variable Name</u>	<u>Description</u>	<u>Units</u>	<u>Location</u>
EECAPC	Emplacement excavation capital cost by waste type and time	\$	HUB, PROCED, SURFST
EECST	Capital cost of emplacement excavation	\$	INPUT, PROCED, SURFST
EEECST	Unit equipment cost for emplacement excavation	\$/equip. unit	HUB, INPUT, PROCED, WASTOP
EEEQPC	Emplacement excavation equipment capacity	empl. units/equip./ shift	INPUT, PROCED, WASTOP
EEEQPL	Emplacement excavation equipment life	empl. units/equip. unit	INPUT, OUTPUT, PROCED, WASTOP
EELBRC	Unit emplacement excavation labor cost	\$/man-year	INPUT, PROCED, WASTOP
EELBRR	Unit emplacement excavation labor requirement	man-years/equip./ shift	INPUT, PROCED, WASTOP
EEMATC	Unit emplacement excavation materials cost	\$/material unit	INPUT, PROCED, WASTOP
EEMATR	Unit emplacement excavation materials by year and waste type	material units	PROCED, WASTOP
EEMATU	Unit emplacement excavation materials	material units/empl. unit	INPUT, PROCED, WASTOP
EEXLBR	Emplacement excavation labor required by year and waste type	man-years	HUB, PROCED, WASTOP
EEXRKM	Rock mass excavated for emplacement excavations	tonnes	HUB, PROCED, WASTOP
EL	Equipment life (dummy variable)	--	REPLAS
EMCST	Waste emplacement cost by year and waste type	\$	HUB, OUTPUT, PROCED
EMEQT	Annual emplacement equipment costs	\$/year	HUB, OUTPUT, PROCED, WASTOP
EMEQPC	Annual emplacement equipment costs by waste type	\$/year	HUB, PROCED, WASTOP
EMLBCT	Emplacement labor cost by year and waste type	\$	HUB, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
EMMATC	Emplacement materials cost by year and waste type	\$	HUB, PROCED, WASTOP
EMMTCT	Annual emplacement material costs	\$/year	OUTPUT, PROCED, WASTOP
EMPLBR	Emplacement labor requirements by year and waste type	man-years	HUB, PROCED, WASTOP
EMPMCH	Number of emplacement machines	--	HUB, OUTPUT, PROCED, WASTOP
EQLIFE	Equipment life (dummy variable)	--	WASTOP
EQREEX	New equipment replacements for emplacement excavation	equipment units	HUB, PROCED, WASTOP
EQREMP	New equipment replacements for emplacement	equipment units	PROCED, WASTOP
EQRPKG	New equipment replacements for packaging	equipment units	PROCED, WASTOP
EQRREC	New equipment replacements for receiving	equipment units	PROCED, WASTOP
EQRTRN	New equipment replacements for transportation	equipment units	PROCED, WASTOP
ERCLBR	Emplacement labor for CH wastes by year and shift	man-years	PROCED, WASTOP
ERRLBR	Emplacement labor for RH wastes by year and shift	man-years	PROCED, WASTOP
EXEQCT	Annual emplacement excavation equipment costs	\$/years	HUB, OUTPUT, PROCED
EXEQPC	Annual emplacement excavation equipment costs by waste type	\$/years	HUB, PROCED, WASTOP
EXLBCT	Annual emplacement excavation labor costs by waste type	\$/year	HUB, PROCED, WASTOP
EXLBR	Emplacement excavation labor by year and shift	man-years	PROCED, WASTOP
EXMACH	Emplacement excavation machine requirements	equipment units	HUB, OUTPUT, PROCED, WASTOP
EXMATC	Emplacement excavation materials costs by year and waste type	\$	HUB, PROCED, WASTOP
EXMTCT	Annual emplacement excavation materials costs	\$/year	OUTPUT, PROCED, WASTOP
EXPLIF	Expended machine life	life units	REPLAS
F	Borehole diameter	meters	HOLMC, OUTPUT

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
FDDF	Facility decommissioning distribution factor	--	INPUT, POSTOP, PROCED
FFHTLD	Far-field heat load	kilowatts	PROCED, WASTOP
FFTL	Far-field thermal limit	kW/acre	INPUT, PROCED, WASTOP
FLDCST	Field cost	\$	PREOP, PROCED
FLUMM	Fraction of labor used for maintenance materials	fraction	INPUT, PROCED, WASTOP
FMOD	Fractional number of component modules	--	WASTOP
G	Dummy variable	--	HOLMC
GXEF	Geometric exclusion factor	--	INPUT, OUTPUT, PROCED, WASTOP
H	Dummy variable	--	HOLMC
HDCON1	Hole drilling constant	--	INPUT, PROCED, WASTOP
HDCON2	Hole drilling constant	--	INPUT, PROCED, WASTOP
HDECFC	Hole drilling equipment unit cost fraction	--	INPUT, PROCED, WASTOP
HDLCFC	Hole drilling labor unit cost fraction	--	INPUT, PROCED, WASTOP
HDMCFC	Hole drilling materials unit cost fraction	--	INPUT, PROCED, WASTOP
HEAT	Total steam requirement for heating	lbs	UTILITY
HEATS	Unit steam heating requirement underground	lbs/acre of repository	INPUT, PROCED, UTILITY
HOLD	Hole depth	meters	PROCED, WASTOP
HOLDC	Hole drilling cost function	--	HOLDC, WASTOP
HOLDEL	Hole depth delta	meters	INPUT, PROCED, WASTOP
HOLDIA	Hole diameter	meters	PROCED, WASTOP
HOLMC	Hole material cost function	--	HOLMC, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
HOLXC	Hole excavation cost	\$/hole	PROCED, WASTOP
HPMIN	Minimum hole pitch	meters	INPUT, PROCED, WASTOP
HPY	Hours per year	--	UTILITY
HTLDNF	Near-field heat load	kilowatts	PROCED, WASTOP
I	Index (usually refers to year)	--	HUB, INPUT, MINDEV, OUTPUT, POSTOP, PREOP, RECEVE, ROCKOP, SHAFT, SURFST, UTILITY, WAFAM, WASTOP
IB	Index	--	HUB, OUTPUT, SURFST
IDD	Decommissioning year index	--	HUB, INPUT, OUTPUT, POSTOP, PROCED, ROCKOP, SURFST, UTILITY, WAFAM
IDDYR	Year decommissioning starts	calendar year	INPUT
IDET	Detailed cost input switch	--	INPUT, PROCED, WASTOP
IDL	Time from base discounting year to construction startup	years	HUB
IE	Index	--	HUB
IEL	Integer value of equipment life	--	REPLAS
IEQPL	Integer value of expired equipment life	--	REPLAS
IEQTP1	Linear or exponential equation selection switch	--	INPUT, PROCED, SHAFT
IEQTP2	Linear or exponential equation selection switch	--	INPUT, PROCED, SHAFT
IEQTP3	Linear or exponential equation selection switch	--	INPUT, PROCED, SHAFT
IEQTP4	Linear or exponential equation selection switch	--	INPUT, PROCED, SHAFT
IEQTP5	Linear or exponential equation selection switch	--	INPUT, PROCED, SHAFT
IFLAG	Logic flag	--	MINDEV, OUTPUT

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
IFY	First year of new equipment operation	--	REPLAS
II	Index	--	HUB, POSTOP, ROCKOP, SURFST, WASTOP
III	Index	--	HUB
IMET	Emplacement method switch	--	HUB, INPUT, PROCED, WAFAM, WASTOP
IMETH	Emplacement excavation method selection variable	--	WASTOP
IFMCW	Incremental packaging modules		HUB, PROCED
IRMCW	Incremental receiving modules for canistered waste	--	HUB, PROCED
IRMNW	Incremental receiving modules for non-canistered waste	--	HUB, PROCED
IRP	Index	--	REPLAS
IS	Number of Integral shifts	--	WASTOP
ISC	Number of shifts operated for CH waste	--	PROCED, WASTOP
ISR	Number of shifts operated for RH waste	--	PROCED, WASTOP
IT	Index marking beginning of surveillance period	--	POSTOP
ITE	Index marking end of surveillance period	--	POSTOP
ITSURV	Surveillance period	years	INPUT, POSTOP, PROCED
IUHDCM	Hole drilling cost calculation method switch	--	INPUT, PROCED, WASTOP
IYDOL	Discount year	calendar year	HUB, INPUT, PROCED
IYR	Year variable used to print calendar year in OUTPUT	--	OUTPUT
IYRCON	Year in which construction begins	calendar year	HUB, INPUT, MINDEV, OUTPUT
IYRDIS	Year to which costs are discounted	calendar year	INPUT, OUTPUT, PROCED
IYRPRO	Year in which production begins	calendar year	INPUT, MINDEV, OUTPUT, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
IZ1	Variable to zero out common blocks	--	HUB, PROCED
IZ2	Variable to zero out common blocks	--	HUB, PROCED
IZ3	Variable to zero out common blocks	--	HUB, PROCED
IZ4	Variable to zero out common blocks	--	HUB, PROCED
IZ5	Variable to zero out common blocks	--	HUB, PROCED
IZ6	Variable to zero out common blocks	--	HUB, PROCED
IZ7	Variable to zero out common blocks	--	HUB, PROCED
IZ8	Variable to zero out common blocks	--	HUB, PROCED
IZ9	Variable to zero out common blocks	--	HUB, PROCED
IZ10	Variable to zero out common blocks	--	HUB, PROCED
IZ11	Variable to zero out common blocks	--	HUB, PROCED
IZ12	Variable to zero out common blocks	--	HUB, PROCED
IZ13	Variable to zero out common blocks	--	HUB, PROCED
K	Index (usually refers to waste type)	--	HUB, INPUT, MINDEV, OUTPUT, POSTOP, PREOP, RECEVE, ROCKOP, SURFST, UTILITY
KB	Index	--	OUTPUT
KD	Index	--	REPLAS, WASTOP
KE	Index	--	OUTPUT
KIND	Waste type definition: 1 = canistered, 2 = noncanistered	--	HUB, INPUT, OUTPUT, PROCED, RECEVE, SURFST, WAFAM, WASTOP
KK	Waste type index	--	WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
L	Index	--	HUB, INPUT, MINDEV, OUTPUT, POSTOP, REPLAS, SHAFT, SURFST, WAFAM, WASTOP
LASTYR	Last year of any operation (determines array sizes)	calendar year	INPUT
LB	Index	--	HUB, MINDEV, OUTPUT, POSTOP, ROCKOP, SURFST, UTILTY, WASTOP
LE	Index (usually refers to end of backfilling operations)	--	HUB, MINDEV, OUTPUT, POSTOP, REPLAS, ROCKOP, SURFST, UTILTY, WAFAM, WASTOP
LEAD	Lead time for room excavation (Input)	years	INPUT, MINDEV, OUTPUT, PROCED
LED	Lead time for room excavation	years	MINDEV, OUTPUT
LEE	Total years required for construction, operation, back filling and decommissioning	years	OUTPUT
LL	Index (usually refers to end of construction)	--	HUB, INPUT, MINDEV, OUTPUT, PREOP, PROCED, SURFST, UTILTY, WASTOP
LLL	Index for first year of repository operations	--	WASTOP
LLPI	Index for first year of repository operations	--	HUB
LX	Index	--	OUTPUT
LY	Index (usually refers to end of waste operations)	--	HUB, INPUT, MINDEV, OUTPUT, PROCED, RECEVE, ROCKOP, SHAFT, SURFST, WAFAM, WASTOP
LYY	Index referring to last year of program operation	--	INPUT, UTILTY
M	Index	--	INPUT, MINDEV, OUTPUT, REPLAS
MEOP	Maximum number of equipment replacements	equipment units	REPLAS

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
MROP	Mined rock operations power	kW/tonne	INPUT, PROCED, UTILITY
MSA	Mined rock storage area	acres	INPUT, MINDEV, PROCED
MSWTCH	Mining cost input type selector	--	HUB, INPUT, MINDEV, PROCED, ROCKOP
MTCPSD	Maximum shaft trips per shift for CH waste	--	INPUT, OUTPUT, PROCED, WASTOP
MTRPSD	Maximum shaft trips per shift for RH waste	--	INPUT, OUTPUT, PROCED, WASTOP
MXMMRH	Maximum trips per shift-year for rock hoisted in men and materials shaft	tonnes/year	INPUT, OUTPUT, PROCED, ROCKOP, SHAFT
MXMPRH	Maximum trips per shift-year for rock hoisted in mine production shaft	tonnes/year	INPUT, OUTPUT, PROCED, ROCKOP, SHAFT
M2ACRE	Square meters per acre constant	--	MINDEV, PROCED, ROCKOP, UTILITY, WASTOP
N	Index	--	HOLDC, HOLMC, HUB, INPUT, OUTPUT, REPLAS
NA	Number of equipment units required for a given year	equipment units	REPLAS
NAA	Index	--	REPLAS
NALSH	Number of shifts allowed	--	INPUT, PROCED, WASTOP
NB	Index	--	REPLAS
NBEQP	Equipment requirements in current year (dummy variable)	--	ROCKOP
NBKF	Total years required for construction, operation and backfilling	years	HUB, OUTPUT, POSTOP, PROCED, ROCKOP
NBYRS	Integer number of years required for backfilling after waste operations	years	ROCKOP
NBSPPA	Number of boresections per panel	--	INPUT, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
NBYR	Time from waste operations startup to backfilling startup	years	INPUT, MINDEV, PROCED
NCHMA	Maximum CH waste-receiving modules	--	INPUT, PROCED, WASTOP
NCOR	Number of corridor types in a panel	--	INPUT, MINDEV, OUTPUT, PROCED
NCORPP	Number of corridors per panel	--	INPUT, MINDEV, OUTPUT, PROCED
NCR	Maximum number of corridor types defined	--	PROCED
NDC	Number of decommissioning cost categories	--	PROCED
NDDC	Variable set aside for future use (not currently used)	--	INPUT, PROCED
NDSMP	Number of mine production shafts	--	PROCED, ROCKOP, SHAFT
NDUM	Dummy variable	--	MINDEV
NEE	Number of emplacement excavation methods	-- --	INPUT, OUTPUT, PROCED, SURFST, WAFAM
NEMPU	Number of emplacement units	--	PROCED, WASTOP
NEQC	Number of equipment units needed in current year (dummy)	--	WASTOP
NEQLY	Number of equipment units needed in previous year (dummy)	--	WASTOP
NEQRPL	Equipment replacements for rock operations	--	HUB, MINDEV, PROCED, ROCKOP
NEWEQP	Equipment replacements (dummy variable)	equipment units	WASTOP
NFAC	Maximum number of surface facility categories	--	PROCED
NFLG	Logic flag	--	WASTOP
NFTL	Near-field thermal limit	kilowatts/acre	INPUT, PROCED, WASTOP
NHLPPA	Number of heat-limited packages per unit area	--	WASTOP
NLAST	Dummy variable indexing the previous year	--	MINDEV, ROCKOP
NM	Index	--	REPLAS, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
NMMACH	Number of mining machines required each year	--	MINDEV, PROCED
NMODCH	Total number of CH waste-receiving modules constructed	--	PROCED, RECEVE
NMODPH	Total number of packaging modules constructed	--	RECEVE
NMODRH	Total number of RH waste-receiving modules constructed	--	PROCED, RECEVE
NN	Number of waste types plus 1	--	OUTPUT
NPKGPR	Number of packages per room	--	OUTPUT, PROCED, WASTOP
NPKGT	Total number of waste packages for each waste type	--	OUTPUT
NPKPEU	Number of packages per emplacement unit	--	INPUT, PROCED, WASTOP
NPKPT	Number of packages	--	INPUT, PROCED
NPKPTC	Number of packages per shaft trip - contact wastes	--	INPUT, OUTPUT, PROCED, WASTOP
NPKPTR	Number of packages per shaft trip - remote wastes	--	INPUT, OUTPUT, PROCED, WASTOP
NPKPTT	Total remote and contact packages per shaft-trip	--	OUTPUT
NPKSTM	Total packages processed each year	package units	PROCED, WAFAM
NPKSUM	Total packages processed in entire repository	package units	WAFAM
NPMRH	Number of packaging modules required in any year	--	HUB, OUTPUT, PROCED, RECEVE, WASTOP
NPPRW	Number of packages per row	--	OUTPUT, PROCED, WASTOP
NPSMWT	Total number of packages processed for each waste type	--	PROCED, WAFAM
NRHRMA	Maximum RH waste-receiving modules	--	INPUT, PROCED, WASTOP
NRMCH	Number of CH waste-receiving modules in any year	--	HUB, OUTPUT, PROCED, RECEVE, WASTOP
NMRMH	Number of RH waste-receiving modules in any year	--	HUB, OUTPUT, PROCED, RECEVE, UTILITY, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
NRO	Number of rock operations	--	HUB, INPUT, PROCED, SURFST
NRON	Rock operations number index	--	HUB, MINDEV, ROCKOP
NRWSPR	Number of rows per room	--	INPUT, PROCED, WASTOP
NS	Number of labor cost differentials for shift work	--	INPUT, PROCED
NSC	Number of support facilities	--	INPUT, OUTPUT, PROCED, SURFST
NSFELF	Surface facility equipment life (in integer years)	years	SURFST
NSFTT	Total number of repository shafts	--	OUTPUT
NST	Number of shaft types	--	HUB, INPUT, MINDEV, OUTPUT, POSTOP, PROCED, SHAFT
NSTM1	Number of repository shafts minus 1	--	INPUT
NTA	Output table numbering variable	--	OUTPUT
NTB	Total number of waste packages emplaced	--	OUTPUT
NTO	Number of transportation operations	--	INPUT, PROCED
NTPS	Total number of trips per shift in contact and remote waste shafts	--	OUTPUT
NTPSMP	Number of trips per shift in mined rock hoisting shaft	--	OUTPUT
NTYP	Extra call list variable	--	WASTOP
NU	New equipment replacements (dummy variable)	--	REPLAS
NUMPKG	Number of waste packages	--	HUB, OUTPUT, PROCED, UTILITY, WAFAM, WASTOP
NUO	Number of underground operations	--	INPUT, PROCED, SURFST
NW	Number of waste types (for variable dimensions)	--	HUB, MINDEV, OUTPUT, PREOP, PROCED, REPLAS, ROCKOP, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
NWO	Number of surface waste operations	--	INPUT, PROCED
NWP1	Summation Index	--	HUB, INPUT, OUTPUT, PROCED, UTILITY
NWT	Number of waste types	--	HUB, INPUT, MINDEV, OUTPUT, POSTOP, PREOP, PROCED, RECEVE, ROCKOP, SURFST, UTILITY, WAFAM, WASTOP
NX	Number of mine production shafts (dummy variable)	--	SHAFT
NY	Number of years (for variable dimensions)	--	HUB, MINDEV, PROCED, RECEVE, WASTOP
NYRO	Maximum time allowed for all repository activities	years	HUB, PROCED
OFTADC	Offsite transportation and disposal unit cost	\$/tonne	HUB, INPUT, PROCED
ONEMIL	One million constant	--	OUTPUT, PROCED
ONETHO	Constant equal to 1000	--	OUTPUT, PROCED
OPMC	Mining cost - annual	\$/year	HUB, PROCED
ORS	Steam - other use	10 ³ lbs/year	INPUT, PROCED, UTILITY
OSFC	Other surface facility costs	millions \$	HUB, PREOP, PROCED
OTBDEN	Other backfill density	g/cm ³	INPUT, MINDEV, PROCED
OTBKF	Mass of other backfill required	tonnes	HUB, MINDEV, PROCED, ROCKOP
OTHBFL	Percentage of other backfill per m ³ backfilled	percent	INPUT, MINDEV, PROCED, ROCKOP
OTMATC	Unit cost for other materials	\$/man-year	PROCED, WASTOP
OTMTCT	Other materials costs	\$	OUTPUT, PROCED, WASTOP
OVRHDF	Overhead factor	--	HUB, INPUT, PROCED, SURFST, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
OWHP	Other waste-handling building electrical load	kW	INPUT, PROCED, UTILITY
OWHPOW	Other waste-handling building power requirements	kWh	UTILITY
OWLBR	Support labor costs	\$	HUB, OUTPUT, PROCED, SURFST
OWOPC	Support material costs	\$	HUB, OUTPUT, PROCED, SURFST
P	Package diameter (dummy variable)	--	HOLMC, PROCED
PACST	Total packaging costs by waste type and time	\$	HUB, OUTPUT, PROCED
PALBCT	Packaging labor cost	\$	HUB, PROCED, WASTOP
PAMTCT	Packaging material cost	\$	OUTPUT, PROCED, WASTOP
PANLEN	Panel length	meters	INPUT, OUTPUT, PROCED, WASTOP
PANWTH	Panel width	meters	INPUT, OUTPUT, PROCED, WASTOP
PARQCT	Annual packaging equipment cost	\$/year	HUB, OUTPUT, PROCED, WASTOP
PCTFIL	Percentage of room filled w/expanded backfill	--	INPUT, MINDEV, PROCED
PFCST	Packaging facility cost	\$/year	HUB, PROCED
PI	Constant = 3.14157	--	MINDEV, PROCED, WASTOP
PITCH	Distance between emplacement units	meters	OUTPUT, PROCED, WASTOP
PKEQPC	Packaging equipment capacity	packages/equip. unit/ shift	HUB, PROCED, WASTOP
PKGCAP	Packaging facility capacity per shift	waste units/shift- year	INPUT, PROCED, WASTOP
PKGDIA	Package diameter	meters	INPUT, PROCED, WASTOP
PKGDS1	Package narrative description	--	INPUT, PROCED
PKGDS2	Package narrative description	--	INPUT, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
PKGDS3	Package narrative description	--	INPUT, PROCED
PKGLBR	Packaging labor requirement	man-years	HUB, PROCED, WASTOP
PKGLN	Package length	meters	INPUT, MINDEV, PROCED, WASTOP
PKGPRK	Packages per rack unit	integer	INPUT, PROCED, WASTOP
PKGUP	Packages per unit pitch	integer	INPUT, PROCED, WASTOP
PGTD	Package thermal density	kW/package	WASTOP
PKMATC	Packaging materials cost	\$	HUB, PROCED, WASTOP
PKMATR	Unit packaging materials requirement	material unit/package unit	PROCED, WASTOP
PLACE	Location of repository	--	INPUT, OUTPUT, PROCED
PMCAP	Packaging module capacity	waste units/year	OUTPUT, PROCED, WASTOP
PMMAX	Maximum packaging facility capacity	waste units/year	WASTOP
PNLREQ	Area requirement for emplacement	acres	OUTPUT, PROCED, WASTOP
PORMDF	Pre-operation mining cost time distribution	fraction	INPUT, MINDEV, PROCED
POWCST	Electric power cost	\$	OUTPUT, PROCED, UTILITY
PRODC	Pre-production costs by waste type and year	\$/year	PREOP, PROCED
PWF	Present worth factor	--	HUB, PROCED
R	Dummy variable	--	HOLMC
RAPP	Receiving and packaging power	kW/module	INPUT, PROCED, UTILITY
RAPS	Steam requirement for receiving and packaging	10 ³ lbs/year	INPUT, PROCED, UTILITY
RCCAP	Rail container capacity	waste units	INPUT, OUTPUT, PROCED, RECEIVE, WASTOP
RCEQPC	Receiving equipment capacity	waste units/shift/ module	HUB, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

<u>Variable Name</u>	<u>Description</u>	<u>Units</u>	<u>Location</u>
RCKCST	Rack cost for trench emplacement	\$/rack	INPUT, PROCED, WASTOP
RCKHC	Unit rock hoisting cost	\$/tonne	HUB, INPUT, PROCED
RCKHST	Rock hoisted, annual	tonnes/year	HUB, MINDEV, OUTPUT, PROCED, ROCKOP
RCMATC	Receiving materials cost	\$	HUB, PROCED, WASTOP
RCMATR	Receiving materials requirement	material units	PROCED, WASTOP
RECLBR	Receiving labor requirement	man-years	HUB, PROCED, WASTOP
RE CST	Total receiving costs by waste type and time	\$	HUB, OUTPUT, PROCED
RECUNT	Receiving units by year and waste type	waste units	HUB, OUTPUT, PROCED, RECEVE, WAFAM, WASTOP
RECUWT	Total receiving units processed by waste type	waste units	PROCED, WAFAM
RED	Diesel fuel requirement for rail engines	10 ³ liters/container	INPUT, PROCED
REEQCT	Receiving equipment cost	\$	HUB, OUTPUT, PROCED, WASTOP
REFBKF	Reference backfill material cost for boreholes	\$/hole	INPUT, PROCED, WASTOP
REFDEP	Reference depth for boreholes	meters	INPUT, PROCED, WASTOP
REFDIA	Reference diameter for boreholes	meters	INPUT, PROCED, WASTOP
REFMAT	Reference barrier materials costs for boreholes	\$/hole	INPUT, PROCED, WASTOP
REFSLV	Reference sleeve costs for boreholes	\$/hole	INPUT, PROCED, WASTOP
RELBCT	Receiving labor cost	\$/year	HUB, PROCED, WASTOP
REMBKF	Remaining backfill volume	m ³	PROCED, ROCKOP
REMTCT	Receiving material costs	\$/year	OUTPUT, PROCED, WASTOP
RFCST	Total receiving facility construction cost	\$/yr	HUB, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
RHPKG	RH packages processed by waste type	package units	PROCED, WAFAM
RHPLBR	RH packaging labor by shift and year	man-years	PROCED, WASTOP
RHRECU	RH waste units processed	waste units	WAFAM
RHRECW	RH waste units processed by waste type	waste units	PROCED, WAFAM
RHRLBR	RH receiving labor by shift and year	man-years/shift	PROCED, WASTOP
RKBKF	Rock backfilled	tonnes/year	HUB, MINDEV, OUTPUT, PROCED, ROCKOP
RKHLBR	Rock hoisting labor	man-years	HUB, PROCED, ROCKOP
RKHMAT	Rock hoisting materials	material units	HUB, PROCED, ROCKOP
RKMSM	Annual mined rock mass	tonnes/year	HUB, MINDEV, OUTPUT, PROCED, UTILITY, WAFAM
RKOFFS	Rock mass transported offsite	tonnes/year	HUB, MINDEV, OUTPUT, PROCED
RKSURF	Rock mass stored on surface	tonnes/year	HUB, MINDEV, OUTPUT, PROCED
RKVOL	Unit room volume excavated by waste type	m ³	MINDEV, PROCED
RMCAP	Receiving module capacity	waste units/year	OUTPUT, PROCED, WASTOP
RMCWS1	RH waste-receiving module construction schedule - initial	--	HUB, INPUT, PROCED
RMCWS2	RH waste-receiving module construction schedule - during operations	--	HUB, INPUT, PROCED
RMFILD	Rooms filled with waste	--	HUB, MINDEV, OUTPUT, PROCED, WASTOP
RMHMIN	Minimum room height	meters	INPUT, MINDEV, PROCED
RMHT	Room height	meters	MINDEV, OUTPUT, PROCED
RMLN	Room height	meters	INPUT, MINDEV, PROCED, UTILITY, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
RMMATR	Materials used in rock excavation	--	HUB, MINDEV, PROCED
RMMAX	Maximum remote-handled waste receiving facility capacity	waste units/year	WASTOP
RMNLBR	Labor required for rock excavation	man-years	HUB, MINDEV, PROCED
RMNWS1	CH waste-receiving module construction schedule - initial	--	HUB, INPUT, PROCED
RMNWS2	CH waste-receiving module construction schedule - during operations	--	HUB, INPUT, PROCED
RMPILU	Room-pillar units	Integer	OUTPUT, PROCED, WASTOP
RMUVOL	Room and corridor unit volume	m ³	MINDEV, PROCED
RMWTH	Room width	meters	INPUT, MINDEV, OUTPUT, PROCED, UTILITY, WASTOP
ROCAPC	Rock operations capital costs per year	\$/year	PROCED, SURFST
ROCST	Rock operations capital costs	\$	HUB, INPUT, PROCED, SURFST
ROECST	Rock operations unit equipment costs	\$/equipment unit	HUB, INPUT, PROCED
ROEQPC	Rock operations equipment capacities	tonnes/equipment/ shift	INPUT, MINDEV, PROCED, ROCKOP
ROEQPL	Rock operations equipment lifetimes	tonnes	INPUT, MINDEV, OUTPUT, PROCED, ROCKOP
ROLBRC	Rock operations unit labor costs	\$/man-year	HUB, INPUT, PROCED
ROLBRR	Rock operations unit labor requirements	man-years/equipment unit/shift	INPUT, MINDEV, PROCED, ROCKOP
ROMATC	Rock operations unit material costs	\$/material unit	HUB, INPUT, PROCED
ROMATU	Rock operations unit material requirements	material units/tonne	INPUT, MINDEV, PROCED, ROCKOP
ROPOW	Rock operations power requirement	kW/year	UTILITY
RPPOW	Receiving and packaging facility power requirement	kW/year	UTILITY

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
RPTYP	Repository description	--	INPUT, OUTPUT, PROCED
RRCHAS	Annual costs for surface storage of mined rock	\$	HUB, OUTPUT, PROCED
RRCHST	Annual costs for hoisting of mined rock	\$	HUB, OUTPUT, PROCED
RRCMIN	Annual costs for mining of mined rock	\$	HUB, OUTPUT, PROCED
RRCOSD	Annual costs for offsite disposal of mined rock	\$	HUB, OUTPUT, PROCED
RRCTOT	Total annual rock operations costs	\$	OUTPUT, PROCED
RSTEAM	Receiving and packaging facility steam requirements	10 ³ lbs/year	UTILITY
RUBKFL	Room units backfilled	--	MINDEV, PROCED
RVP	Ventilation power	kW/acre of repository	INPUT, PROCED, UTILITY
S	Dummy variable	--	HOLMC, SURFST
SCCON1	Shaft sinking function constant 1	\$	INPUT, PROCED, SHAFT
SCCON2	Shaft sinking function constant 2	\$/meter	INPUT, PROCED, SHAFT
SCCST	Variable for future use (not currently used)	--	INPUT, PROCED
SCDF	Startup cost distribution factor	--	INPUT, PROCED
SCEQPC	Variable for future use (not currently used)	--	INPUT, PROCED
SCHSHP	Annual CH waste shipments	--	PROCED, RECEIVE
SCLBRC	Variable for future use	--	INPUT, PROCED
SCLBRR	Variable for future use	--	INPUT, PROCED
SCMATC	Variable for future use	--	INPUT, PROCED
SCMATU	Variable for future use	--	INPUT, PROCED
SCMCAP	CH waste-receiving module capacity per year	waste units/year	WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
SCSKD	Shaft construction schedule	--	HUB, INPUT, MINDEV, PROCED
SEALCT	Shaft sealing cost by waste type and time	\$	HUB, POSTOP, PROCED
SFCAPC	Surface facility capital cost	\$/year	HUB, PROCED, SURFST
SFCCST	Total surface facility cost allocated by waste type	\$	HUB, POSTOP, PROCED
SFCS	Surface facility construction schedule	--	INPUT, PROCED, SURFST
SFCST	Support facility capital cost	\$	INPUT, OUTPUT, PROCED SURFST
SFCTOT	Total shaft cost by component	\$	OUTPUT, PROCED
SFECST	Facility unit equipment cost	\$/facility	INPUT, PROCED, SURFST
SFEQCT	Annual surface facility equipment cost	\$/year	HUB, OUTPUT, PROCED, SURFST
SFEQPC	Support facility equipment cost	\$/year	HUB, PROCED, SURFST
SFEQPL	Support facility equipment life	years	INPUT, OUTPUT, PROCED, SURFST
SFLBRC	Support facility unit labor cost	\$/man-year	INPUT, PROCED, SURFST
SFLBRR	Support facility unit labor requirement	man-years/facility/ shift	INPUT, PROCED, SURFST
SFMATC	Support facility unit material cost	\$/material unit	INPUT, PROCED, SURFST
SFMATU	Support facility unit material requirements	material units/ facility	INPUT, PROCED, SURFST
SFP	Support facility electrical load	kW	INPUT, PROCED, UTILITY
SFPPOW	Support facility power requirements	kWh	UTILITY
SFSP	Spent fuel storage electrical load	kW	INPUT, PROCED, UTILITY
SFSPOW	Spent fuel storage power requirement	kWh	UTILITY
SFTC	Fraction of shift operated - CH waste	--	PROCED, WASTOP
SFTDD	Shaft design diameter	meters	INPUT, MINDEV, OUTPUT, POSTOP, PROCED, SHAFT

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
SFTHE	Hoisting equipment cost	\$	INPUT, OUTPUT, PROCED, SHAFT
SFTITL	Support facility name	--	INPUT, OUTPUT, PROCED
SFTLC	Shaft lining cost	\$/meter	OUTPUT, PROCED, SHAFT
SFTLD	Shaft lined depth	meters	INPUT, OUTPUT, PROCED, SHAFT
SFTNUM	Shaft number	--	HUB, INPUT, OUTPUT, POSTOP, PROCED, SHAFT, WASTOP
SFTR	Fraction of shift operated - RH wastes	--	PROCED, WASTOP
SFTREQ	Preliminary shift requirements	no. of shifts	WASTOP
SFTSC	Shaft sinking cost	\$/meter	OUTPUT, PROCED, SHAFT
SFTSS	Underground shaft station construction cost	\$	INPUT, OUTPUT, PROCED
SFTWC	Shaft water control cost	\$	OUTPUT, PROCED, SHAFT
SFTXD	Shaft excavation depth	meters	INPUT, MINDEV, OUTPUT, PROCED, SHAFT
SFTXR	Shaft incremental excavation radius	meters	INPUT, MINDEV, OUTPUT, POSTOP, PROCED, SHAFT
SHAFTX	Rock excavated in shaft sinking	tonnes	MINDEV, PROCED
SHCFAC	shift cost factor	1 + fraction	INPUT, PROCED, WASTOP
SHCPY	Shaft cost per year	\$/year	HUB, PREOP, PROCED
SHDFC	Total cost per shaft	\$/shaft	HUB, OUTPUT, PROCED, SHAFT
SIZE	Repository size	acres	INPUT, OUTPUT, PROCED, UTILITY, WASTOP
SKED	Surface facility construction schedule (dummy variable)	--	HUB
SKFUNC	Shaft sinking cost function	\$/ft of depth	POSTOP, PREOP, SHAFT, SKFUNC

RECON VARIABLE LISTING (Contd)

<u>Variable</u> <u>Name</u>	<u>Description</u>	<u>Units</u>	<u>Location</u>
SLBR	Number of shifts per day worked by support personnel	--	INPUT, PROCED, SURFST
SLCU	Unit repository costs	\$/kgHM, \$/m ³ , \$/ package	HUB, PROCED
SLEETH	Sleeve thickness	meters	INPUT, PROCED, WASTOP
SLEVCS	Sleeve cost	\$	HOLMC
SLEVOR	Sleeve outside radius	meters	PROCED, WASTOP
SMNDWT	Total mined rock mass by waste type	tonnes	PROCED, WAFAM
SOA	Surface operations area	acres	INPUT, OUTPUT, PROCED, SURFST
SOTBKF	Annual supplemental backfill required	tonnes	MINDEV, OUTPUT, PROCED, ROCKUP
SPMCAP	Packaging module capacity by waste type	receiving units	WASTOP
SPUC	Site preparations cost	\$ thousands/acre	INPUT, OUTPUT, PROCED, SURFST
SRHLBR	Storage and rock handling labor	man-years/year	HUB, PROCED, ROCKOP
SRHPKG	Total RH packages	package units	WAFAM
SRHMAT	Storage and rock-handling materials	material units/year	HUB, PROCED, ROCKOP
SRHSHP	Annual RH waste shipments	shipments/year	PROCED, RECEVE
SRKBKF	Annual rock mass backfilled	tonnes/year	MINDEV, OUTPUT, PROCED, ROCKOP
SRKHST	Annual rock mass hoisted	tonnes/year	MINDEV, OUTPUT, PROCED, ROCKOP, SHAFT
SRKMND	Annual rock mass mined	tonnes/year	MINDEV, OUTPUT, PROCED, WAFAM
SRM	Total rock mass mined	tonnes	MINDEV, PROCED ROCKOP
SRMCAP	RH waste-receiving module capacity	waste units/year	WASTOP
SRMF	Total rooms filled with waste in last operation year	rooms	WASTOP
SRMFLD	Annual rooms filled	rooms	PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
SRMM	Annual rock mass mined for all waste types	tonnes	MINDEV, PROCED, ROCKOP
SRMWT	Total rooms filled with waste by waste type	rooms	PROCED, WASTOP
SRRMC	Shift requirements for CH receiving module	shifts	MINDEV, OUTPUT, PROCED, SURFST, UTILITY, WASTOP
SRRMR	Shift requirements for RH receiving module	shifts	MINDEV, OUTPUT, PROCED, ROCKOP, SURFST, UTILITY, WASTOP
SRSFTC	Shift requirements for CH waste shaft	shifts	WASTOP
SRSFTR	Shift requirements for RH waste shaft	shifts	WASTOP
SS	Surface storage mined rock capacity	tonnes	MINDEV
SSCON1	Shaft sealing function constant 1	--	INPUT, POSTOP, PROCED
SSCON2	Shaft sealing function constant 2	--	INPUT, POSTOP, PROCED
SSDF	Shaft sealing cost distribution over time	--	INPUT, POSTOP, PROCED
SSFCST	Total support facility capital costs	\$	OUTPUT
STARTC	Startup costs	\$/year	HUB, PREOP, PROCED
STEAM	Annual steam requirement allocated by waste type	10 ³ lbs	OUTPUT, PROCED, UTILITY
STMC	Unit steam cost	\$/10 ³ lbs/year	INPUT, PROCED, UTILITY
STMCST	Annual steam cost	\$/year	OUTPUT, PROCED, UTILITY
STPCT	Percentage of field costs used for startup costs	--	INPUT, PREOP, PROCED
SUD	Diesel fuel requirement - surface use	10 ³ liters/day	INPUT, PROCED, UTILITY
SUMBKF	Sum of rock mass backfilled	tonnes	HUB, OUTPUT, PROCED
SUMCPK	Annual waste packages processed for all waste types	waste packages	PROCED, WASTOP
SUMCRC	Total annual waste units received	--	PROCED, WASTOP
SUMIND	Total rock mass mined	tonnes	PROCED, WAFAM

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
SUMMET	Total packages emplaced by emplacement method and waste type	--	PROCED, WAFAM
SUMREC	Total waste units processed	waste units	WAFAM
SUMRPK	Annual RH waste packages processed	package units	PROCED, WASTOP
SUMRRC	Annual RH receiving units processed	waste units	PROCED, WASTOP
SUMRSH	Total RH waste shipments	shipments	WAFAM
SUMSHC	Total waste shipments	shipments	WAFAM
SUMJTL	Total utility costs	\$	WAFAM
SUPC	Annual CH waste packages processed	package units	WASTOP
SUPR	Yearly RM waste packages processed	package units	WASTOP
SURC	Yearly CH receiving units processed	waste units	WASTOP
SURCST	Annual surveillance cost	\$/year	INPUT, POSTOP, PROCED
SURF	Rock mass stored on surface (dummy variable)	tonnes	MINDEV
SURFDC	Unit surface handling and storage cost	\$/tonne	HUB, INPUT, PROCED
SURR	Yearly RH receiving units processed	waste units	WASTOP
SURVC	Total discounted surveillance cost	\$	POSTOP
SURVCT	Surveillance cost by year and waste type	\$	HUB, POSTOP, PROCED
T	Dummy variable	--	HOLMC
TA	Temporary storage variable for printing various output variables	--	OUTPUT
TACCST	Total annual repository cost	\$	OUTPUT, PROCED
TAECS	Total architect-engineer costs allocated by waste type	\$	HUB, OUTPUT, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
TALBCT	Total labor cost	\$	HUB, OUTPUT, PROCED
TANF	Near-field total area	acres	PROCED, WASTOP
TB	Temporary storage variable for printing various output variables	--	OUTPUT
TBOCST	Backfilling and Decommission cost category subtotal by waste type	--	HUB, OUTPUT, PROCED
TBFCST	Total backfilling cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TBKCT	Total backfilling cost	\$	HUB
TC	Temporary storage variable for printing various output variables	--	OUTPUT
TCCAP	Truck container capacity	waste units/cask	INPUT, OUTPUT, PROCED, RECEVE, WASTOP
TCCHRM	Total cost of CH receiving modules	\$	OUTPUT, PROCED, RECEVE
TCLAND	Land purchase cost	\$	INPUT, PREOP, PROCED
TCLICE	Licensing cost	\$	INPUT, PREOP, PROCED
TCNCST	Total contingency costs by waste type	\$	HUB, OUTPUT, PROCED
TCPCLN	Total central pillar corridor length	meters	INPUT, MINDEV, PROCED, ROCKOP, UTILITY
TCRHPM	Total cost of RH packaging modules	\$	OUTPUT, PROCED, RECEVE
TCRHRM	Total cost of RH receiving modules	\$	OUTPUT, PROCED, RECEVE
TD	Temporary storage variable for printing various output variables	--	OUTPUT
TDCCST	Total decommissioning costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TDWI	Heat density per waste unit	kW/waste unit	INPUT, OUTPUT, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
TE	Temporary storage variable for printing various output variables	--	OUTPUT
TECAPC	Total capital costs associated with emplacement excavation	\$	HUB, OUTPUT, PROCED
TEEEC	Total emplacement excavation equipment costs by emplacement method	\$	HUB, OUTPUT, PROCED
TEKNEK	Mining method	--	INPUT, OUTPUT, PROCED
TEMCST	Total emplacement cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TEQPT	Total emplacement excavation equipment cost	\$	HUB, OUTPUT, PROCED
TEXCST	Total emplacement excavation cost by waste type	\$	HUB, OUTPUT, PROCED
TF	Temporary storage variable for printing various output variables	--	OUTPUT
TG	Temporary storage variable for printing various output variables	--	OUTPUT
TH	Temporary storage variable for printing various output variables	--	OUTPUT
THEET	Total repository heat load	kilowatts	WASTOP
THSCST	Total rock hoisting cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TI	Today's time	--	HUB, OUTPUT, PROCED
TITLE	Title	--	INPUT, OUTPUT, PROCED
TLCCST	Total licensing cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TLDCST	Total land cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TMATCT	Annual materials costs for waste operations	\$/year	OUTPUT, PROCED, WASTOP
TMINCT	Total rock excavation costs	\$	HUB

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
TNFTA	Total near-field thermal area	acres	WASTOP
TNPT1	Rock skip capacity for rock hoisting shaft	tonnes	INPUT, MINDEV, OUTPUT, PROCED, ROCKOP
TNPT2	Rock skip capacity for men and materials shaft	tonnes	INPUT, MINDEV, OUTPUT, PROCED, ROCKOP
TOCST	Total waste operations costs	\$	INPUT, PROCED SURFST
TODCST	Total offsite disposal cost allocated by waste type	\$	INPUT, PROCED SURFST
TOECST	Transportation operations unit equipment cost	\$/equipment unit	INPUT, PROCED, WASTOP
TOEQPC	Transportation operations equipment capacity	packages/equipment unit/shift	INPUT, PROCED, WASTOP
TOEQPL	Transportation operations equipment life	packages	INPUT, OUTPUT, PROCED, WASTOP
TOLBRC	Transportation operations unit labor cost	\$/man-year	INPUT, PROCED
TOLBRR	Transportation operations unit labor requirement	man-years/equipment unit	INPUT, PROCED, WASTOP
TOMATC	Transportation operations unit material cost	\$/material unit	INPUT, PROCED, WASTOP
TOMATU	Transportation operations unit material requirements	material unit/package	INPUT, PROCED
TOMCST	Total rock excavation cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TONPAR	Surface rock storage density	tonnes/acre	INPUT, MINDEV, PROCED
TONPT	Dummy variable for rock hoisting shaft skip capacity	--	OUTPUT
TOPCST	Total waste operations cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TOTMCL	Total main corridor length	meters	INPUT, PROCED, WASTOP
TOTSFC	Total facility capital cost	\$	OUTPUT, PROCED
TP	Total rock mass backfilled	tonnes	REPLAS, ROCKOP

RECON VARIABLE LISTING (Contd)

<u>Variable Name</u>	<u>Description</u>	<u>Units</u>	<u>Location</u>
TPKCST	Total packaging operations costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TPYMM	Annual rock holsting capacity for men and materials shaft	tonnes	SHAFT
TPYMP	Annual rock holsting capacity for rock holsting shaft	tonnes	SHAFT
TRBKF	Total material backfilled	tonnes	HUB
TRCAPC	Transportation capital cost	--	HUB, PROCED, SURFST
TRCC	Total rock excavation and handling costs by rock operation	\$	OUTPUT, PROCED
TRCCST	Total receiving operations costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TRCHWD	Trench width	meters	INPUT, PROCED, WASTOP
TRCLBR	Transportation labor requirement	man-years	PROCED, WASTOP
TRCST	Annual transport costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TREC	Replacement equipment costs by rock operation	\$	HUB, OUTPUT, PROCED
TREM	Total back mass remaining to be backfilled	tonnes	ROCKOP
TREQCT	Annual transportation equipment cost	\$/year	HUB, OUTPUT, PROCED, WASTOP
TREQPC	Transportation equipment capacity (dummy)	packages/year	HUB, PROCED, WASTOP
TRFILD	Total rooms filled with waste	--	MINDEV
TRHCT	Total rock holsting cost	\$	HUB
TRHSTD	Total rock hoisted	tonnes	HUB
TRKMND	Total rock mined	tonnes	HUB
TRLBCT	Transportation labor cost	\$	HUB, PROCED, WASTOP
TRM	Variable for storing total rock mined over various time periods	tonnes	MINDEV
TRMATC	Transportation materials cost	\$	HUB, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
TRMATR	Transportation materials requirement	material units	PROCED, WASTOP
TRMTCT	Annual transportation materials cost	\$/year	OUTPUT, PROCED, WASTOP
TRNLBR	Transport labor required by waste type and time	man-years	HUB, PROCED, WASTOP
TRNSPT	Number of transporters	--	HUB, OUTPUT, PROCED, WASTOP
TRRLBR	RH waste transport labor by waste type and time	man-years	PROCED, WASTOP
TRSHCT	Total rock surface handling cost	\$	HUB
TRSHP	Total remote-handled waste shipments received	--	PROCED, RECEVE
TSFCST	Total surface facility capital costs	\$	HUB, OUTPUT, PROCED
TSFEC	Support facility equipment replacement cost by facility type	\$	OUTPUT, PROCED, SURFST
TSH	Total waste shipments received	--	OUTPUT
TSHCST	Total shaft construction cost by waste type	\$	HUB, OUTPUT, PROCED
TSHPCN	Total cask shipments	shipments	OUTPUT, PROCED, RECEVE, UTILITY, WAFAM
TSLCST	Total shaft sealing cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSPCST	Total site preparation cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSSCST	Total surface handling cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSUBCN	Total facility construction cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSUBRO	Total rock operation cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSUCST	Total startup cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TSURVC	Annual surveillance cost	\$	OUTPUT, POSTOP, PROCED
TSVCST	Total surveillance cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TTCAPC	Total transport capital cost	\$	HUB, OUTPUT, PROCED

RECON VARIABLE LISTING (Contd)

A.36

Variable Name	Description	Units	Location
TTEC	Transport equipment cost by waste handling category	\$	HUB, OUTPUT, PROCED
TTI	Temporary storage variable for printing various cost totals	--	OUTPUT
TTRCST	Total transport cost allocated by waste type	\$	HUB, OUTPUT, PROCED
TTSH	Total waste shipments by waste type	--	OUTPUT
TTTK	Average receiving facility turnaround time per truck cask	days	INPUT, PROCED, WASTOP
TTTR	Average receiving facility turnaround time per rail cask	days	INPUT, PROCED, WASTOP
TUCAPC	Total underground facility capital cost	\$	HUB, OUTPUT, PROCED
TUEC	Emplacement equipment cost by waste handling category	\$	HUB, OUTPUT, PROCED
TUFCST	Total underground facility construction cost by waste type	\$	HUB, OUTPUT, PROCED
TUTCST	Total support operations costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TWEC	Receiving facility equipment cost by waste handling category	\$	HUB, OUTPUT, PROCED
TWOEQC	Annual waste operations equipment cost	\$	HUB, OUTPUT, PROCED
TWOPCT	Annual support operations costs allocated by waste type	\$	HUB, OUTPUT, PROCED
TWTCST	Total repository cost allocated by waste type	\$	HUB, OUTPUT, PROCED
UAECST	Unit cost of A-E services	\$/unit	HUB, OUTPUT, PROCED
UBDCST	Unit cost for all backfilling and decommissioning operations	\$/unit	HUB, OUTPUT, PROCED
UBFCST	Unit cost of backfilling	\$/unit	HUB, OUTPUT, PROCED
UBFRMS	Unbackfilled rooms	--	MINDEV, PROCED
UBFRPY	Unbackfilled rooms per year	--	MINDEV, PROCED, UTILITY
UBKVOL	Unbackfilled volume	³ m	MINDEV, PROCED, ROCKOP

RECON VARIABLE LISTING (Contd)

Variable			
Name	Description	Units	Location
UCNCST	Unit cost of contingencies	\$/unit	HUB, OUTPUT, PROCED
UDCCST	Unit cost of decommissioning	\$/unit	HUB, OUTPUT, PROCED
UEMCST	Unit cost of emplacement operations	\$/unit	HUB, OUTPUT, PROCED
UEXCST	Unit cost of emplacement excavation operations	\$/unit	HUB, OUTPUT, PROCED
UFCAPC	Underground facility capital costs	\$/year	HUB, PROCED, SURFST
UGD	Diesel fuel requirement - underground	10 ³ liters/package	INPUT, PROCED, UTILITY
UGFC	Total capital costs of underground facilities	\$	HUB, PREOP, PROCED
UGRMOD	Number of underground modules	--	PROCED, WASTOP
UHSCST	Unit cost of rock hoisting operations	\$/unit	HUB, OUTPUT, PROCED
ULCCST	Unit cost of repository licensing	\$/unit	HUB, OUTPUT, PROCED
ULDCST	Unit cost of land acquisition	\$/unit	HUB, OUTPUT, PROCED
UNTMAS	Mass per waste unit	kilograms	HUB, INPUT, PROCED
UOCST	Emplacement operations capital cost	\$ millions	INPUT, PROCED, SURFST
UODCST	Unit cost of offsite rock disposal	\$/unit	HUB, OUTPUT, PROCED
UOECST	Emplacement operations unit equipment cost	\$/equipment unit	INPUT, PROCED, WASTOP
UOEQPC	Emplacement operations equipment capacity	emplacements/ equipment/shift	INPUT, PROCED, WASTOP
UOEQPL	Emplacement operations equipment life	emplacements	INPUT, OUTPUT, PROCED, WASTOP
UOLBRC	Emplacement operations unit labor cost	\$/man-year	INPUT, PROCED, WASTOP
UOLBRR	Emplacement operations unit labor requirement	man-years/equipment unit	INPUT, PROCED, WASTOP
UOMATC	Emplacement operations unit material cost	\$/material unit	INPUT, PROCED, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
UOMATU	Emplacement operations material unit requirement	material unit/ emplacement unit	INPUT, PROCED, WASTOP
UOMCST	Unit cost of mining operations	\$/unit	HUB, OUTPUT, PROCED
UOPCST	Unit cost for all waste operations	\$/unit	HUB, OUTPUT, PROCED
UPC	Power cost	cents/kWh	INPUT, PROCED, UTILITY
UPKCST	Unit cost of waste packaging	\$/unit	HUB, OUTPUT, PROCED
URCCST	Unit cost of waste receiving	\$/unit	HUB, OUTPUT, PROCED
USDLIF	Used equipment life	life units	REPLAS
USFCST	Unit cost of support facilities	\$/unit	HUB, OUTPUT, PROCED
USHCST	Unit cost of shaft construction	\$/unit	HUB, OUTPUT, PROCED
USLCST	Unit cost of shaft sealing	\$/unit	HUB, OUTPUT, PROCED
USPCST	Unit cost of site preparation	\$/unit	HUB, OUTPUT, PROCED
USSCST	Unit cost of surface rock handling and storage	\$/unit	HUB, OUTPUT, PROCED
USUBCN	Unit cost of all capital construction	\$/unit	HUB, OUTPUT, PROCED
USUBRO	Unit cost of all rock operations	\$/unit	HUB, OUTPUT, PROCED
USUCST	Unit cost of startup operations	\$/unit	HUB, OUTPUT, PROCED
USVCST	Unit cost of post-operational surveillance	\$/unit	HUB, OUTPUT, PROCED
UTRCST	Unit cost of transport operations in repository	\$/unit	HUB, OUTPUT, PROCED
UUFCST	Unit cost of underground facility construction	\$/unit	HUB, OUTPUT, PROCED
UUTCST	Unit cost of repository utilities	\$/unit	HUB, OUTPUT, PROCED
UWTCST	Total unit cost for repository	\$/unit	HUB, OUTPUT, PROCED
VARMC	Variable mining cost	\$/tonne	HUB, INPUT, PROCED

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
VENCHT	Ventilation corridor height	meters	PROCED
VENCLN	Ventilation corridor length	meters	PROCED
VENCWT	Ventilation corridor width	meters	PROCED
VNTPOW	Power requirement for ventilation	kW	UTILITY
VOLDW	DemIneralized water volume	10 ³ liters/day	INPUT, PROCED, UTILITY
VOLMND	Rock volume mined	m ³	MINDEV, PROCED
VOLW	Water volume	10 ³ liters/day	INPUT, PROCED, UTILITY
WABATH	Water barrier thickness	meters	INPUT, PROCED, WASTOP
WABOR	Diameter of hole plus water barrier	meters	PROCED, WASTOP
WAF	Dummy waste allocation factor	--	HUB, POSTOP, SURFST
WAFAL	Waste allocation factor based on all wastes	--	HUB, POSTOP, PROCED, SURFST, UTILITY, WAFAM
WAFCN	Waste allocation factor based on canistered waste	--	HUB, PROCED, SURFST, UTILITY, WAFAM
WAFMET	Allocation factor based on packages used in each emplace- ment method	--	PROCED, SURFST, WAFAM
WAFMV	Waste allocation factor based on mined volume	--	HUB, MINDEV, POSTOP, PREOP, ROCKOP, SURFST, WAFAM
WAFMVY	Waste allocation factor based on mined volume by year	--	PROCED, UTILITY, WAFAM
WAFNC	Waste allocation factor based on noncanistered waste	--	HUB, POSTOP, PROCED, SURFST, WAFAM
WAFRHP	Waste allocation factor based on RH packages	--	HUB, POSTOP, PROCED, WAFAM
WAFRSH	Waste allocation factor based on RH waste shipments	--	PROCED, WAFAM

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
WAFSHC	Waste allocation factor based on all waste shipments	--	PROCED, WAFAM
WAFUGW	Waste allocation factor based on all waste packages processed	--	HUB, POSTOP, PROCED, WAFAM
WAFUTL	Waste allocation factor based on utility costs	--	PROCED, WAFAM
WATER	Repository water usage requirement	10 ⁶ liters	OUTPUT, PROCED, UTILITY
WATERC	Total water cost	\$	OUTPUT, PROCED, UTILITY
WBCSTF	Incremental water barrier cost factor	--	HOLMC
WCCON1	Shaft sinking water control cost constant 1	--	INPUT, PROCED, SHAFT
WCCON2	Shaft sinking water control cost constant 2	--	INPUT, PROCED, SHAFT
WOCST	Waste operations capital cost	\$	HUB, INPUT, PROCED, RECEVE
WOECST	Waste operations unit equipment cost	\$/equipment unit	INPUT, PROCED, WASTOP
WOEQPC	Waste operations unit equipment capacity	waste unit/equipment unit/shift	HUB, INPUT, PROCED, WASTOP
WOEQPL	Waste operations unit equipment life	waste units	INPUT, OUTPUT, PROCED, WASTOP
WOLABR	Waste operations labor requirement	man-years	PROCED, WASTOP
WOLBRC	Waste operations unit labor cost	\$/man-year	INPUT, PROCED, WASTOP
WOLBRR	Waste operations unit labor requirement	man-years/shift/module	INPUT, PROCED, WASTOP
WOMATC	Waste operations unit materials cost	\$/material unit	INPUT, PROCED, WASTOP
WOMATU	Waste operations unit materials requirement	material unit/module	INPUT, PROCED, WASTOP
WOPLBR	Labor requirement for all repository waste operations	man-years	HUB, OUTPUT, PROCED
WRKYR	Days in work year - constant (250)	--	INPUT, MINDEV, PROCED, UTILITY, WASTOP

RECON VARIABLE LISTING (Contd)

Variable Name	Description	Units	Location
WSTSUP	Annual waste units requiring disposal	waste units	INPUT, PROCED, WASTOP
WSTVOL	Waste volume	m ³	HUB, PROCED, WASTOP
WSTYP	Waste type descriptions	--	INPUT, OUTPUT, PROCED
WTHEET	Total repository heat by waste type	kilowatts	PROCED, WASTOP
WTRC	Unit water cost	cents/10 ⁶ liters	INPUT, PROCED, UTILITY
WUPP	Maximum waste units per package	--	HUB, INPUT, PROCED, WASTOP
WVOLPU	Waste volume per waste unit	m ³	INPUT, PROCED, WASTOP
X	Dummy variable	--	HOLMC
XPANFC	Rock expansion factor after mining	fraction	INPUT, MINDEV, PROCED
XRASHO	Extraction ratio (room/room + pillar)	--	INPUT, OUTPUT, PROCED, WASTOP
ZER01	Variable used to zero out common blocks	--	HUB, PROCED
ZER02	Variable used to zero out common blocks	--	HUB, PROCED
ZER03	Variable used to zero out common blocks	--	HUB, PROCED
ZER04	Variable used to zero out common blocks	--	HUB, PROCED
ZER05	Variable used to zero out common blocks	--	HUB, PROCED
ZER06	Variable used to zero out common blocks	--	HUB, PROCED
ZER07	Variable used to zero out common blocks	--	HUB, PROCED
ZER08	Variable used to zero out common blocks	--	HUB, PROCED
ZER09	Variable used to zero out common blocks	--	HUB, PROCED

APPENDIX B

RECON MODEL LISTING

APPENDIX B

RECON MODEL LISTING

Included in this appendix is a listing of the RECON computer program, together with a set of data tables showing the model output. The data in the tables are shown simply for illustration and do not correspond to any actual case.

***** RECON2 PROCED *****

)/83 08:53:06 (2)

C

PARAM PROC

C

REAL NFTL
REAL MSA
REAL MROP
INTEGER RMPILU
INTEGER SFTNUM
CHARACTER*8,DA,TI

C

PARAMETER NY = 60
PARAMETER IO = 6
PARAMETER IN = 5
PARAMETER NW = 4
PARAMETER NWP1 = NW +1
PARAMETER NC = 10
PARAMETER NCR = 6
PARAMETER NS = 3
PARAMETER NST = 7
PARAMETER NDC = 2
PARAMETER NFAC = 20
PARAMETER NRO = 5
PARAMETER NTO = 2
PARAMETER NUO = 2
PARAMETER NWO = 3
PARAMETER NEE = 3
PARAMETER NEO = 5
PARAMETER NYRO = NY+40
PARAMETER PI = 3.1415927
PARAMETER M2ACRE = 4047
PARAMETER ONEMIL = 1000000.
PARAMETER ONETHO = 1000.
PARAMETER NEQP = 24
PARAMETER IZ1 = 3882
PARAMETER IZ2 = 100
PARAMETER IZ3 = 9576
PARAMETER IZ4 = 525
PARAMETER IZ5 = 14004
PARAMETER IZ6 = 2785
PARAMETER IZ7 = 4345
PARAMETER IZ8 = 372
PARAMETER IZ9 = 134
PARAMETER IZ10 = 925
PARAMETER IZ11 = 6232
PARAMETER IZ12 = 2720
PARAMETER IZ13 = 159

C

DIMENSION ZERO1 (IZ1)
COMMON/PARAM/ AREAPP
COMMON/PARAM/ CORARA
COMMON/PARAM/ CORMAS(NW,NC)
COMMON/PARAM/ CORWTH(NCR)
COMMON/PARAM/ CPCMM(NW,NC)
COMMON/PARAM/ CSTOT(NY)
COMMON/PARAM/ DPY

***** RECON2 PROCED *****

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COMMON/PARAM/  DENSTY
COMMON/PARAM/  IDD
COMMON/PARAM/  IMET(NW)
COMMON/PARAM/  ISC
COMMON/PARAM/  ISR
COMMON/PARAM/  IYDOL
COMMON/PARAM/  IYRCON
COMMON/PARAM/  IYRDIS
COMMON/PARAM/  IYRPRO
COMMON/PARAM/KIND(NW)
COMMON/PARAM/  LEAD
COMMON/PARAM/  LL
COMMON/PARAM/  LY
COMMON/PARAM/  LYY
COMMON/PARAM/  MSWICH
COMMON/PARAM/  NPSMWT(NW)
COMMON/PARAM/  NSC
COMMON/PARAM/  NUNPKG(NWP1,NY)
COMMON/PARAM/  NWT
COMMON/PARAM/  PKGLN(NW)
COMMON/PARAM/  PKGPUP(NW)
COMMON/PARAM/  PNLREQ(NW,NY)
COMMON/PARAM/  RECUNT(NWP1,NY)
COMMON/PARAM/  RECUWT(NW)
COMMON/PARAM/  RCKHST(NW,NYRO)
COMMON/PARAM/  RKBKF(NW,NYRO)
COMMON/PARAM/  RKMSH(NW,NY)
COMMON/PARAM/  RRVOL(NW)
COMMON/PARAM/  RMFLD(NWP1,NY+10)
COMMON/PARAM/  RMLN(NW)
COMMON/PARAM/  RMWTH(NW)
COMMON/PARAM/  RPTYP(4)
COMMON/PARAM/  RRCTOT(NY)
COMMON/PARAM/  SFTDD(NST)
COMMON/PARAM/  SFTNUM(NST)
COMMON/PARAM/  SHAFTX(NW)
COMMON/PARAM/  SFTXD(NST)
COMMON/PARAM/  SFTXR(NST)
COMMON/PARAM/  SIZE
COMMON/PARAM/  SRKMND(NY)
COMMON/PARAM/  SRMFLD
COMMON/PARAM/  SRRMC(NY)
COMMON/PARAM/  SRRMR(NY)
COMMON/PARAM/  SUMIND
COMMON/PARAM/  TWOPCT(NWP1,NY)
COMMON/PARAM/  UBFMS
COMMON/PARAM/  VENCLN(NW)
COMMON/PARAM/  VENCHT(NW)
COMMON/PARAM/  VENCWT(NW)
COMMON/PARAM/  VOLMND(NW,NY)
COMMON/PARAM/  WRKYR
COMMON/PARAM/  WSTYP(3,NWP1)
COMMON/PARAM/  WSTVOL(NW,NY)
COMMON/PARAM/  WUPP(NW)
EQUIVALENCE(ZERO1(1),AREAPP)

```

C
END

***** RECON2 PROCED *****

C

C

INCOM PROC

C

```
DIMENSION ZERO2 (I22)
COMMON/INCOM/ BKFLC
COMMON/INCOM/ BLANK
COMMON/INCOM/ CONFAC(4)
COMMON/INCOM/DRATE
COMMON/INCOM/ HDECFC
COMMON/INCOM/ HDLCFC
COMMON/INCOM/ HDMCFC
COMMON/INCOM/ IDET
COMMON/INCOM/ IUMDCM
COMMON/INCOM/ P (NW)
COMMON/INCOM/ PKGDS1(4,NW)
COMMON/INCOM/ PKGDS2(4,NW)
COMMON/INCOM/ PKGDS3(4,NW)
COMMON/INCOM/ NPKPEU(NW)
COMMON/INCOM/ PLACE(4)
COMMON/INCOM/ RCKHC
COMMON/INCOM/ SURFDC
COMMON/INCOM/ SPUC
COMMON/INCOM/ TEKNEK(4)
COMMON/INCOM/ TOMATC(NTO,NW)
COMMON/INCOM/ TOMATU(NTO,NW)
COMMON/INCOM/ UNTMAS(NW)
COMMON/INCOM/ VARMC
COMMON/INCOM/ NBSPPA(NW)
EQUIVALENCE(ZERO2(1),BKFLC)
```

END

C

HUBCOM PROC

C

```
DIMENSION ZERO3 (I23)
COMMON/HUBCOM/ ABCST(NYRO)
COMMON/HUBCOM/ ANBFCT(NYRO)
COMMON/HUBCOM/CONTGY(NW,NYRO,4)
COMMON/HUBCOM/ACONTG(NYRO)
COMMON/HUBCOM/ CSTBKFNW,NYRO)
COMMON/HUBCOM/ CsthstNW,NYRO)
COMMON/HUBCOM/ CSTOSD(NW,NYRO)
COMMON/HUBCOM/ CSTSHS(NW,NYRO)
COMMON/HUBCOM/ DA
COMMON/HUBCOM/ DEPTH
COMMON/HUBCOM/ ECOST(NWP1,NY)
COMMON/HUBCOM/ EMCST(NWP1,NY)
COMMON/HUBCOM/IPMCW(NY)
COMMON/HUBCOM/ IRMCW(NY)
COMMON/HUBCOM/ IRMNW(NY)
COMMON/HUBCOM/ OPMC(NW,NYRO)
COMMON/HUBCOM/ PACST(NWP1,NY)
COMMON/HUBCOM/ PFCST(NW,NY)
COMMON/HUBCOM/ PWF(NYRO)
COMMON/HUBCOM/ RECST(NWP1,NY)
COMMON/HUBCOM/ RFCST(NW,NY)
COMMON/HUBCOM/ SEQCST
```

***** RECON2 PROCED *****

```

COMMON/HUBCOM/ SHCPY(NW,NY)
COMMON/HUBCOM/ SLCU (3,NWP1)
COMMON/HUBCOM/ TACCST(NYR0)
COMMON/HUBCOM/ TAECST(NWP1)
COMMON/HUBCOM/ TBOCST(NWP1)
COMMON/HUBCOM/ TBFCST(NWP1)
COMMON/HUBCOM/ TCNCST(NWP1)
COMMON/HUBCOM/ TDCCST(NWP1)
COMMON/HUBCOM/ TECAPC
COMMON/HUBCOM/ TEQPT
COMMON/HUBCOM/ TEMCST(NWP1)
COMMON/HUBCOM/ TEXCST(NWP1)
COMMON/HUBCOM/ THSCST(NWP1)
COMMON/HUBCOM/ TI
COMMON/HUBCOM/ TITLE (20)
COMMON/HUBCOM/ TOTSF
COMMON/HUBCOM/ TLCCST(NWP1)
COMMON/HUBCOM/ TLDCST(NWP1)
COMMON/HUBCOM/ TODCST(NWP1)
COMMON/HUBCOM/ TOMCST(NWP1)
COMMON/HUBCOM/ TOPCST(NWP1)
COMMON/HUBCOM/ TPKCST(NWP1)
COMMON/HUBCOM/ TPMCST(NWP1)
COMMON/HUBCOM/ TRCCST(NWP1)
COMMON/HUBCOM/ TRCST(NWP1,NY)
COMMON/HUBCOM/ TSFCST(NWP1)
COMMON/HUBCOM/ TSHCST(NWP1)
COMMON/HUBCOM/ TSLCST(NWP1)
COMMON/HUBCOM/ TSPCST(NWP1)
COMMON/HUBCOM/ TSSCST(NWP1)
COMMON/HUBCOM/ TSUBCN(NWP1)
COMMON/HUBCOM/ TSUBRO(NWP1)
COMMON/HUBCOM/ TSUCST(NWP1)
COMMON/HUBCOM/ TSVCS(NWP1)
COMMON/HUBCOM/ TTCAPC
COMMON/HUBCOM/ TTEC(NT0)
COMMON/HUBCOM/ TTRCST(NWP1)
COMMON/HUBCOM/ TUCAPC
COMMON/HUBCOM/ TUFCS(NWP1)
COMMON/HUBCOM/ TUTCS(NWP1)
COMMON/HUBCOM/ TWTCS(NWP1)
COMMON/HUBCOM/ TWOEQC(NY)
COMMON/HUBCOM/ UAECST(NWP1,3)
COMMON/HUBCOM/ UBOCST(NWP1,3)
COMMON/HUBCOM/ UBFCST(NWP1,3)
COMMON/HUBCOM/ UCNCS(NWP1,3)
COMMON/HUBCOM/ UDCCST(NWP1,3)
COMMON/HUBCOM/ UEMCS(NWP1,3)
COMMON/HUBCOM/ UEXCS(NWP1,3)
COMMON/HUBCOM/ UGFC(NW,NC)
COMMON/HUBCOM/ UHSCST(NWP1,3)
COMMON/HUBCOM/ ULCCST(NWP1,3)
COMMON/HUBCOM/ ULDCST(NWP1,3)
COMMON/HUBCOM/ UODCS(NWP1,3)
COMMON/HUBCOM/ UOMCS(NWP1,3)
COMMON/HUBCOM/ UOPCS(NWP1,3)
COMMON/HUBCOM/ UPKCS(NWP1,3)

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***** RECON2 PROCED *****

```
COMMON/HUBCOM/ UPMCST(NWP1,3)
COMMON/HUBCOM/ URCCST(NWP1,3)
COMMON/HUBCOM/ USFCST(NWP1,3)
COMMON/HUBCOM/ USHCST(NWP1,3)
COMMON/HUBCOM/ USLCST(NWP1,3)
COMMON/HUBCOM/ USPCST(NWP1,3)
COMMON/HUBCOM/ USSCST(NWP1,3)
COMMON/HUBCOM/ USUBCN(NWP1,3)
COMMON/HUBCOM/ USUBRO(NWP1,3)
COMMON/HUBCOM/ USUCST(NWP1,3)
COMMON/HUBCOM/ USVCST(NWP1,3)
COMMON/HUBCOM/ UTRCST(NWP1,3)
COMMON/HUBCOM/ UUFCST(NWP1,3)
COMMON/HUBCOM/ UUTCST(NWP1,3)
COMMON/HUBCOM/ UWTCST(NWP1,3)
COMMON/HUBCOM/ WOPLBR(NWP1,NY)
EQUIVALENCE (ZERO3 (1),ABDCST(1))
```

END

```
C
C
C RECCOM PROC
C
```

```
DIMENSION ZERO4 (I24)
COMMON/RECCOM/ NMODCH
COMMON/RECCOM/ NMODRH
COMMON/RECCOM/ RMCWS1(NC)
COMMON/RECCOM/ RMCWS2(NC)
COMMON/RECCOM/ RMNWS1(NC)
COMMON/RECCOM/ RMNWS2(NC)
COMMON/RECCOM/ SRHSHP(NY)
COMMON/RECCOM/ SCHSHP(NY)
COMMON/RECCOM/ TCRHRM
COMMON/RECCOM/ TCCHRM
COMMON/RECCOM/ TCRHPM
COMMON/RECCOM/ TRSHP(NY)
COMMON/RECCOM/ TSHPCN(NW,NY)
EQUIVALENCE (ZERO4 (1),NMODCH)
```

```
C
C END
C
C SOPCOM PROC
C
```

```
DIMENSION ZERO5 (I25)
COMMON/SOPCOM/ AMLBCT(NY)
COMMON/SOPCOM/ ANPAR(NY)
COMMON/SOPCOM/ APLBCT(NY)
COMMON/SOPCOM/ ARLBCT(NY)
COMMON/SOPCOM/ OWLBR(NY)
COMMON/SOPCOM/ ATLBCT(NY)
COMMON/SOPCOM/ AXLBCT(NY)
COMMON/SOPCOM/ EEMATR(NW,NY)
COMMON/SOPCOM/ EEXLBR(NW,NY)
COMMON/SOPCOM/ EEXRKM(NW,NY)
COMMON/SOPCOM/ EMECCT(NY)
COMMON/SOPCOM/ EMEGPC(NW,NY)
COMMON/SOPCOM/ EMLBCT(NW,NY)
```


***** RECON2 PROCED *****

COMMON/SOPCOM/AVLRPA(NY)
COMMON/SOPCOM/ CHRLBR(NY,NS)
COMMON/SOPCOM/CLSEMP(NW)
COMMON/SOPCOM/ CMCAP
COMMON/SOPCOM/CPA
COMMON/SOPCOM/ CRRAIL(NW,NY)
COMMON/SOPCOM/CUMPAR(NY)
COMMON/SOPCOM/ EMHATC(NW,NY)
COMMON/SOPCOM/ EMHTCT(NY)
COMMON/SOPCOM/ EMPLBR(NW,NY)
COMMON/SOPCOM/ EMPMCH(NWP1,NY)
COMMON/SOPCOM/ ERCLBR(NY,NS)
COMMON/SOPCOM/ ERR1BR(NY,NS)
COMMON/SOPCOM/ EQREEX(NW,NY)
COMMON/SOPCOM/ EQREMP(NW,NY)
COMMON/SOPCOM/ EQRPKG(NW,NY)
COMMON/SOPCOM/ EQRREC(NW,NY)
COMMON/SOPCOM/ EQRTN(NW,NY)
COMMON/SOPCOM/ EXEQCT(NY)
COMMON/SOPCOM/ EXEQPC(NW,NY)
COMMON/SOPCOM/ EXLBR (NY,NS)
COMMON/SOPCOM/ EXLBCT(NW,NY)
COMMON/SOPCOM/ EXMACH(NWP1,NY)
COMMON/SOPCOM/ EXMATC(NW,NY)
COMMON/SOPCOM/ EXMTCT(NY)
COMMON/SOPCOM/GXEF
COMMON/SOPCOM/FFHTLD(NW,NY)
COMMON/SOPCOM/FFTL
COMMON/SOPCOM/ FLUMH
COMMON/SOPCOM/HPMIN (NW)
COMMON/SOPCOM/HTLONF(NW,NY)
COMMON/SOPCOM/ HTCPSD
COMMON/SOPCOM/ MTRPSD
COMMON/SOPCOM/ NALSH
COMMON/SOPCOM/ NEHPU (NW,NY)
COMMON/SOPCOM/ NCHRNA
COMMON/SOPCOM/NFTL
COMMON/SOPCOM/NPKGRR(NW,NY)
COMMON/SOPCOM/ NPMRH (NY)
COMMON/SOPCOM/ NRHRMA
COMMON/SOPCOM/ NRMCH (NY)
COMMON/SOPCOM/ NRMRH (NY)
COMMON/SOPCOM/NPPRW(NW,NY)
COMMON/SOPCOM/ NRWSPR(NW)
COMMON/SOPCOM/ OTHATC(NW,NY)
COMMON/SOPCOM/ OTMTCT(NY)
COMMON/SOPCOM/ OVRHDF
COMMON/SOPCOM/ PALBCT(NW,NY)
COMMON/SOPCOM/ PAMTCT(NY)
COMMON/SOPCOM/ PANLEN
COMMON/SOPCOM/PANWTH
COMMON/SOPCOM/ PARQCT(NY)
COMMON/SOPCOM/ PITCH(NW,NY)
COMMON/SOPCOM/ PKEQPC(NW,NY)
COMMON/SOPCOM/ PKGCAP(NW)
COMMON/SOPCOM/ PKGLBR(NW,NY)
COMMON/SOPCOM/ PKMATC(NW,NY)

***** RECON2 PROCED *****

COMMON/SOPCOM/ PKMATR(NW,NY)
COMMON/SOPCOM/ PMCAP
COMMON/SOPCOM/ RCCAP (NW)
COMMON/SOPCOM/ RCEQPC(NW,NY)
COMMON/SOPCOM/ RCHATC(NW,NY)
COMMON/SOPCOM/ RCMATR(NW,NY)
COMMON/SOPCOM/ REEOCT(NY)
COMMON/SOPCOM/ RECLBR(NW,NY)
COMMON/SOPCOM/ RELBCT(NW,NY)
COMMON/SOPCOM/ REMTCT(NY)
COMMON/SOPCOM/ RHPLBR(NY,NS)
COMMON/SOPCOM/ RMCAP
COMMON/SOPCOM/ RHRLBR(NY,NS)
COMMON/SOPCOM/RMPILU(NW)
COMMON/SOPCOM/ SFTC (NS)
COMMON/SOPCOM/ SFTR (NS)
COMMON/SOPCOM/ SHCFAC(NS)
COMMON/SOPCOM/SRMWT(NW)
COMMON/SOPCOM/ SUMCPK(NY)
COMMON/SOPCOM/ SUMCRC(NY)
COMMON/SOPCOM/ SUMEPU(NY)
COMMON/SOPCOM/ SUMRPK(NY)
COMMON/SOPCOM/ SUMRRC(NY)
COMMON/SOPCOM/ TALBCT(NY)
COMMON/SOPCOM/TANF(NW)
COMMON/SOPCOM/ TCCAP (NW)
COMMON/SOPCOM/TDWI(NY,NW)
COMMON/SOPCOM/TMATCT(NY)
COMMON/SOPCOM/ TOCST (NTO)
COMMON/SOPCOM/ TOECST(NTO)
COMMON/SOPCOM/ TOEQPC(NTO)
COMMON/SOPCOM/ TOEQPL(NTO)
COMMON/SOPCOM/ TOLBRC(NTO)
COMMON/SOPCOM/ TOLBRR(NTO)
COMMON/SOPCOM/TOTMCL
COMMON/SOPCOM/ TRCHWD(NW)
COMMON/SOPCOM/ TRCLBR(NY,NS)
COMMON/SOPCOM/ TREOCT(NY)
COMMON/SOPCOM/ TREQPC(NW,NY)
COMMON/SOPCOM/ TRLBCT(NW,NY)
COMMON/SOPCOM/ TRMATC(NW,NY)
COMMON/SOPCOM/ TRMATR(NW,NY)
COMMON/SOPCOM/ TRMTCT(NY)
COMMON/SOPCOM/ TRNLBR(NW,NY)
COMMON/SOPCOM/ TRNSPT(3,NY)
COMMON/SOPCOM/ TRRLBR(NY,NS)
COMMON/SOPCOM/ TTTK (NW)
COMMON/SOPCOM/ TTTR (NW)
COMMON/SOPCOM/ TWEC (NW0)
COMMON/SOPCOM/ UGRMOD(NY)
COMMON/SOPCOM/ WOLABR(NW,NY)
COMMON/SOPCOM/ WOLBRR(NW0)
COMMON/SOPCOM/ WOCST (NW0)
COMMON/SOPCOM/ WOLBRC(NW0)
COMMON/SOPCOM/ WOECST(NW0)
COMMON/SOPCOM/ WOECPL(NW0)
COMMON/SOPCOM/ WOECPC(NW0)

***** RECON2 PROCED *****

```
COMMON/SOPCOM/  WOMATC(NW0,NW)
COMMON/SOPCOM/  WOMATU(NW0,NW)
COMMON/SOPCOM/WSTSUP(NW,NY)
COMMON/SOPCOM/WTHEET(NW)
COMMON/SOPCOM/WVOLPU(NW)
COMMON/SOPCOM/XRASHO(NW)
EQUIVALENCE(ZERO5 (1),AMLBCT(1))
```

C

END

C

C

SSTCOM PROC

C

```
DIMENSION ZERO6 (IZ6)
COMMON/SSTCOM/  CSTSP(NC)
COMMON/SSTCOM/  CSTSF(NY)
COMMON/SSTCOM/ASPC(NW,NY)
COMMON/SSTCOM/  EECAPC(NW,NY)
COMMON/SSTCOM/  OSFC(NW,NY)
COMMON/SSTCOM/  OWQPC(NWP1,NY)
COMMON/SSTCOM/  ROCAPC(NW,NY)
COMMON/SSTCOM/  SFCAPC(NW,NY)
COMMON/SSTCOM/  SFCCST(NW)
COMMON/SSTCOM/  SFCST (NFAC)
COMMON/SSTCOM/  SFEQPC(NW,NY)
COMMON/SSTCOM/  SFEQCT(NY)
COMMON/SSTCOM/  SFLBRC(NFAC)
COMMON/SSTCOM/  SFLBRR(NFAC)
COMMON/SSTCOM/  SFECST(NFAC)
COMMON/SSTCOM/  SFEQPL(NFAC)
COMMON/SSTCOM/  SFHATC(NFAC)
COMMON/SSTCOM/  SFHATU(NFAC)
COMMON/SSTCOM/  SFTITL(12,NFAC)
COMMON/SSTCOM/  SFCS (NC)
COMMON/SSTCOM/  SLBR(NFAC)
COMMON/SSTCOM/  SOA
COMMON/SSTCOM/  TRCAPC(NW,NY)
COMMON/SSTCOM/  TSFEC (NFAC)
COMMON/SSTCOM/  UFCAPC(NW,NY)
EQUIVALENCE(ZERO6(1),CSTSP(1))
```

C

END

C

C

MNDCOM PROC

C

```
DIMENSION ZERO7 (IZ7)
COMMON/MNDCOM/  ANFILE(NY)
COMMON/MNDCOM/  ANCPTY(NY)
COMMON/MNDCOM/  ANNEX(NY)
COMMON/MNDCOM/  BKRATE
COMMON/MNDCOM/  CAREW(NW,NY)
COMMON/MNDCOM/  CORDSC(12,NCR)
COMMON/MNDCOM/CORHT(NCR)
COMMON/MNDCOM/CORLEN(NCR)
COMMON/MNDCOM/  CORYOL(NW,NY)
COMMON/MNDCOM/  CUMFLD(NY)
```

***** RECON2 PROCED *****

```
COMMON/MNDCCM/  DELPHT(NW)
COMMON/MNDCCM/  IHSTFL(NYRO)
COMMON/MNDCCM/  NEYR
COMMON/MNDCCM/  NCOR
COMMON/MNDCCM/  NCORPP(NCR)
COMMON/MNDCCM/  NMMACH(NY)
COMMON/MNDCCM/  MSA
COMMON/MNDCCM/  OFTADC
COMMON/MNDCCM/  OTBKF(NW,NYRO)
COMMON/MNDCCM/  OTHBFL
COMMON/MNDCCM/  OTBDEN
COMMON/MNDCCM/  PCTFIL
COMMON/MNDCCM/  PORMDF(2,NC)
COMMON/MNDCCM/  NEQRPL(NCR,NYRO)
COMMON/MNDCCM/  RKQFFS(NY)
COMMON/MNDCCM/  RKSURF(NYRO)
COMMON/MNDCCM/  RMHMIN
COMMON/MNDCCM/  RMHT(NW)
COMMON/MNDCCM/  RMHATR(NW,NY)
COMMON/MNDCCM/  RMNLBR(NW,NY)
COMMON/MNDCCM/  RMUVOL(NW)
COMMON/MNDCCM/  ROCST (NRO)
COMMON/MNDCCM/  ROLBRC(NRO)
COMMON/MNDCCM/  ROLERR(NRO)
COMMON/MNDCCM/  ROECST(NRO)
COMMON/MNDCCM/  ROEQPL(NRO)
COMMON/MNDCCM/  ROEQPC(NRO)
COMMON/MNDCCM/  ROMATC(NRO)
COMMON/MNDCCM/  ROMATU(NRO)
COMMON/MNDCCM/  RRCHAS(NYRO)
COMMON/MNDCCM/  RRCHST(NYRO)
COMMON/MNDCCM/  RRCHIN(NY)
COMMON/MNDCCM/  RRCOSD(NY)
COMMON/MNDCCM/  RUBKFL(NW)
COMMON/MNDCCM/  SCSKD(NC)
COMMON/MNDCCM/  SOTBKF(NYRO)
COMMON/MNDCCM/  SRKBFK(NYRO)
COMMON/MNDCCM/  SRKHST(NYRO)
COMMON/MNDCCM/  SRH
COMMON/MNDCCM/  SRHM(NW)
COMMON/MNDCCM/  TCPCLN
COMMON/MNDCCM/  TONPAR
COMMON/MNDCCM/  TRCC(6)
COMMON/MNDCCM/  TREC (NRO)
COMMON/MNDCCM/  USFRPY(NY)
COMMON/MNDCCM/  UBKVOL(NW)
COMMON/MNDCCM/  XPANFC
EQUIVALENCE(ZERO7 (1),ANFILD(1))
```

C

END

C

C

WAFCCM PROC

C

```
DIMENSION ZEP08 (I28)
COMMON/WAFCCM/  CFSPCT
COMMON/WAFCCM/  NPKSTM(NY)
```

***** RECON2 PROCED *****

```
COMMON/WAFCON/ CHREC(NW)
COMMON/WAFCON/ RHPKG(NW)
COMMON/WAFCON/ RHREC(NW)
COMMON/WAFCON/ SMNDWT(NW)
COMMON/WAFCON/ WAFAL(NW)
COMMON/WAFCON/ WAFCN(NW)
COMMON/WAFCON/ WAFMET(NW,NEE)
COMMON/WAFCON/ SUMMET(NW,NEE)
COMMON/WAFCON/ SUMET(NEE)
COMMON/WAFCON/ WAFMV(NW)
COMMON/WAFCON/ WAFMVY(NW,NY)
COMMON/WAFCON/ WAFNC(NW)
COMMON/WAFCON/ WAFRHP(NW)
COMMON/WAFCON/ WAFRSH(NW)
COMMON/WAFCON/ WAFSHC(NW)
COMMON/WAFCON/ WAFUGW(NW)
COMMON/WAFCON/ WAFUTL(NW)
EQUIVALENCE(ZERO8(1),CFSPCT)
```

END

C

C

SFTCOM PROC

C

```
DIMENSION ZERO9(1Z9)
COMMON/SFTCOM/ CCCON1
COMMON/SFTCOM/ CCCON2
COMMON/SFTCOM/ IEQTP2
COMMON/SFTCOM/ CSTSHT(NC)
COMMON/SFTCOM/ MXMMRH
COMMON/SFTCOM/ MXMPRH
COMMON/SFTCOM/ NDSMP
COMMON/SFTCOM/ NRBPRM
COMMON/SFTCOM/ NCBPRM
COMMON/SFTCOM/ NPKPTR(NW)
COMMON/SFTCOM/NPKPTC(NW)
COMMON/SFTCOM/ TNPT1
COMMON/SFTCOM/ TNPT2
COMMON/SFTCOM/ SCCON1
COMMON/SFTCOM/ SCCON2
COMMON/SFTCOM/ IEQTP1
COMMON/SFTCOM/ SFCTOT(6)
COMMON/SFTCOM/ SFTHE(NST)
COMMON/SFTCOM/ SFTLC(NST)
COMMON/SFTCOM/ SFTLD(NST)
COMMON/SFTCOM/ SFTSC(NST)
COMMON/SFTCOM/ SFTSS(NST)
COMMON/SFTCOM/SFTWC(NST)
COMMON/SFTCOM/ SHDFC(NST)
COMMON/SFTCOM/ WCCON1
COMMON/SFTCOM/ WCCON2
COMMON/SFTCOM/ IEQTP3
EQUIVALENCE(ZERO9(1),CCCON1)
```

C

END

C

C

PRECOM PROC

***** RECON2 PROCED *****

C

```

DIMENSION ZERO10 (IZ10)
COMMON/PRECOM/ AECON1
COMMON/PRECOM/ AECON2
COMMON/PRECOM/ IEQTP4
COMMON/PRECOM/ AESERV(NW,NY)
COMMON/PRECOM/ CLCDF (NC)
COMMON/PRECOM/ CLNDF (NC)
COMMON/PRECOM/ COSTLD(NW,NC)
COMMON/PRECOM/ COSTLC(NW,NC)
COMMON/PRECOM/ CSTAE (NC)
COMMON/PRECOM/ CSTLND(NC)
COMMON/PRECOM/ CSTLIC(NC)
COMMON/PRECOM/ CSTUGF(NC)
COMMON/PRECOM/ CSTSU (NC)
COMMON/PRECOM/ FLDCST(NW,NC)
COMMON/PRECOM/PRODC(NW,NY)
COMMON/PRECOM/ SCDF (NC)
COMMON/PRECOM/ STARTC(NW,NY)
COMMON/PRECOM/ STPCT
COMMON/PRECOM/ TCLAND
COMMON/PRECOM/ TCLICE
EQUIVALENCE(ZERO10 (1),AECON1)

```

C

END

C

PSTCOM PROC

C

```

DIMENSION ZERO11 (IZ11)
COMMON/PSTCOM/ DBDF(NC)
COMMON/PSTCOM/ DCOMCF
COMMON/PSTCOM/ ANDDCT(NYRO)
COMMON/PSTCOM/ ANSLCT(NYRO)
COMMON/PSTCOM/ BKFLBR(NW,NYRO)
COMMON/PSTCOM/ BKFMAT(NW,NYRO)
COMMON/PSTCOM/ BKSHFT(NYRO)
COMMON/PSTCOM/ NDDC
COMMON/PSTCOM/ DDFRAC
COMMON/PSTCOM/ DDCST (NDC)
COMMON/PSTCOM/ DDLBRC(NDC)
COMMON/PSTCOM/ DDLBRR(NDC)
COMMON/PSTCOM/ DDEOPC(NDC)
COMMON/PSTCOM/ DDMATC(NDC)
COMMON/PSTCOM/ DDTITL(12,NDC)
COMMON/PSTCOM/ DECOMC(NW,NYRO)
COMMON/PSTCOM/ FDDF(NC)
COMMON/PSTCOM/ ITSURV
COMMON/PSTCOM/ NBKF
COMMON/PSTCOM/ REMBKF(NW)
COMMON/PSTCOM/ RKHLBR(NW,NYRO)
COMMON/PSTCOM/ RKHMAT(NW,NYRO)
COMMON/PSTCOM/ SEALCT(NW,NYRO)
COMMON/PSTCOM/ SCCST
COMMON/PSTCOM/ SCLERC
COMMON/PSTCOM/ SCLBRR
COMMON/PSTCOM/ SCEOPC
COMMON/PSTCOM/ SCMATC

```

***** RECGN2 PROCED *****

```
COMMON/PSTCOM/  SCMATU
COMMON/PSTCOM/  SRHLBP(NW,NYRO)
COMMON/PSTCOM/  SRHMAT(NW,NYRO)
COMMON/PSTCOM/  SSDF(NC)
COMMON/PSTCOM/  SS CON1
COMMON/PSTCOM/  SS CON2
COMMON/PSTCOM/  IEQTP5
COMMON/PSTCOM/  SUMBKF(NYRO)
COMMON/PSTCOM/  SURCST
COMMON/PSTCOM/  TSURVC(NYRO)
COMMON/PSTCOM/  SURVCT(NW,NYRO)
EQUIVALENCE(ZERO11 (1),DBDF(1))
```

C

END

C

C

UTLCOM PROC

C

```
DIMENSION ZERO12 (IZ12)
COMMON/UTLCOM/  ACP
COMMON/UTLCOM/  ANUTC(NWP1,NY)
COMMON/UTLCOM/  DIESEL(NWP1,NY)
COMMON/UTLCOM/  DSLC
COMMON/UTLCOM/  DSLCST(NWP1,NY)
COMMON/UTLCOM/  DWTRC
COMMON/UTLCOM/  HEATS
COMMON/UTLCOM/  HROP
COMMON/UTLCOM/  ORS
COMMON/UTLCOM/  QWHP
COMMON/UTLCOM/  POWCST(NWP1,NY)
COMMON/UTLCOM/  POWER (NWP1,NY)
COMMON/UTLCOM/  RAPP
COMMON/UTLCOM/  RAPS
COMMON/UTLCOM/  RED
COMMON/UTLCOM/  RVP
COMMON/UTLCOM/  SFP
COMMON/UTLCOM/  SFSP
COMMON/UTLCOM/  STEAM (NWP1,NY)
COMMON/UTLCOM/  STMC
COMMON/UTLCOM/  STMCST(NWP1,NY)
COMMON/UTLCOM/  SUD
COMMON/UTLCOM/  UGD
COMMON/UTLCOM/  UPC
COMMON/UTLCOM/  VOLDW
COMMON/UTLCOM/  VOLW
COMMON/UTLCOM/  WATER (NWP1,NY)
COMMON/UTLCOM/  WATERC(NWP1,NY)
COMMON/UTLCOM/  WTRC
EQUIVALENCE(ZERO12 (1),ACP)
```

C

END

C

C

UOPCOM PROC

C

```
DIMENSION ZERO13 (IZ13)
COMMON/UOPCOM/  BCKFTH(NW)
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***** RECON2 PROCED *****

```

COMMON/UOPCOM/ CAPLEN(NW)
COMMON/UOPCOM/ CHMTEM(NW)
COMMON/UOPCOM/ EECST (NEO)
COMMON/UOPCOM/ EELPRC(NEO)
COMMON/UOPCOM/ EELERR(NEO)
COMMON/UOPCOM/ EEECS(NEO)
COMMON/UOPCOM/ EEEQPC(NEO)
COMMON/UOPCOM/ EEEQPL(NEO)
COMMON/UOPCOM/ EEMATC(NEO)
COMMON/UOPCOM/ EEMATU(NEO)
COMMON/UOPCOM/ HDCON1
COMMON/UOPCOM/ HDCON2
COMMON/UOPCOM/ NTYP
COMMON/UOPCOM/ HOLD(NW)
COMMON/UOPCOM/ HOLDEL(NW)
COMMON/UOPCOM/ HOLDIA(NW)
COMMON/UOPCOM/HOLXC (NW)
COMMON/UOPCOM/ PKGDIA(NW)
COMMON/UOPCOM/ PKGPRK(NW)
COMMON/UOPCOM/ RCKCST(NW)
COMMON/UOPCOM/ REFBKF(NW)
COMMON/UOPCOM/ REFDEP(NW)
COMMON/UOPCOM/ REFIDIA(NW)
COMMON/UOPCOM/ REFMAT(NW)
COMMON/UOPCOM/ REFSLV(NW)
COMMON/UOPCOM/ SLEETH(NW)
COMMON/UOPCOM/ SLEVOR(NW)
COMMON/UOPCOM/ TEEEC (NEO)
COMMON/UOPCOM/ TUEC (NUO)
COMMON/UOPCOM/ UOCST (NUO)
COMMON/UOPCOM/ UOLPRC(NUO)
COMMON/UOPCOM/ UOLBRR(NUO)
COMMON/UOPCOM/ UOECST(NUO)
COMMON/UOPCOM/ UOEQPL(NUO)
COMMON/UOPCOM/ UOEQPC(NUO)
COMMON/UOPCOM/ UOMATC(NUO,NW)
COMMON/UOPCOM/ UOMATU(NUO,NW)
COMMON/UOPCOM/ WABATH(NW)
COMMON/UOPCOM/ WABOR(NW)
EQUIVALENCE (ZERO13 (1),BCKFTH(1))

```

C
END

C
C
COMMENT PROC

```

C
C ABCC = COST-ADMINISTRATION BUILDING, 10**6 $
C ACCC = COST-AIR-CONDITIONING BUILDING, 10**6 $
C ACP = AIR CONDITIONING POWER, KW
C ALC = ANNUAL LABOR COST, $/YEAR
C AMMC = ANNUAL MAINTINANCE MATERIALS COST, $/YEAR
C APC = ANNUAL PACKING COST, $/YEAR
C BLDMNT = LABOR+COST-MAINTENANCE BUILDING
C BKFLC = BACKFILLING COST, $/CUBIC METER
C CFCON = CASH FLOW - CONSTRUCTION
C CFOPR = CASH FLOW - OPERATING
C CLSEMP = CLOSEST EMBLACEMENT TO CORRIDOR, METERS

```


***** RECON2 PROCED *****

C CORLEN = CORRIDOR LENGTH/ROOM, METERS/ROOM
 C CPA = CENTRAL PILLAR AREA, AREA, ACRES
 C CRPPM = RECEIPTS, WASTE UNITS PER PACKING MODULE PER SHIFT YEAR
 C CRPRM = RECEIPTS, CONTAINER UNITS PER CANISTERED WASTE RECEIVING
 C PER SHIFT YEAR
 C CRRAIL = CONTAINER RECEIPTS BY RAIL, PERCENT
 C CTCC = COST-COOLING TOWER, 10**6 \$
 C DA = TODAY'S DATE
 C DDWS = CANISTERED WASTE SHAFT, DIAMETER METERS
 C DELCHT = DELTA CORRIDOR HEIGHT, METERS
 C DELCWT = DELTA CORRIDOR WIDTH, METERS
 C DELRHT = DELTA ROOM, METERS
 C DENSTY = ROCK DENSITY, TONNES/CUBIC METER
 C DEPTH = MINE DEPTH, METERS
 C DSLC = DIESEL-COST, \$/L
 C DWTRC = DEMINERALIZED WATER-COST, CENTS/10**6 L
 C EBCC = COST-STORAGE AREA EXHAUST BUILDING, 10**6 \$
 C ECRMH = EQUIPMENT COST, RECEIVING MODULE, REMOTE HANDLED WASTE
 C ECRMCH = EQUIPMENT COST, RECEIVING MODULE, CONTACT HANDLED WASTE
 C ECPM = EQUIPMENT COST, PACKING MODULE
 C ECMMS = EQUIPMENT COST, MINED ROCK STORAGE
 C ECWDB = EQUIPMENT COST, WASTE OPERATIONS BUILDING
 C ECADB = EQUIPMENT COST, ADMINISTRATION BUILDING
 C ECMVB = EQUIPMENT COST, MINE VENTILATION BUILDING
 C ECSAE = EQUIPMENT COST, STORAGE AREA EXHAUST
 C ECSP = EQUIPMENT COST, STEAM PLANT
 C ECAC = EQUIPMENT COST, AIR CONDITIONING BUILDING
 C ECFH = EQUIPMENT COST, FIREHOUSE
 C ECMB = EQUIPMENT COST, MAINTENANCE BUILDING
 C ECWH = EQUIPMENT COST, WAREHOUSE
 C ECST = EQUIPMENT COST, SEWAGE TREATMENT
 C ECROB = EQUIPMENT COST, RAIL OPERATIONS BUILDING
 C ECPAS = EQUIPMENT COST, POWER AND SUBSTATION
 C ECUGO = EQUIPMENT COST, UNDERGROUND OPERATIONS
 C EMMC = IMMOBILIZATION MATERIALS, \$/ PACKAGE
 C EMPCON = EMPLACEMENT CONFIGURATION, PACK/ROW
 C EPSUB = LABOR+COST-ELECTRIC POWER SUBSTATION
 C FILRL = FILLER MATERIAL COST, \$/PACKAGE
 C FHCC = COST-FIRE HOUSE, 10**6 \$
 C FIRHSE = LABOR+COST-FIRE HOUSE
 C FLUMM = FRACTION OF LABOR USED FOR MAINTENANCE MATERIALS
 C FXCSKD = FIXED MINING COST CONSTRUCTION SCHEDULE
 C FXMNC = FIXED MINING COST
 C HEATS = STEAM-HEATING, LBS/ACRE OF REPOSITORY
 C HOLMNT = HOLE LINER MATERIAL
 C HOLXC = HOLE EXAVATION COST, \$/HOLE
 C HPMIN = MINIMUM HOLE PITCH, METERS
 C IRMCW = INCREMENTAL RECEIVING MODULE FOR CANISTERED WASTE
 C IRMNW = INCREMENTAL RECEIVING MODULE FOR NON-CANISTERED WASTE
 C IYDOL = DISCOUNT YEAR
 C IYRCON = YEAR IN WHICH CONSTRUCTION BEGINS
 C IYRPRO = YEAR IN WHICH PRODUCTION BEGINS
 C KIND = WASTE TYPE DEFINITION, 1 = CANISTERED, 2 = NON-CANISTERED
 C LY = LAST YEAR OF OPERATION (INDEX)
 C MBCC = COST-MAINTENANCE BUILDING, 10**6 \$
 C MMP = MINING MACHINER POWER, KW/TONNE MINED
 C MROP = MINED ROCK OPERATIONS POWER, KW/ TONNE

***** RECON2 PROCED *****

C MAS = MINED ROCK STORAGE AREA, ACRES
 C NFTL = NEARFIELD THERMAL LOAD, KW/ACRE
 C NMOCW = NUMBER OF RECEIVING MODULES FOR CANISTERED WASTE
 C NMODN = NUMBER OF RECEIVING MODULES FOR NON-CANISTERED WASTE
 C NPAKM = NUMBER OF PACKAGING MODULES, CANISTERED WASTE
 C NWTP = NUMBER OF WASTE TYPES
 C OPCMIN = MINING COST TOTAL
 C OPMC = MINING COST ANNUAL
 C ORS = STEAM-OTHER USE, 10**3 LBS/YEAR
 C OTHRC = OTHER WASTE PACKAGE MATERIAL COST, \$/PACKAGE
 C OVRHDF = OVERHEAD FACTOR
 C OVRPC = OVERPACK COST, \$/PACKAGE
 C OVRTMF = OVERTIME FACTOR
 C OWHP = OTHER WASTE HANDLING BUILDING POWER, KW
 C P = WASTE INPUT CONDITION, 1 = PRE PACKAGED, 2 = NON-PACKAGE
 C PFCST = PACKAGING FACILITY COST, \$/YEAR
 C PKGDS1 = PACKAGE NARRATIVE DISCRIPTION
 C PKGDS2 = PACKAGE NARRATIVE DISCRIPTION
 C PKGDS3 = PACKAGE NARRATIVE DISCRIPTION
 C PKGLN = PACKAGE LENGTH, METERS
 C PLACE = LOCATION OF REPOSITORY
 C PMCC = COST-RECEIVING MODULE-PACKAGING 10**6 \$/MODULE
 C PRICC = PRIMARY CONTAINER COST, \$/PACKAGE
 C PWF = PRESENT WORTH FACTOR
 C RAPP = RECEIVING AND PACKAGING POWER, KW/MODULE
 C RAPS = STEAM-RECEIVING-PACKAGING, 10**3 LBS/YEAR
 C RCCAP = RAIL CONTAINER CAPACITY, WASTE UNITS
 C RCKHC = ROCK HOISTING COST
 C RCKHST = ROCK HOISTED, ANNUAL
 C RED = DIESEL-RAIL ENGINE, 10**3 L/CONTAINER
 C RHCC = COST-MINED MATERIAL HANDLING, 10**6 \$
 C RKBKF = ROCK BACKFILLED, TONNES
 C RKMMSH = ANNUAL MINED ROCK MASS
 C PMCCC = COST-RECEIVING MODULE- CANISTERD 10**6 \$/MODULE
 C RMCSW1 = CANISTERED WASTE RECEIVING MODULE CONSTRUCTION SCHEDULE
 C RMCSW2 = CANISTERED WASTE RECEIVING MODULE CONSTRUCTION SCHEDULE
 C RMLN = ROOM LENGTH, METERS
 C RMNCC = COST-RECEIVING MODULE-NON-CANISTERD 10**6 \$/MODULE
 C RMNSW1 = NON-CANISTERED WASTE RECEIVING MODULE CONSTRUCTION SCHEE
 C RMNSW2 = NON-CANISTERED WASTE RECEIVING MODULE CONSTRUCTION SCHEE
 C RMNSW2 = NON-CANISTERED WASTE RECEIVING MODULE CONSTRUCTION SCHEDULE
 C RMWTH = ROOM WIDTH METERS
 C ROBCC = COST-RAIL OPERATION BUILDING, 10**6 \$
 C RPTYP = REPOSITORY DESCRIPTION
 C RSMIN = MINIMUM ROW SPACING
 C RVP = VENTILATION POWER, KW/ACRE OF REPOSITORY
 C RWSPRM = ROWS PER ROOM
 C SACC = COST-MINED MATERIAL STOCKPILE-PREPARATION 10**3 \$/ACRE
 C SCDAS = SUMMARY COST - DECOMMISSIONING AND SEALING
 C SCOSF = SUMMARY COST - OTHER SURFACE FACILITIES
 C SCPOP = SUMMARY COST - PRE-OPERATIONAL
 C SCSHF = SUMMARY COST - SHAFTS AND HEADFRAMES
 C SCSKD = SHAFT CONSTRUCTION SCHEDULE
 C SCSOP = SUMMARY COST - SURFACE OPERATING
 C SCTOT = SUMMARY COST - TOTALS
 C SCUOD = SUMMARY COST - UNDERGROUND MINE DEVELOPMENT
 C SCUOP = SUMMARY COST - UNDERGROUND OPERATING

***** DECON2 PROCED *****

C SCUTL = SUMMARY COST - UTILITIES
 C SCWPF = SUMMARY COST - WASTE PACKAGING FACILITIES
 C SCWRF = SUMMARY COST - WASTE RECEIVING FACILITIES
 C
 C SFTDD(ST,RP) = SHAFT DESIGN DIAMETER, METERS
 C SFTXR(ST,RP) = INCREMENTAL EXCAVATION RADIUS, METERS
 C SFTXD(ST,RP) = EXCAVATION DEPTH, METERS
 C SFTLD(ST,RP) = LINED DEPTH, METERS
 C SFTSC(ST,RP) = SINKING COST, \$/METER
 C SFTLC(ST,RP) = LINING COST, \$/METER
 C SFTHE(ST,RP) = HOISTING EQUIPMENT COST, \$
 C SFTNUM (ST,RP)
 C WHERE ST= 1 - MEN AND MATERIALS SHAFT
 C WHERE ST= 2 - MINING VENTILATION SHAFT
 C WHERE ST= 3 - CANISTERED WASTE SHAFT
 C WHERE ST= 4 - LOW LEVEL WASTE SHAFT
 C WHERE ST= 5 - DEVELOPMENT EXHAUST SHAFT
 C WHERE ST= 6 - STORAGE EXHAUST SHAFT
 C WHERE RP= REPOSITORY TYPE INDEX
 C
 C SFCS = SURFACE FACILITY COMPLETION SCHEDULE
 C SFP = SUPPORT FACILITY POWER, KW
 C SFSP = SPENT FUEL STORAGE POWER, KW
 C SIZE = REPOSITORY SIZE, ACRES
 C SOA = SITE OPERATIONS AREA, ACRES
 C SHCPY = SHAFT COST PER YEAR
 C SHDFC = SHAFT AND HEAD FRAME UNIT COST
 C SPCC = COST-STEAM PLANT, 10**6 \$
 C SPSCC = COST-STAND BY POWER SUBSTATION 10**6 \$
 C SPUC = COST-SITE PREPARATION, 10**3 \$/ACRE
 C STCC = COST-SEWAGE TREATMENT, 10**6 \$
 C STMC = STEAM-COST, CENTS/10**3 LBS/YEAR
 C SUD = DIESEL-SURFACE USE, 10**3 L/DAY
 C SURFOC = SURFACE FACILITY DISPOSAL COST
 C TCCAP = TRUCK CONTAINER CAPACITY, UNITS
 C TDWI = RECEIVING FACILITY, KW/WASTE UNIT
 C TEKNEK = MINING METHOD
 C TI = TODAYS TIME
 C TITLE = TITLE
 C TRMND = TOTAL ROCK MINED, TONNES
 C TRNHT = TRANSPORTER HEIGHT, METERS
 C TRNWH = TRANSPORTER WIDTH, METERS
 C UGD = DIESEL-UNDERGROUND, 10**3 L/PACKAGE
 C UPC = POWER COST, CENTS/KWH
 C VARMC = VARIABLE MINING COST
 C VBCC = COST-MINED VENTILATION BUILDING, 10**6 \$
 C VOLDW = DEMINERALIZED WATER-VOLUME, 10**3 L/DAY
 C VOLW = WATER-VOLUME, 10**3 L/DAY
 C WAFAL = WASTE ALLOCATION FACTOR FOR ALL WASTES
 C WAFCH = WASTE ALLOCATION FACTOR FOR CANISTERED WASTE
 C WAFNC = WASTE ALLOCATION FACTOR FOR NON-CANISTERED WASTE
 C WAFMV = WASTE ALLOCATION FACTOR FOR MINED VOLUME
 C WCSC = COST-WATER CONTROL, DURING SINKING 10**6 \$/DIAMETER/SHAF
 C WHCC = COST-WAREHOUSE, 10**6 \$
 C WOBCC = COST-WASTE OPERATION BUILDING, 10**6 \$
 C WSTYP = FACILITY PARAMETER DESCRIPTIONS
 C WICC = COST-WATER TANKS, 10**6 \$

***** RECON2 PROCED *****

C WTRC = WATER-COST, CENTS/10**6 L
C WUPP = MAXIMUM WASTE UNITS/PACKAGE
C XRASHO = ROOM / (ROOM + PILLAR)
C
END

ERRORS: NONE. TIME: 3.169 SEC. IMAGE COUNT: 915

***** RECON2 HUB *****

33 15:29:14 (0)

C

```
INCLUDE PARAM
INCLUDE INCCM
INCLUDE RECCOM
INCLUDE SOPCOM
INCLUDE SSTCOM
INCLUDE MNDCOM
INCLUDE SFTCOM
INCLUDE HUBCOM
INCLUDE PRECOM
INCLUDE PSTCOM
INCLUDE UTLCOM
INCLUDE UOPCOM
INCLUDE WAFCOM
```

C

```
CALL DIVSET(1000)
DO 1 I=1,IZ1
ZER01 (I) = 0.0
1 CONTINUE
DO 2 I=1,IZ2
ZER02 (I) = 0.0
2 CONTINUE
DO 3 I=1,IZ3
ZER03 (I) = 0.0
3 CONTINUE
DO 4 I=1,IZ4
ZER04 (I) = 0.0
4 CONTINUE
DO 5 I=1,IZ5
ZER05 (I) = 0.0
5 CONTINUE
DO 6 I=1,IZ6
ZER06 (I) = 0.0
6 CONTINUE
DO 7 I=1,IZ7
ZER07 (I) = 0.0
7 CONTINUE
DO 8 I=1,IZ8
ZER08 (I) = 0.0
8 CONTINUE
DO 9 I=1,IZ9
ZER09 (I) = 0.0
9 CONTINUE
DO 10 I=1,IZ10
ZER010 (I) = 0.0
10 CONTINUE
DO 11 I=1,IZ11
ZER011 (I) = 0.0
11 CONTINUE
DO 12 I=1,IZ12
ZER012 (I) = 0.0
12 CONTINUE
DO 13 I=1,IZ13
ZER013 (I) = 0.0
13 CONTINUE
```

```

C
C
C
    CALL DATE(DA)
    CALL TIME(TI)
C
C
    CALL INPUT
    IDL=IYRCON-IYDOL
    DO 25 I=1,NYRO
    II = IDL + I
    PMF(I)=1./((1.+DRATE)**II)
25 CONTINUE
C
C
    CALL WASTOP
C WASTE OPERATIONS
C
C
    DO 3000 I=1,LY
    DO 3010 K=1,NWT
    WOPLBR(K,I) = RECLBR(K,I) + PKGLBR(K,I) + TRNLBR(K,I) + EMPLBR(K,I)
    1 + EEXLPR(K,I)
    WOPLBR(NWP1,I) = WOPLBR(NWP1,I) + WOPLBR(K,I)
    TRNSPT(3,I) = TRNSPT(1,I) + TRNSPT(2,I)
    EMPMCH(NWP1,I) = EMPMCH(NWP1,I) + EMPMCH(K,I)
    EXMACH(3,I) = EXMACH(1,I) + EXMACH(2,I)
3010 CONTINUE
3000 CONTINUE
    DO 3200 I=1,LY
    DO 3200 K=1,NWT
    RECST(K,I) = RELBCT(K,I) + RCMATC(K,I) + RCEQPC(K,I)
    PACST(K,I) = PALBCT(K,I) + PKMATC(K,I) + PKEQPC(K,I)
    TRCST(K,I) = TRLBCT(K,I) + TRMATC(K,I) + TREQPC(K,I)
    EMCST(K,I) = EMLBCT(K,I) + EHMATC(K,I) + EMEQPC(K,I)
    ECOST(K,I) = EXLBCT(K,I) + EXMATC(K,I) + EXEQPC(K,I)
    TWOPCT(K,I) = RECST(K,I) + PACST(K,I) + TRCST(K,I) + EMCST(K,I)
    1 + ECOST(K,I)
    RECST(NWP1,I) = RECST(NWP1,I) + RECST(K,I)
    PACST(NWP1,I) = PACST(NWP1,I) + PACST(K,I)
    TRCST(NWP1,I) = TRCST(NWP1,I) + TRCST(K,I)
    EMCST(NWP1,I) = EMCST(NWP1,I) + EMCST(K,I)
    ECOST(NWP1,I) = ECOST(NWP1,I) + ECOST(K,I)
3200 CONTINUE
    DO 745 K=1,NWT
    DO 745 I=1,LY
    RKMSH(K,I) = RKPSH(K,I) + EEXRKM(K,I)
745 CONTINUE
C
C MINE DEVELOPMENT
C
    CALL MINDEV
C
C
    CALL RECEVE
C
C RECEIVING

```

```

C      DO 405 I=1,NY
      IRMCW(I) = 0
      IRMNW(I) = 0
      DO 405 K=1,NWT
      PFCST(K,I) = 0.0
      RFCST(K,I) = 0.0
405  CONTINUE
C
C
      LLP1 =LL + 1
      DO 100 K = 1,NWT
      DO 75 I=LLP1,LY
      IF(KIND(K).EQ.2) GO TO 45
      IRMCW(I)=NRMH(I)- NRMH(I-1)
      IF(IRMCW(I).LE.0) GO TO 40
      III = 0
      IB = I - LL
      IE = I - 1
      DO 30 II = IB,IE
      III = III + 1
      SKED = RMCWS1(III)
      IF(I.GT.LL) SKED = RMCWS2(III)
      RFCST(K,II) = IRMCW(I) * WOCST(1) * SKED * WAFCN(K)
      + + RFCST(K,II)
30  CONTINUE
40  CONTINUE
      IPMCW(I) = NPMRH(I) - NPMRH(I-1)
      IF(IPMCW(I).LE.0) GO TO 75
      III = 0
      IB = I - LL
      IE = I - 1
      DO 42 II = IB,IE
      III = III + 1
      SKED = RMCWS1(III)
      IF(I.GT.LL) SKED = RMCWS2(III)
      PFCST(K,II) = IPMCW(I) * WOCST(3) * SKED * WAFCN(K)
      + + PFCST(K,II)
42  CONTINUE
      GO TO 75
45  CONTINUE
      IRMNW(I)=NRMCH(I)- NRMCH(I-1)
      IF(IRMNW(I).LE.0) GO TO 75
      III = 0
      IB = I - LL
      IE = I - 1
      DO 50 II= IB,IE
      III = III + 1
      SKED = RMNWS1 (III)
      IF(I.GT.LL) SKED = RMNWS2(III)
      RFCST(K,II) = RFCST(K,II) + IPMNW(I) * WOCST(2)*SKED*WAFNC(K)
50  CONTINUE
75  CONTINUE
100 CONTINUE
C
C
C

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```

C  SHAFT CONSTRUCTION
C
C      CALL SHAFT
C
DO 750 I=1,LL
CSTSHT(I) = 0.
DO 750 K=1,NW
SHCPY(K,I) = 0.0
750 CONTINUE
DO 770 K=1,NWT
DO 770 L=1,NST
DO 770 I=1,LL
WAF = WAFMV(K)
IF(L.EQ.1) WAF = WAFAL(K)
IF(L.EQ.3) WAF = WAFRHP(K)
IF(L.EQ.3.AND.SFTNUM(4).EQ.0) WAF = WAFUGW(K)
IF(L.EQ.4) WAF = WAFNC(K)
SHCPY(K,I)=SHCPY(K,I)+SFTNUM(L)*SHDFC(L)*SCSKD(I)*WAF
770 CONTINUE
DO 780 K=1,NWT
DO 780 I=1,LL
CSTSHT(I) = SHCPY(K,I) + CSTSHT(I)
780 CONTINUE
C
C      CALL ROCKOP
C
C  ROCK OPERATIONS COST CALCULATIONS
C
LE = NBKF + IDD
C
DO 705 K = 1,NWT
DO 705 I = 1,LE
SUMBKFI(I) = SUMBKFI(I)+PKBKF(K,I)+OTBKF(K,I)
705 CONTINUE
IF(MSWTCH.EQ.0) GO TO 710
NRON = 1
DO 690 I=1,LY
DO 690 K=1,NWT
C
C
C
TRMIND = TRMIND + RMNLBR(K,I)*OVRHDF * ROLBRC(NRON) + PMMATR(K,I)
1 * ROMATC(NRON) + NEQRPL(NRON,I) * ROECST(NRON)
1 * WAFMV(K)
TRKMND = TRKMND + RKMSH(K,I)
690 CONTINUE
C
TRMIND = TRMIND + ROECST(NRON)
C  ROCK HOISTING
C
NRON = 2
DO 695 I=1,LE
DO 695 K=1,NWT
TRHCT = TRHCT + RKHLBR(K,I) * OVRHDF * POLBRC(NRON) + RKHMAT(K,I)
1 * ROMATC(NRON) + NEQRPL(NRON,I) * ROECST(NRON) * WAFMV(K)
TRHSTD = TRHSTD + ABS(ROCKHST(K,I))
695 CONTINUE

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      TRHCT = TRHCT + ROCST(NRON)
C
C  SURFACE ROCK HANDLING
C
      NRON = 3
      DO 700 I=1,LE
      DO 700 K=1,NWT
      TRSHCT = TRSHCT + SPHLBR(K,I)*OVRHDF*ROLBRC(NRON) + SRHMAT(K,I)
      I * ROMATC(NRON) + NEQRPL(NPON,I) * ROECST(NRON) * WAFMV(K)
700 CONTINUE
      TRSHCT = TRSHCT + ROCST(NRON)
      NRON = 5
      DO 702 I=1,LE
      DO 701 K=1,NWT
C
C  BACKFILLING
C
      TBKCT = TBKCT + BKFLBR(K,I) *OVRHDF*ROLBRC(NRON) + BKFMAT(K,I)
      I * ROMATC(NRON) + NEQRPL(NPON,I) * ROECST(NRON) * WAFMV(K)
701 CONTINUE
      TRBKF = TRBKF + SUMBKF(I)
702 CONTINUE
      TBKCT = TBKCT + ROCST(NPON)
      VARMC = THINCT / TRKMND
      RCKHC = TRHCT / TRHSTD
      SURFDC = TRSHCT / TRHSTD
      BKFLC = TBKCT / TRBKF
710 CONTINUE
      DO 730 K=1,NWT
      DO 720 I=1,LY
      OPMC(K,I) = VARMC * RKMSH(K,I)
      CSTHST(K,I) = RCKHC * ABS(RCKHST(K,I))
      CSTSHS(K,I) = SURFDC * ABS(RCKHST(K,I))
      CSTBKF(K,I) = BKFLC * (RKBKF(K,I) + OTBKF(K,I))
      CSTOSD(K,I) = OFTADC * RKOFFS(I) * WAFMV(K)
      RRCMIN(I) = RRCMIN(I) + OPMC(K,I)
      RRCHST(I) = RRCHST(I) + CSTHST(K,I)
      RRCHAS(I) = RRCHAS(I) + CSTSHS(K,I)
      ANBFCT(I) = ANBFCT(I) + CSTBKF(K,I)
      RRCOSD(I) = RRCOSD(I) + CSTOSD(K,I)
720 CONTINUE
      LB =LY +1
      DO 725 I=LB,LE
      CSTHST(K,I) = RCKHC * ABS(RCKHST(K,I))
      CSTSHS(K,I) = SURFDC * ABS(RCKHST(K,I))
      CSTBKF(K,I) = BKFLC * (RKBKF(K,I) + OTBKF(K,I))
      RRCHST(I) = RRCHST(I) + CSTHST(K,I)
      RRCHAS(I) = RRCHAS(I) + CSTSHS(K,I)
      ANBFCT(I) = ANBFCT(I) + CSTBKF(K,I)
725 CONTINUE
730 CONTINUE
C
C  UTILITY COSTS
C
      CALL UTILITY
C
C

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```

C      CALL SUPFST
C      SURFACE SITE
C
      DO 3100 I=1,LY
      TWDEQC(I) = REEQCT(I) + PARQCT(I) + TREQCT(I) + EMEQCT(I) +
      1 EXEQCT(I) + SFEQCT(I)
      TALBCT(I) = ARLBCT(I) + APLBCT(I) + ATLBCT(I) + AMLBCT(I) + AXLBCT(I)
      + + OWLBR(I)
3100 CONTINUE
C
C
C      SUM SURFACE OPERATIONS
C
      DO 652 I=1,LL
      DO 652 K=1,NWT
      OSFC(K,I) = SFCAPC(K,I)
      UGFC(K,I) = TRCAPC(K,I) + UFCAPC(K,I) + EECAPC(K,I)
652 CONTINUE
      DO 655 I=1,LY
      DO 655 K=1,NWT
      OSFC(K,I) = RFCST(K,I) + PFCST(K,I) + OSFC(K,I)
      TTCAPC = TTCAPC + TRCAPC(K,I)
      TECAPC = TECAPC + EECAPC(K,I)
      TUCAPC = TUCAPC + UFCAPC(K,I)
      SFCST(K) = SFCST(K) + OSFC(K,I)
      CSTSF(I) = CSTSF(I) + OSFC(K,I)
      OWOPC(K,I) = OWOPC(K,I) + ANUTC(K,I) + SFEQPC(K,I)
      OWOPC(NWP1,I) = OWOPC(NWP1,I) + OWOPC(K,I)
      TWOPCT(K,I) = TWOPCT(K,I) + OWOPC(K,I)
      TWOPCT(NWP1,I) = TWOPCT(NWP1,I) + TWOPCT(K,I)
655 CONTINUE
      DO 660 K=1,NWT
      DO 660 I=1,LL
      CSTUGF(I) = CSTUGF(I) + UGFC(K,I)
660 CONTINUE
C
C
C      PRE-PRODUCTION
C
      CALL PREOP
C
C
C      POST-PRODUCTION
C
      CALL POSTOP
C
C      CALCULATE EQUIPMENT COST SUMMARIES
C
      DO 670 K=1,NWT
      DO 670 I=1,LY
      IF(KIND(K).EQ.2) GO TO 665
      TWEC(1) = TWEC(1) + RCEQPC(K,I)
      TTEC(1) = TTEC(1) + TREQPC(K,I)
      TUEC(1) = TUEC(1) + EMEQPC(K,I)
      GO TO 666

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665 CONTINUE
    TWEC(2) = TWEC(2) + RCEQPC(K,I)
    TTEC(2) = TTEC(2) + TREQPC(K,I)
    TUEC(2) = TUEC(2) + EMEQPC(K,I)
666 CONTINUE
    TWEC(3) = TWEC(3) + PKEQPC(K,I)
    TREC(1) = TREC(1) + NEGRPL(1,I) * WOEQPC(1) * WAFMV(K)
    TEQPT = TEQPT + RCEQPC(K,I) + TREQPC(K,I) + EMEQPC(K,I) + PKEQPC(K,I) +
    1 NEGRPL(1,I) * WOEQPC(1) * WAFMV(K)
670 CONTINUE
    DO 680 K=1,NWT
    DO 680 I=1,LE
    DO 680 NRON=2,NRO
    TREC(NRON) = TREC(NRON) + NEQRPL(NRON,I) * WOEQPC(NRON) * WAFMV(K)
    TEQPT = TEQPT + NEQRPL(NRON,I) * WOEQPC(NRON) * WAFMV(K)
680 CONTINUE
    DO 685 K=1,NWT
    DO 685 I=1,LY
    L = IMET(K)
    IF(IMET(K).EQ.4) L=1
    TEEEC(L) = TEEEC(L) + EQREEX(K,I) * EEEEST(L)
    TEQPT = TEQPT + EQREEX(K,I) * EEEEST(L)
685 CONTINUE
C
C   CONTINGENCY
C
C   CALCULATE CONTINGENCY COSTS FOR PREOPERATIONS
C
    N = 1
    DO 2000 I=1,LL
    DO 2000 K=1,NWT
    CONTGY(K,I,N) = CONFAC(N) * (COSTLD(K,I) + COSTLC(K,I) + ASPC(K,I)
    1 + SHCPY(K,I) + OSFC(K,I) + UGFC(K,I) + AESERV(K,I)
    2 + STARTC(K,I))
2000 CONTINUE
C
    DO 2005 I=LL+1,LY
    DO 2005 K=1,NWT
    CONTGY(K,I,N) = CONTGY(K,I,N) + OSFC(K,I) * CONFAC(N)
2005 CONTINUE
C   CALCULATE CONTINGENCY COSTS FOR ROCK OPERATIONS
C
    DO 2010 I=1,LY
    DO 2010 K=1,NWT
    N = 2
    CONTGY(K,I,N) = CONFAC(N) * (OPMC(K,I) + CSTHST(K,I)
    1 + CSTSHS(K,I) + CSTOSD(K,I))
C
C   CALCULATE CONTINGENCY FOR WASTE OPERATIONS
C
    N=3
    CONTGY(K,I,N) = CONFAC(N) * (PECST(K,I) + PACST(K,I) + TPCST(K,I)
    1 + EMCST(K,I) + ECOST(K,I) + OXOPC(K,I))
C
C   CALCULATE CONTINGENCY FOR BACKFILLING AND DECOMMISSIONING OPERATION
C

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```

      N = 4
      CONTGY(K,I,N)=CONFAC(N) * CSTBKF(K,I)
      DO 2010 N=1,4
      ACONTG(I) = ACONTG(I) + CONTGY(K,I,N)
2010  CONTINUE
      LB= LY+1
      DO 2015 I=LB,LE
      DO 2015 K=1,NWT
      N=2
      CONTGY(K,I,N) = CONFAC(N) *(CSTHST(K,I) +CSTSHS(K,I))
      N=4
      CONTGY(K,I,N) = CONFAC(N) * (CSTBKF(K,I) + SEALCT(K,I)
      1 + DECOMC(K,I) + SURVCT(K,I))
      ACONTG(I) = CONTGY(K,I,2) + CONTGY(K,I,4)
      1 + ACONTG(I)
2015  CONTINUE
C
C   CALCULATE COST SUMMARIES BY WASTE TYPE
C   PRE-OPEATIONS
C
      DO 2110 K=1,NWT
      DO 2100 I=1,LL
      TLDCST(K) = TLDCST(K) + COSTLD(K,I)
      TLCCST(K) = TLCCST(K) + COSTLC(K,I)
      TSPCST(K) = TSPCST(K) + ASPC(K,I)
      TSHCST(K) = TSHCST(K) + SHCPY(K,I)
      TSFCST(K) = TSFCST(K) + OSFC(K,I)
      TUFCST(K) = TUFCST(K) + UGFC(K,I)
      TAECST(K) = TAECST(K) + AESERV(K,I)
      TSUCST(K) = TSUCST(K) + STARTC(K,I)
2100  CONTINUE
      DO 2105 I = LL+1,LY
      TSFCST(K) = TSFCST(K)+OSFC(K,I)
2105  CONTINUE
      TSUBCN(K) = TLDCST(K) + TLCCST(K) + TSPCST(K) + TSHCST(K)
      1 + TPMCST(K) + TSFCST(K) + TUFCST(K) + TAECST(K) + TSUCST(K)
      TLDCST(NWP1) = TLDCST(NWP1) + TLDCST(K)
      TLCCST(NWP1) = TLCCST(NWP1) + TLCCST(K)
      TSPCST(NWP1) = TSPCST(NWP1) + TSPCST(K)
      TSHCST(NWP1) = TSHCST(NWP1) + TSHCST(K)
      TSFCST(NWP1) = TSFCST(NWP1) + TSFCST(K)
      TUFCST(NWP1) = TUFCST(NWP1) + TUFCST(K)
      TAECST(NWP1) = TAECST(NWP1) + TAECST(K)
      TSUCST(NWP1) = TSUCST(NWP1) + TSUCST(K)
      TSUBCN(NWP1) = TSUBCN(NWP1) + TSUBCN(K)
2110  CONTINUE
C
C   ROCK OPERATIONS
C
      DO 2130 K=1,NWT
      DO 2120 I=1,LE
      TOMCST(K) = TOMCST(K) + OPMC(K,I)
      THSCST(K) = THSCST(K) + CSTHST(K,I)
      TSSCST(K) = TSSCST(K) + CSTSHS(K,I)
      TODCST(K) = TODCST(K) + CSTOSD(K,I)
2120  CONTINUE
      TSUBRO(K) = TOMCST(K) + THSCST(K)+TSSCST(K)+TODCST(K)

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      TOMCST(NWP1) = TOMCST(NWP1) + TOMCST(K)
      THSCST(NWP1) = THSCST(NWP1) + THSCST(K)
      TSSCST(NWP1) = TSSCST(NWP1) + TSSCST(K)
      TODCST(NWP1) = TODCST(NWP1) + TODCST(K)
      TSUBRO(NWP1) = TSUBRO(NWP1) + TSUBRO(K)
2130  CONTINUE
C
C      WASTE OPERATIONS
C
      DO 2150 K=1,NWT
      DO 2140 I=1,LY
      TRCCST(K) = TRCCST(K) + RECST(K,I)
      TPKCST(K) = TPKCST(K) + PACST(K,I)
      TTRCST(K) = TTRCST(K) + TRCST(K,I)
      TEMCST(K) = TEMCST(K) + EMCST(K,I)
      TEXTCST(K) = TEXTCST(K) + ECOST(K,I)
      TUTCST(K) = TUTCST(K) + OWOPC(K,I)
2140  CONTINUE
      TOPCST(K) = TRCCST(K) + TPKCST(K) + TTRCST(K) + TEMCST(K)
      1 + TEXTCST(K) + TUTCST(K)
      TRCCST(NWP1) = TRCCST(NWP1) + TRCCST(K)
      TPKCST(NWP1) = TPKCST(NWP1) + TPKCST(K)
      TTRCST(NWP1) = TTRCST(NWP1) + TTRCST(K)
      TEMCST(NWP1) = TEMCST(NWP1) + TEMCST(K)
      TEXTCST(NWP1) = TEXTCST(NWP1) + TEXTCST(K)
      TUTCST(NWP1) = TUTCST(NWP1) + TUTCST(K)
      TOPCST(NWP1) = TOPCST(NWP1) + TOPCST(K)
2150  CONTINUE
C
C      POST OPERATIONS
C
      DO 2170 K=1,NWT
      DO 2160 I=1,LE
      TBFCST(K) = TBFCST(K) + CSTBKF(K,I)
      TSLCST(K) = TSLCST(K) + SEALCT(K,I)
      TDCCST(K) = TDCCST(K) + DECOMC(K,I)
      TSVCST(K) = TSVCST(K) + SURVCT(K,I)
2160  CONTINUE
      TBDCST(K) = TBFCST(K)+TSLCST(K)+TDCCST(K)+TSVCST(K)
      TBFCST(NWP1) = TBFCST(NWP1) + TBFCST(K)
      TSLCST(NWP1) = TSLCST(NWP1) + TSLCST(K)
      TDCCST(NWP1) = TDCCST(NWP1) + TDCCST(K)
      TSVCST(NWP1) = TSVCST(NWP1) + TSVCST(K)
      TBDCST(NWP1) = TBDCST(NWP1) + TBDCST(K)
2170  CONTINUE
      DO 2200 K=1,NWT
      DO 2200 I= 1,LE
      DO 2200 N= 1,4
      TCNCST(K) = TCNCST(K) + CONTGY(K,I,N)
2200  CONTINUE
      DO 2205 K=1,NWT
      TCNCST(NWP1) = TCNCST(NWP1) + TCNCST(K)
2205  CONTINUE
      DO 2210 K=1,NWT
      TWTCTST(K) = TSUPCN(K) + TSUBRO(K) + TOPCST(K) + TBDCST(K)
      1 + TCNCST(K)
      TWTCTST(NWP1) = TWTCTST(NWP1) + TWTCTST(K)

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2210 CONTINUE
C
DO 2215 K=1,NWP1
DO 2215 L=1,3
SLCU(L,K) = 0.0
2215 CONTINUE
C
LE=N8KF+ID0
DO 2220 K=1,NWT
DO 2220 I=1,LY
SLCU(1,K)=SLCU(1,K)+PWF(I)*RECUNT(K,I)*UNTHAS(K)
SLCU(2,K)=SLCU(2,K)+PWF(I)*WSTVOL(K,I)
SLCU(3,K)=SLCU(3,K)+PWF(I)*RECUNT(K,I)/WUPP(K)
SLCU(1,NWP1)=SLCU(1,NWP1)+PWF(I)*RECUNT(K,I)*UNTHAS(K)
SLCU(2,NWP1)=SLCU(2,NWP1)+PWF(I)*WSTVOL(K,I)
SLCU(3,NWP1)=SLCU(3,NWP1)+PWF(I)*RECUNT(K,I)/WUPP(K)
2220 CONTINUE
DO 2250 L=1,3
DO 2250 K=1,NWT
DO 2230 I=1,LL
ULDCST(K,L) = ULDCST(K,L) + COSTLD(K,I) * PWF(I)
ULCCST(K,L) = ULCCST(K,L) + COSTLC(K,I) * PWF(I)
USPCST(K,L) = USPCST(K,L) + ASPC(K,I) * PWF(I)
USHCST(K,L) = USHCST(K,L) + SHCPY(K,I) * PWF(I)
USFCST(K,L) = USFCST(K,L) + OSFC(K,I) * PWF(I)
UUF CST(K,L) = UUF CST(K,L) + UFCAPC(K,I) * PWF(I)
UAECST(K,L) = UAECST(K,L) + AESERV(K,I) * PWF(I)
USUCST(K,L) = USUCST(K,L) + STARTC(K,I) * PWF(I)
2230 CONTINUE
DO 2240 I=1,LY
URCCST(K,L) = URCCST(K,L) + RECST(K,I) * PWF(I)
UPKCST(K,L) = UPKCST(K,L) + PACST(K,I) * PWF(I)
UTRCST(K,L) = UTRCST(K,L) + TRCST(K,I) * PWF(I)
UEMCST(K,L) = UEMCST(K,L) + EMCST(K,I) * PWF(I)
UEXCST(K,L) = UEXCST(K,L) + ECOST(K,I) * PWF(I)
UUTCST(K,L) = UUTCST(K,L) + QWOPC(K,I) * PWF(I)
2240 CONTINUE
DO 2250 I= 1,LE
UOMCST(K,L) = UOMCST(K,L) + OPMC(K,I) * PWF(I)
UHSCST(K,L) = UHSCST(K,L) + Csthst(K,I) * PWF(I)
USSCST(K,L) = USSCST(K,L) + CSTSHS(K,I) * PWF(I)
UODCST(K,L) = UODCST(K,L) + CSTOSD(K,I) * PWF(I)
UBFCST(K,L) = UBFCST(K,L) + CSTBKF(K,I) * PWF(I)
USLCST(K,L) = USLCST(K,L) + SEALCT(K,I) * PWF(I)
UDCCST(K,L) = UDCCST(K,L) + DECOMC(K,I) * PWF(I)
USVCST(K,L) = USVCST(K,L) + SURVCT(K,I) * PWF(I)
DO 2250 N=1,4
UCNCST(K,L) = UCNCST(K,L) + CONTGY(K,I,N) * PWF(I)
2250 CONTINUE
DO 2260 L=1,3
DO 2260 K=1,NWT
ULDCST(NWP1,L) = ULDCST(NWP1,L) + ULDCST(K,L)
ULCCST(NWP1,L) = ULCCST(NWP1,L) + ULCCST(K,L)
USPCST(NWP1,L) = USPCST(NWP1,L) + USPCST(K,L)
USHCST(NWP1,L) = USHCST(NWP1,L) + USHCST(K,L)
USFCST(NWP1,L) = USFCST(NWP1,L) + USFCST(K,L)
UUF CST(NWP1,L) = UUF CST(NWP1,L) + UUF CST(K,L)

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    UAECST(NWP1,L) = UAECST(NWP1,L) + UAECST(K,L)
    USUCST(NWP1,L) = USUCST(NWP1,L) + USUCST(K,L)
    UOMCST(NWP1,L) = UOMCST(NWP1,L) + UOMCST(K,L)
    UHSCST(NWP1,L) = UHSCST(NWP1,L) + UHSCST(K,L)
    USSCST(NWP1,L) = USSCST(NWP1,L) + USSCST(K,L)
    UODCST(NWP1,L) = UODCST(NWP1,L) + UODCST(K,L)
    URCCST(NWP1,L) = URCCST(NWP1,L) + URCCST(K,L)
    UPKCST(NWP1,L) = UPKCST(NWP1,L) + UPKCST(K,L)
    UTRCST(NWP1,L) = UTRCST(NWP1,L) + UTRCST(K,L)
    UEMCST(NWP1,L) = UEMCST(NWP1,L) + UEMCST(K,L)
    UEXCST(NWP1,L) = UEXCST(NWP1,L) + UEXCST(K,L)
    UUTCST(NWP1,L) = UUTCST(NWP1,L) + UUTCST(K,L)
    UBFCST(NWP1,L) = UBFCST(NWP1,L) + UBFCST(K,L)
    USLCST(NWP1,L) = USLCST(NWP1,L) + USLCST(K,L)
    UDCCST(NWP1,L) = UDCCST(NWP1,L) + UDCCST(K,L)
    USVCST(NWP1,L) = USVCST(NWP1,L) + USVCST(K,L)
    UCNCST(NWP1,L) = UCNCST(NWP1,L) + UCNCST(K,L)
2260 CONTINUE
    DO 2270 L=1,3
    DO 2270 K=1,NWP1
    IF(SLCU(L,K).EQ.0.) GO TO 2350
    ULDCST(K,L) = ULDCST(K,L) / SLCU(L,K)
    ULCCST(K,L) = ULCCST(K,L) / SLCU(L,K)
    USPCST(K,L) = USPCST(K,L) / SLCU(L,K)
    USHCST(K,L) = USHCST(K,L) / SLCU(L,K)
    USFCST(K,L) = USFCST(K,L) / SLCU(L,K)
    UUFCST(K,L) = UUFCST(K,L) / SLCU(L,K)
    UAECST(K,L) = UAECST(K,L) / SLCU(L,K)
    USUCST(K,L) = USUCST(K,L) / SLCU(L,K)
    UOMCST(K,L) = UOMCST(K,L) / SLCU(L,K)
    UHSCST(K,L) = UHSCST(K,L) / SLCU(L,K)
    USSCST(K,L) = USSCST(K,L) / SLCU(L,K)
    UODCST(K,L) = UODCST(K,L) / SLCU(L,K)
    URCCST(K,L) = URCCST(K,L) / SLCU(L,K)
    UPKCST(K,L) = UPKCST(K,L) / SLCU(L,K)
    UTRCST(K,L) = UTRCST(K,L) / SLCU(L,K)
    UEMCST(K,L) = UEMCST(K,L) / SLCU(L,K)
    UEXCST(K,L) = UEXCST(K,L) / SLCU(L,K)
    UUTCST(K,L) = UUTCST(K,L) / SLCU(L,K)
    UBFCST(K,L) = UBFCST(K,L) / SLCU(L,K)
    USLCST(K,L) = USLCST(K,L) / SLCU(L,K)
    UDCCST(K,L) = UDCCST(K,L) / SLCU(L,K)
    USVCST(K,L) = USVCST(K,L) / SLCU(L,K)
    UCNCST(K,L) = UCNCST(K,L) / SLCU(L,K)
    GO TO 2270
2350 CONTINUE
    ULDCST(K,L) = 0.
    ULCCST(K,L) = 0.
    USPCST(K,L) = 0.
    USHCST(K,L) = 0.
    USFCST(K,L) = 0.
    UUFCST(K,L) = 0.
    UAECST(K,L) = 0.
    USUCST(K,L) = 0.
    UOMCST(K,L) = 0.
    UHSCST(K,L) = 0.
    USSCST(K,L) = 0.

```

```

      UODCST(K,L) = 0.
      URCCST(K,L) = 0.
      UPKCST(K,L) = 0.
      UTRCST(K,L) = 0.
      UEMCST(K,L) = 0.
      UEXCST(K,L) = 0.
      UUTCST(K,L) = 0.
      UBFCST(K,L) = 0.
      USLCST(K,L) = 0.
      UDCCST(K,L) = 0.
      USVCST(K,L) = 0.
      UCNCST(K,L) = 0.
2270 CONTINUE
      DO 2280 L=1,3
      DO 2280 K=1,NWP1
      USUBCN(K,L) = ULDCST(K,L) + ULCCST(K,L) + USPCST(K,L) + USHCST(K,L)
      1 + USFCST(K,L) + UUF CST(K,L) + UAECST(K,L) + USUCST(K,L)
      USUBRO(K,L) = UOMCST(K,L) + UHSCST(K,L) + USSCST(K,L) + UODCST(K,L)
      UOPCST(K,L) = URCCST(K,L) + UPKCST(K,L) + UTRCST(K,L) + UEMCST(K,L)
      1 + UEXCST(K,L) + UUTCST(K,L)
      UBDCST(K,L) = UBFCST(K,L) + USLCST(K,L) + UDCCST(K,L) + USVCST(K,L)
      UUTCST(K,L) = USUBCN(K,L) + USUBRO(K,L) + UOPCST(K,L) + UBDCST(K,L)
      1 + UCNCST(K,L)
2280 CONTINUE
C
C
      DO 2450 K=1,NWT
      DO 2450 I=1,NY
      RECUNT(NWP1,I) = RECUNT(NWP1,I) + RECUNT(K,I)
      NUMPKG(NWP1,I) = NUMPKG(NWP1,I) + NUMPKG(K,I)
      RMFILD(NWP1,I) = RMFILD(NWP1,I) + RMFILD(K,I)
2450 CONTINUE
C
C
      CALL OUTPUT
C
C
      1100 FORMAT(20A4)
C
      END

```

RORS: NONE. TIME: 3.509 SEC. IMAGE COUNT: 665

***** RECON2 HOLDC *****

```

/83 08:53:13 (C)
      FUNCTION HOLDC(A,B,D,N)
      C
        IF(N.NE.1) GO TO 100
        HOLDC = A * EXP(B*D)
        RETURN
      100 CONTINUE
      C
        IF(N.GT.4) GO TO 200
        HOLDC = A * D **B
        RETURN
      200 CONTINUE
        HOLDC = 0.0
      C
        RETURN
      END

```

ERRORS: NONE. TIME: 0.678 SEC. IMAGE COUNT: 15

***** RECON2 HOLMC *****

***** RECON2 HOLMC *****

7/83 08:53:14 (26)

```
      FUNCTION HOLMC(A,B,C,D,E,F,G,H,P,R,S,T,N)
      C
      X = (P-G)
      IF(X.EQ.0.) GO TO 100
      WBCSTF = X / (G-A) + 1
      SLEVCS = X / (2* B-C) + 1
      BFLMCS = X / (2* D-E) + 1
      GO TO 200
      100 CONTINUE
      WBCSTF = 1.
      SLEVCS = 1.
      BFLMCS = 1.
      200 CONTINUE
      C
      HOLMC = (H * WBCSTF + R * SLEVCS + S * BFLMCS) / T
      C
      RETURN
      END
```

ERRORS: NONE. TIME: 0.681 SEC. IMAGE COUNT: 18

***** RECON2 INPUT *****

***** RECON2 INPUT *****

7/93 08:53:14 (C)

SUBROUTINE INPUT

C

```
INCLUDE PARAM
INCLUDE INCOM
INCLUDE HUBCOM
INCLUDE SOPCOM
INCLUDE MNDCOM
INCLUDE WAFCOM
INCLUDE RECCOM
INCLUDE UOPCOM
INCLUDE SFTCOM
INCLUDE UTLCOM
INCLUDE SSTCOM
INCLUDE PRECOM
INCLUDE PSTCOM
```

C

C

```
DATA BLANK/' '
DATA (WSTYP(L,NWP1),L=1,3)/'REPO','SITO','RY '
```

C

C

```
READ(IN,1100) DATYPE
READ(IN,1100) TITLE
READ(IN,1100) (RPTYP(L),L=1,4),(PLACE(L),L=1,4),(TEKNEK(L),
1L=1,4)
READ(IN,*) IYRCON,IYRPRO,LASTYR,IYDOL,IDDYR,NWT
1, ORATE
IYRDIS = IYDOL
READ(IN,*) DEPTH,DENSTY,SPUC
1,CONFAC
NSTM1 = NST-1
READ(IN,*) (SFTNUM(L),L=1,NSTM1)
DO 75 K=1,NWT
READ(IN,1100) (WSTYP(L,K),L=1,3),
1 (PKGDS1(L,K),L=1,4),(PKGDS2(L,K),L=1,4),(PKGDS3(L,K),L=1,4)
75 CONTINUE
READ(IN,*) (KIND(K),K=1,NWT),(UNTMAS(K),K=1,NWT)
```

C

C

```
LL=IYRPRO-IYRCON
LY=LASTYR-IYRCON+1
IDD=IDDYR
LYY=LY
```

C

C

C

```
WASTOP

READ(IN,1100) DATYPE
READ(IN,*) SIZE, CPA, TOTMCL, PANLEN, PANWTH
1, GXEF, NFTL, FFTL
2, NALSH, NRHRMA, NCHRNA, WRKYR, MTRPSD, MTCPSD
3, (SHCFAC(L),L=1,NS), OVRHDF, FLUMH
READ(IN,*) (WUPP (K),K=1,NWT), (WVOLPU(K),K=1,NWT)
READ(IN,*) (TTTP (K),K=1,NWT), (TTTK (K),K=1,NWT)
READ(IN,*) (RCCAP (K),K=1,NWT), (TCCAP (K),K=1,NWT)
READ(IN,*) (PKGCAP(K),K=1,NWT)
```

***** RECQNZ INPUT *****

```

      READ(IN,*) (RMLN (K),K=1,NWT), (RMWTH (K),K=1,NWT)
      READ(IN,*) (CLSEMP(K),K=1,NWT), (XRASHO(K),K=1,NWT)
      READ(IN,*) (HPMIN (K),K=1,NWT), (PKGPUP(K),K=1,NWT)
      READ(IN,*) (NBSPPA(K),K=1,NWT)
      DO 50 K=1,NWT
      READ(IN,*) (WSTSUP(K,I),I=1,LY)
50  CONTINUE
      DO 60 K=1,NWT
      READ(IN,*) (TOWI(I,K),I=1,LY)
60  CONTINUE
      DO 70 K=1,NWT
      READ(IN,*) (CRRAIL(K,I),I=1,LY)
70  CONTINUE
      DO 120 L = 1,NWO
      READ(IN,*) WOCST(L),WOLBRR(L),WOLBRC(L),WOEQPL(L),
      1 WOEQPC(L),WOECST(L)
      READ(IN,*) (WOMATU(L,K),K=1,NWT), (WOMATC(L,K),K=1,NWT)
120 CONTINUE

```

C
C
C

MINDEV

```

      READ(IN,1100) DATYPE
      READ(IN,*) LEAD, RMHMIN,NCOR,TCPCLN,PCTFIL,XPANFC,MSA,TONPAR,
      1 OFTADC,NBYR,OTHBFL,OTBDEN,BKRATE
      NCOR = NCOR + 1
      DO 145 M= 1, NCOR
      READ (IN,1100) (CORDSC(N,M),N=1,12)
      READ (IN,*) CORWTH(M), CORLEN(M),CORHT(M), NCORPP(M)
145 CONTINUE
      READ(IN,*)(DELRHT(K),K=1,NWT), (PKGLN(K),K=1,NWT), (NRWSPR(K),
      1 K=1,NWT)
      READ(IN,*) (PORMDF(1,I),I=1,LL), (PORMDF(2,I),I=1,LL)
      1 , (SCSKD(I),I=1,LL)
      READ(IN,*) (SFTDD(L),SFTXR(L),SFTXD(L),L=1,NST)
      READ(IN,*)MSWTCH
      IF(MSWTCH.EQ.0) GO TO 142
      DO 140 L=1,NRO
      READ(IN,*) ROCST(L),ROLBRR(L),ROLBRC(L),ROEQPL(L),
      1 ROEQPC(L),ROECST(L),ROMATU(L),ROMATC(L)
140 CONTINUE
      GO TO 144
142 CONTINUE
      READ(IN,*) VARMC,RCKHC,SURFDC,BKFLC
144 CONTINUE

```

C
C
C

RECEVE

```

      READ(IN,1100) DATYPE
      READ(IN,*) NRBPRM, NCBPRM
      READ(IN,*)(RMCWS1(I),I=1,LL) , (RMCWS2(I),I=1,LL)
      READ(IN,*) (RMNWS1(I),I=1,LL) , (RMNWS2(I),I=1,LL)

```

C
C
C

UGOPR

```

      READ(IN,1100) DATYPE
      DO 130 L =1,NT0
      READ(IN,*) TOCST(L),TOLBRR(L),TOLBRC(L),TOEQPL(L),

```

***** RECON2 INPUT *****

```

1TOEQPC(L),TOECST(L)
  READ(IN,*) (TOMATU(L,K),K=1,NWT),(TOMATC(L,K),K=1,NWT)
130 CONTINUE
  READ(IN,*) IDET,IUHDCM
  READ(IN,*) (TRCHWD(K),K=1,NWT)
  DO 200 K=1,NWT
  READ(IN,*) NPKPEU(K),PKGDIA(K),PEFDIA(K),HOLDEL(K),IMET(K)
200 CONTINUE
  DO 250 L=1,NUO
  READ(IN,*) UOCST(L),UOLBRR(L),UOLBRC(L),UOEQPL(L),UOEQPC(L),
  IUOECST(L)
  IF(IDET.EQ.1) GO TO 250
  DO 240 K=1,NWT
  IF(KIND(K).NE.L) GO TO 240
  READ(IN,*) UOMATU(L,K),UOMATC(L,K)
240 CONTINUE
250 CONTINUE
  IF(IDET.NE.1) GO TO 300
  DO 270 K=1,NWT
  READ(IN,*) REFHAT(K),REFSLV(K),REFBKF(K)
  READ(IN,*) WABATH(K),SLEETH(K),BCKFTH(K),CAPLEN(K),
  IREFDEP(K)
  READ(IN,*) CHMTEM(K),PKGPRK(K),RCKCST(K)
270 CONTINUE
300 CONTINUE
  DO 155 L=1,NEE
  IF(IUHDCM.EQ.1.AND.L.EQ.1) GO TO 350
  READ(IN,*) EECST(L),EELBRR(L),EELBRC(L),EEEQPL(L),EEEQPC(L),
  IEEECST(L),EEMATU(L),EEMATC(L)
  GO TO 155
350 CONTINUE
  READ(IN,*) EELBRC(L),EEECST(L),EEMATC(L),
  1 HDLCFC,HDECFC,HDMCFC,HDCON1,HDCON2,NTYP
155 CONTINUE
C
C  SHAFT
C
  READ(IN,1100) DATYPE
  READ(IN,*) MXMPRH,MXMMRH,TNPT1,TNPT2,
  1 SCON1,SCON2,IEQTP1,CCCON1,CCCON2,IEQTP2
  2 ,WCCON1,WCCON2,IEQTP3
  READ(IN,*) (SFTLD(L),L=1,NST)
  READ(IN,*) (SFTHE(L),L=1,NST)
  READ(IN,*) (SFTSS(L),L=1,NST)
  READ(IN,*) (NPKPTR(K),K=1,NWT),(NPKPTC(K),K=1,NWT)
C
C  SURFST
C
  READ(IN,1100) DATYPE
  READ(IN,*) (SFCS(L),L=1,LL)
  READ(IN,*) NSC,SOA
  DO 150 L=1,NSC
  READ(IN,1100) (SFTITL(N,L),N=1,12)
  READ(IN,*) SFCST(L),SFLBRR(L),SLBR(L),SFLBRC(L),SFEQPL(L),
  1SFECST(L),SFMATU(L),SFMATC(L)
150 CONTINUE
C

```

***** RECON2 INPUT *****

C UTILITY

C

READ(IN,1100) DATYPE
 READ(IN,*) UPC ,STMC, DWTRC, WTRC, DSLC
 READ(IN,*) RAPP, SFSP, OWHP, SFP,MROP,RVP,
 1 ACP, HEATS, RAPS, ORS
 READ(IN,*) VOLW, VOLDW, SUD, UGD, RED

C

C PREOP

C

READ(IN,1100) DATYPE
 READ(IN,*) (SCDF(I),I=1,LL)
 1, (CLNDF(I),I=1,LL)
 2, (CLCDF(I),I=1,LL)
 READ(IN,*) TCLAND,TCLICE,STPCT,AECON1,AECON2,IEQTP4

C

C POSTOP

C

READ(IN,1100) DATYPE
 READ(IN,*) (DBDF(I),I=1,IDD)
 READ(IN,*) (SSDF(I),I=1,IDD)
 READ(IN,*) (FDDF(I),I=1,IDD)
 READ(IN,*) SSCON1, SSCON2, IEQTP5, DCOMCF, SURCST, ITSURV
 READ(IN,*) NDDC,DDFRAC
 IF(NDDC.EQ.0) GO TO 165
 DO 160 L=1,NDDC
 READ(IN,1100) (DDITL(N,L),N=1,12)
 READ(IN,*) DDCST(L),DDLBR(L),DDLBR(L),DDEQPC(L),DDMATC(L)
 160 CONTINUE
 165 CONTINUE
 READ(IN,*) SCCST,SCLBR(L),SCLBR(L),SCEQPC,SCMATU,SCMATC

C

C

1100 FORMAT(20A4)

C

RETURN
 END

ERRORS: NONE. TIME: 1.363 SEC. IMAGE COUNT: 206

***** RECON2 MINDEV *****

***** RECON2 MINDEV *****

/83 08:53:16 (0)

```

SUBROUTINE MINDEV
C
  INCLUDE PARAM
  INCLUDE MNDCOM
  INCLUDE WAFCOM
  INCLUDE SFTCOM
  INCLUDE SOPCOM
C
  DIMENSION CORVR(NW)
C
C
  LE=LY-LEAD
  DPY = WRKYR
  LED = LEAD
C
  DO 150 I=1,NY
    SRKMND(I) = 0.0
    SRKHST(I) = 0.0
    SRKBF(I) = 0.0
    RKSURF(I) = 0.0
  150 CONTINUE
C
  MINING DURING OPERATION
  DO 200 K=1,NWT
    DO 100 M=2,NCOR
      CORVR(K) = CORVR(K) + CORLEN(M) * CORHT(M) * CORWTH(M)
      I * NCORPP(M) / RMPILU(K)
  100 CONTINUE
      RMHT(K) = AMAX1(PKGLN(K),RMHMIN)+DEL RHT(K)
      IF(IMET(K).EQ.4) RMHT(K) = RMHMIN + DEL RHT(K)
      RKVOL(K) = RMLN(K)*RMWTH(K)*RMHT(K)
      DO 200 I=1,LE
        DO 170 M=2,NCOR
          CORVOL(K,I)=CORVOL(K,I)+CORLEN(M)*CORWTH(M)*CORHT(M)*NCORPP(M)
          I * PNLREQ(K,I+LED) / AREAPP
  170 CONTINUE
          VOLMND(K,I) = RMFILD(K,I+LED)*RKVOL(K) + CORVOL(K,I)
          RKMSH(K,I) = VOLMND(K,I) * DENSTY + RKMSH(K,I)
  200 CONTINUE
C
C
C
C
  PRE-OPERATIONAL MINING
  SRM = 0.0
  DO 220 K=1,NWT
    SRMM(K) = 0.0
  220 CONTINUE
C
  DO 250 K=1,NWT
    DO 250 I=1,LY
      SRMM(K) = SRMM(K) + RKMSH(K,I)
      SRM = SRM + RKMSH(K,I)
  250 CONTINUE
C
  DO 260 K=1,NWT
    SHAFTX (K) = 0.

```

```

***** RECON2 MINDEV *****

      DO 260 L=1,NST
      SHAFTX(K) = SHAFTX(K) + (((SFTXR(L) + SFTDD(L) /2.) **2)*PI)
      1 * SFTXD(L)) * (SRMM(K)/SRM) * DENSTY
260 CONTINUE
      DO 265 K=1,NWT
      DO 265 I=1,LL
      RKMSM(K,I) = RKMSM(K,I) + SHAFTX(K) * SCSKD(I)
265 CONTINUE
C
      DO 270 K=1,NWT
      DO 270 I=1,LL
      CPCMH(K,I) = TCPCLN * CORWTH(I)*CORHT(I)*DENSTY*SRMM(K)/
      1SRM * PORMDF(1,I)
      CORMAS(K,I) = CORARA*CORHT(I)*DENSTY*SRMM(K)/SRM*
      1 PORMDF(2,I) * MZACRE
270 CONTINUE
C
C   MINING LOGISTICS
C
      DO 330 K=1,NWT
      DO 300 I=1,LY
      ANFILD(I) = ANFILD(I) + RMFILD(K,I)
300 CONTINUE
      DO 310 I=1,LE
      ANNEX(I) = ANNEX(I) + RMFILD(K,I+LED)
310 CONTINUE
      DO 330 I=2,LY
      CAREW(K,I)=CAREW(K,I-1) + PNLREQ(K,I)
330 CONTINUE
      CUMFLD(I) = ANFILD(I)
      DO 350 I=2,LY
      CUMFLD(I) = CUMFLD(I-1) + ANFILD(I)
350 CONTINUE
      DO 360 K=1,NWT
      DO 360 I=1,LL
      RKMSH(K,I) = RKMSH(K,I) + CORMAS(K,I) + CPCMH(K,I)
360 CONTINUE
      DO 520 I=1,LY
      DO 520 K=1,NWT
      SRKMND(I) = SRKMND(I) + RKMSH(K,I)
520 CONTINUE
C   MINING          RESOURCE REQUIREMENTS
C   LABOR
C   PRE-OPERATIONAL MINING
C       ASSUMES 3 SHIFT/DAY OPERATION
      NRON = 1
      IF(MSWTCH.EQ.0) GO TO 371
      DO 365 I=1,LL
      IF(SRKMND(I).EQ.0.) GO TO 365
      TRM = 0.C
      DO 361 K=1,NWT
      TRM = TRM + RKMSH(K,I)
361 CONTINUE
      ANCPTY(I) = ROEQPC(NRON) * 3. * DPY
C       NUMBER OF MINING MACHINES NEEDED
      IF(ANCPTY(I).EQ.0.) GO TO 365
      NMMACH(I) = TRM / ANCPTY(I) + .999

```


***** RECGN2 MINDEV *****

```

C      LABOR CALCULATION
      DO 363 K=1,NWT
      RMNLBR(K,I) = NMMACH(I) * ROLBRR(NRON) * 3.*RKMSM(K,I)/SRKMND(I)
363 CONTINUE
365 CONTINUE
C      MINING DURING OPERATIONS
C      ASSUMES SAME SHIFT OPERATION AS WASTE OPERATIONS
      LB = LL + 1
      DO 368 I=LB,LY
      IF(SRKMND(I).EQ.0.) GO TO 368
      TRM = 0.0
      DO 362 K=1,NWT
      TRM = TRM + RKMSM(K,I)
362 CONTINUE
      ANCPY(I) = ROEQPC(NRON) * 3. * DPY
      IF(ANCPY(I).EQ.0.) GO TO 368
      NMMACH(I) = TRM / ANCPY(I) + .999
      DO 364 K=1,NWT
      RMNLBR(K,I) = NMMACH(I) * ROLBRR(NRON) * AMAX1(SRRMR(I),SRRMC(I))
      1 * RKMSM(K,I) / SRKMND(I)
C      MATERIALS
      RMMATR(K,I) = ROMATU(NRON) * RKMSM(K,I)
364 CONTINUE
368 CONTINUE
      DO 369 I=1,LY
      TRM = SRKMND(I)
      IF(I.EQ.1) NLAST = 0
      NDUM = NMMACH(I)
      CALL REPLAS(NDUM,NLAST,K,NEQRPL(NRON,I),TRM,ANCPY(I),
      1 ROEQPL(NRON),NW,I)
      NLAST = NDUM
369 CONTINUE
371 CONTINUE
C
C      BACKFILLING LOGISTICS
C
      DO 370 K=1,NWT
      RMUVOL(K) = RKVOL(K) + CORVR(K)
370 CONTINUE
      CUMBKF = 0.0
C
      IFLG = 0
      IFLAG = 0
      LB = NBYR + IYRPRO - IYRCON + 1
      BFLEFF = PCTFIL / XPANFC
      IF(LB.GT.LY) UBFRMS = CUMFLD(LY)
      IF(LB.GT.LY) GO TO 530
      DO 500 I=LB,LY
      IF(IFLAG.GT.0) GO TO 450
      DO 380 K=1,NWT
      RUBKFL(K) = (VOLMND(K,I) + OTHBFL / (1. - OTHBFL) * VOLMND(K,I))
      1 / (RMUVOL(K) * BFLEFF)
      CUMBKF = CUMBKF + RUBKFL(K)
380 CONTINUE
      IF(IFLG.EQ.0) UBFRMS = CUMFLD(I) - CUMBKF
      IF(IFLG.EQ.0) GOTO 381
      DO 382 K=1,NWT

```

***** RECON2 MINDEV *****

```

      UBFRMS = UBFRMS + RMFILD(K,I) - RUBKFL(K)
382  CONTINUE
381  CONTINUE
      IF(UBFRMS.LE.0.) GO TO 400
      DO 390 K=1,NWT
        RKBKF(K,I) = VOLMND(K,I) * DENSTY
        OTBKF(K,I)=VOLMND(K,I)*OTHBFL*OTBDEN / (1.-OTHBFL)
        IF(VOLMND(K,I).EQ.0.) GO TO 385
        GO TO 390
385  CONTINUE
        RKBKF(K,I) = RMFILD(K,I) * RMOVOL(K) *BFLEFF * DENSTY
        I * (1. - OTHBFL)
        OTBKF(K,I)=OTHBFL*(RKBKF(K,I)/DENSTY) *OTBDEN / (1.-OTHBFL)
        UBFRMS = UBFRMS - RMFILD(K,I)
        IFLG = I
390  CONTINUE
      IF(UBFRMS.LE.0.) GO TO 400
      GO TO 455
400  CONTINUE
      IFLAG = I
      TRFILD = 0.0
      DO 405 K=1,NWT
        TRFILD = TRFILD + RMFILD(K,I)
405  CONTINUE
      DO 410 K=1,NWT
        RKBKF(K,I) = (RUBKFL(K) + UBFRMS * RMFILD(K,I) / TRFILD)
        I * RMOVOL(K) * BFLEFF * DENSTY * (1.-OTHBFL)
        OTBKF(K,I)=OTHBFL*RKBKF(K,I)*OTBDEN/DENSTY / (1.-OTHBFL)
410  CONTINUE
      UBFRMS = 0.0
      GO TO 455
450  CONTINUE
      DO 420 K=1,NWT
        RKBKF(K,I) = RMFILD(K,I)*RMOVOL(K)*BFLEFF*DENSTY
        I * (1-OTHBFL)
        OTBKF(K,I)=OTHBFL*RKBKF(K,I)*OTBDEN/DENSTY / (1.-OTHBFL)
420  CONTINUE
455  CONTINUE
      UBFRPY(I) = UBFRMS
500  CONTINUE
530  CONTINUE
C
      CALL WAFAM
C
      SURF = 0.
      DO 600 I=1,LY
        DO 550 K=1,NWT
          RCKHST(K,I)=RKMSH(K,I)-RKBKF(K,I)
          IF(MSA.EQ.0.) MSA = MSA + RCKHST(K,I)
          SURF=SURF+RCKHST(K,I)
          SRKHST(I) = SRKHST(I) + RCKHST(K,I)
          SRBKF(I) = SRBKF(I) + RKBKF(K,I)
          SOTBKF(I) = SOTBKF(I) + OTBKF(K,I)
550  CONTINUE
        SS = MSA * TONPAR
        RKOFFS(I)=AMAX1(0.,(SURF-SS))
        RKSURF(I) = SURF-RKOFFS(I)

```

***** RECON2 MINDEV *****

```
      SURF = SURF - RKOFFS(I)
600  CONTINUE
C
      DO 620 K=1,NMT
      UBKVOL(K) = UBFRMS * RMUVOL(K) * WAFMV(K)
620  CONTINUE
C
      RETURN
      END
```

ERRORS: NONE. TIME: 1.938 SEC. IMAGE COUNT: 235

***** RECON2 OUTPUT *****

***** RECON2 OUTPUT *****

/83 08:53:17 (0)

SUBROUTINE OUTPUT

C

```

INCLUDE PARAM
INCLUDE INCOM
INCLUDE RECCOM
INCLUDE SOPCOM
INCLUDE SSTCOM
INCLUDE MNDCOM
INCLUDE SFTCOM
INCLUDE HUBCOM
INCLUDE PRECOM
INCLUDE PSTCOM
INCLUDE UTLCOM
INCLUDE UOPCOM
INCLUDE WAFCOM

```

C

```

CHARACTER *1 NTA
DIMENSION TOT(2), NTA(10), NPKGT(NW), TTSH(NW+1)
DATA DASH/'-'/
DATA BLANK/' '/
DATA TOT/'TOTA', 'L'/
DATA NTA /'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J'/

```

C

C

```

LED = LEAD
LE=LY+IDD
LEE = NBKF + IDD

```

C

C TABLE 1

C

```

WRITE(10,1000)
WRITE(10,1055) TITLE
WRITE(10,1001) DA
WRITE(10,1002) TI
WRITE(10,1003) (RPTYP(L),L=1,4)
WRITE(10,1004)
WRITE(10,1005) (PLACE(L),L=1,4)
WRITE(10,1006) IYRCON
WRITE(10,1007) IYRPRO
WRITE(10,1008) DEPTH
WRITE(10,1026) SOA
WRITE(10,1027) SIZE
WRITE(10,1028) (TEKNEK(L),L=1,4)
WRITE(10,1029) CPA
DO 50 M=1,NCOR
WRITE(10,1030) (CORDSC(N,M),N=1,12)
WRITE(10,1031) CORWTH(M)
WRITE(10,1032) CORLEN(M)
WRITE(10,1033) CORMT(M)
WRITE(10,1047) NCORPP(M)
50 CONTINUE
WRITE(10,1034) PANWTH
WRITE(10,1035) PANLEN
WRITE(10,1036) GXEF
WRITE(10,1037) SPUC

```

***** RECON2 OUTPUT *****

```

RATE = ORATE * 100.
WRITE(IO,1038) RATE
WRITE(IO,1039)
LX = NWT * 13-2
WRITE(IO,1040) (DASH,L=1,LX)
WRITE(IO,1041) ((WSTYP(L,K),L=1,3),K=1,NWT)
LX = NWT*11
WRITE(IO,1042) (DASH,L=1,LX)
WRITE(IO,1043) (XRASHO(K),K=1,NWT)
WRITE(IO,1044) (RMWTH (K),K=1,NWT)
WRITE(IO,1045) (RMHT (K),K=1,NWT)
WRITE(IO,1046) (RMPILU(K),K=1,NWT)
WRITE(IO,1052)
WRITE(IO,1053)
WRITE(IO,1054)

```

C
C
C

TABLE 2

```

WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1078) (RPTYP(L),L=1,4)
WRITE(IO,1079)
WRITE(IO,1072)
WRITE(IO,1073)
WRITE(IO,1080) RMCAP,PMCAP
WRITE(IO,1081)
WRITE(IO,1082) CMCAP
WRITE(IO,1083)
LX = NWT * 13-2
WRITE(IO,1223)
WRITE(IO,1224) (DASH,L=1,LX)
LX = NWT * 11
WRITE(IO,1084) ((WSTYP(L,K),L=1,3), K=1,NWT)
WRITE(IO,1085) (DASH,L=1,LX)
WRITE(IO,1010)
WRITE(IO,1086) (RCCAP(K),K=1,NWT)
WRITE(IO,1087) (TCCAP(K),K=1,NWT)

```

C
C
C

TABLE 3

```

WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1160) (RPTYP(L),L=1,4)
WRITE(IO,1161)
WRITE(IO,1162)
LX = NWT * 13-2
WRITE(IO,1163) (DASH,L=1,LX)
WRITE(IO,1164) ((WSTYP(L,K),L=1,3), K=1,NWT)
LX = NWT * 11
WRITE(IO,1165) (DASH,L=1,LX)
WRITE(IO,1010)
DO 350 K=1,NWT
CO 350 I=1,LX

```

***** RECON2 OUTPUT *****

```

      CRRAIL(K,I) = CRRAIL(K,I) * 100.
350  CONTINUE
      IYR = IYRCON - 1
      DO 400 I=1,LY
      IYR = IYR + 1
      WRITE(10,1166) IYR,(CRRAIL(K,I),K=1,NWT)
400  CONTINUE
C
C      TABLE 4
C
      WRITE(10,1000)
      WRITE(10,1055) TITLE
      WRITE(10,1001) DA
      WRITE(10,1002) TI
      WRITE(10,1215) (RPTYP(L),L=1,4)
      WRITE(10,1216)
      WRITE(10,1217)
      LX = NWT * 13 + 7
      WRITE(10,1218) (DASH,L=1,LX)
      WRITE(10,1219)
      LX = NWT * 11 + 7
      WRITE(10,1220) ((WSTYP(L,K),L=1,3), K=1,NWT),TOT
      WRITE(10,1221) (DASH,L=1,LX)
      WRITE(10,1010)
      IYR = IYRCON - 1
      DO 320 I=1,NWP1
      TTSH(I) = 0
320  CONTINUE
      DO 340 I=1,LY
      IYR = IYR + 1
      TSH = 0.
      DO 325 K = 1,NWT
      TSH = TSHPCN(K,I) + TSH
      TTSH(K) = TTSH(K)+TSHPCN(K,I)
325  CONTINUE
      TTSH(NWT+1) = TTSH(NWT+1)+TSH
      WRITE(10,1222) IYR, NMRH(I), NPMRH(I), NRMCH(I)
      1,(TSHPCN(K,I),K=1,NWT),TSH
340  CONTINUE
      LX = (NWT+1)*10
      WRITE(10,1370) (DASH,L=1,LX)
      WRITE(10,1306) (TTSH(K),K=1,NWT+1)
C
C      TABLE 5
C
      KB = 1
      KE = NWT
      IFLAG = 0
      M = 0
825  CONTINUE
      DO 901 K =KB,KE
      M = M+1
      WRITE(10,1000)
      WRITE(10,1055) TITLE
      WRITE(10,1001) DA
      WRITE(10,1002) TI
      IF(K.NE.NWP1) WRITE(10,1186) NTA(M),(WSTYP(L,K),L=1,3)

```

***** RECON2 OUTPUT *****

```

      IF(K.NE.NWP1) WRITE(IO,1187) (RPTYP(L),L=1,4)
      IF(K.EQ.NWP1) WRITE(IO,1225) NTA(M),(RPTYP(L),L=1,4)
      IF(K.EQ.NWP1) WRITE(IO,1336)
      WRITE(IO,1188)
      WRITE(IO,1189)
      WRITE(IO,1190)
      WRITE(IO,1191)
      WRITE(IO,1010)
      IYR = IYRCON - 1
      TA = 0.0
      NTB = 0
      TC = 0.0
      DO 900 I=1,LX
        ASHIFT = SRRMR(I)
        IF(K.EQ.NWP1) GO TO 830
        IF(KIND(K).EQ.2) ASHIFT = SRRMC(I)
        GO TO 840
830    CONTINUE
        ASHIFT = AMAX1(SRRMR(I), SRRMC(I))
840    CONTINUE
        T# = TA+RECUNT(K,I)
        NTB = NTB+NUMPKG(K,I)
        TC = TC+RMFILD(K,I)
        IYR = IYR + 1
        IF (K.NE.NWP1)
          + WRITE(IO,1350) IYR,ASHIFT,RECUNT(K,I),NUMPKG(K,I),WOPLBR(K,I),
          1 RMFILD(K,I)
        IF (K.EQ.NWP1)
          1 WRITE(IO,1192) IYR,ASHIFT,RECUNT(K,I),NUMPKG(K,I),WOPLBR(K,I),
          1 TRNSPT(3,I),EMPMCH(K,I),EXMACH(3,I),RMFILD(K,I)
900    CONTINUE
        WRITE(IO,1307) TA,NTB,TC
901    CONTINUE
        IF(IFLAG.EQ.1) GO TO 850
        KB = NWP1
        KE = NWP1
        IFLAG = 1
        GO TO 825
850    CONTINUE
C
C      TABLE 6
C
      DO 501 I=1,NWT
        NPKGT(I) = 0
501    CONTINUE
        WRITE(IO,1000)
        WRITE(IO,1055) TITLE
        WRITE(IO,1001) DA
        WRITE(IO,1002) TI
        WRITE(IO,1167) (RPTYP(L),L=1,4)
        WRITE(IO,1168)
        WRITE(IO,1169) ((WSTYP(L,K),L=1,3), K=1,NWT)
        LX = NWT * 20
        WRITE(IO,1170) (DASH,L=1,LX)
        WRITE(IO,1171) (BLANK,L=1,NWT)
        WRITE(IO,1172) (BLANK,L=1,NWT)
        WRITE(IO,1173) (BLANK,L=1,NWT)

```

***** RECON2 OUTPUT *****

```

      LX = NWT * 19
      WRITE(IO,1174) (DASH,L=1,LX)
      WRITE(IO,1010)
      IYR = IYRCON - 1
      DO 500 I=1,LY
      DO 510 J = 1,NWT
      NPKGT(J) = NPKGT(J)+NUMPKG(J,I)
510  CONTINUE
      IYR = IYR + 1
      WRITE(IO,1175) IYR, (NUMPKG(K,I),TOWI(I,K),K=1,NWT)
500  CONTINUE
      LX = NWT*9
      WRITE (IO,1360) (DASH,L=1,LX)
      WRITE(IO,1308) (NPKGT(J),J=1,NWT)

C
C  TABLE 7
C
      WRITE(IO,1000)
      WRITE(IO,1055) TITLE
      WRITE(IO,1001) DA
      WRITE(IO,1002) TI
      WRITE(IO,1176) (RPTYP(L),L=1,4)
      WRITE(IO,1177)
      LX = NWT * 26 - 1
      WRITE (IO,1180) ((WSTYP(L,K),L=1,3),K=1,NWT)
      LX = NWT * 24
      WRITE(IO,1181) (DASH,L=1,LX)
      WRITE(IO,1182) (BLANK,L=1,NWT)
      WRITE(IO,1183) (BLANK,L=1,NWT)
      LX = NWT * 22
      WRITE(IO,1184) (DASH,L=1,LX)
      WRITE(IO,1010)
      IYR = IYRCON - 1
      DO 800 I=1,LY
      IYR = IYR + 1
      WRITE(IO,1185) IYR,(PITCH(K,I),NPPRW(K,I),NPKGPR(K,I),K=1,NWT)
800  CONTINUE

C
C  TABLE 8
C
      DO 620 K=1,NWT
      DO 605 I = 1,LY
      RKMSM(K,I) = RKMSM(K,I) / ONETHO
      RKBKF(K,I) = RKBKF(K,I) / ONETHO
      RCKHST(K,I) = RCKHST(K,I) / ONETHO
605  CONTINUE
      LB = LY+1
      DO 606 I = LB,LEE
      RKBKF(K,I) = RKBKF(K,I) / ONETHO
      RCKHST(K,I) = RCKHST(K,I) / ONETHO
606  CONTINUE
      WRITE(IO,1000)
      WRITE(IO,1055) TITLE
      WRITE(IO,1001) DA
      WRITE(IO,1002) TI
      WRITE(IO,1011) NTA(K),(WSTYP(L,K),L=1,3)

```


***** RECON2 OUTPUT *****

```

WRITE(10,1018) (RPTYP(L),L=1,4)
WRITE(10,1012)
WRITE(10,1013)
WRITE(10,1014)
WRITE(10,1015)
WRITE(10,1016)
IYR = IYRCON-1
TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
DO 600 I=1,LY
IYR = IYR + 1
TA = TA+RKMSM(K,I)
TB = TB+RKBKF(K,I)
TC = TC+RCKHST(K,I)
TD = TD+RMFILO(K,I+LED)
TE = TE+RMFILO(K,I)
WRITE(10,1016) IYR,RKMSM(K,I),RKBKF(K,I),RCKHST(K,I),
IRMFILD(K,I+LED),RMFILO(K,I),PNLREQ(K,I),CAREW(K,I)
600 CONTINUE
LB = LY + 1
DO 610 I=LB,LEE
IYR = IYR + 1
TB = TB+RKBKF(K,I)
TC = TC+RCKHST(K,I)
WRITE(10,1303) IYR,RKBKF(K,I),RCKHST(K,I)
610 CONTINUE
WRITE(10,1309) TA,TB,TC,TD,TE
620 CONTINUE
C
C
C
C
TABLE 9
IFLG = 0
WRITE(10,1000)
WRITE(10,1055) TITLE
WRITE(10,1001) DA
WRITE(10,1002) TI
WRITE(10,1017) (RPTYP(L),L=1,4)
WRITE(10,1009)
WRITE(10,1019)
WRITE(10,1020)
WRITE(10,1021)
WRITE(10,1022)
WRITE(10,1023)
WRITE(10,1010)
C
DO 720 I = 1,LY
SRKMND(I) = SRKMND(I) / ONETHO
SRKBKF(I) = SRKBKF(I) / ONETHO
SRKHST(I) = SRKHST(I) / ONETHO
RKSURF(I) = RKSURF(I) / ONETHO
RKOFFS(I) = RKOFFS(I) / ONETHO
720 CONTINUE

```

***** RECGN2 OUTPUT *****

```

      LB = LY+1
      DO 721 I = LB,LEE
      SRKBKF(I) = SRKBKF(I) / ONETHO
      SRKHST(I) = SPKHST(I) / ONETHO
      RKSURF(I) = RKSURF(I) / ONETHO
721  CONTINUE
      IYR = IYRCON - 1
      TA = 0.0
      TB = 0.0
      TC = 0.0
      TD = 0.0
      TE = 0.0
      TF = 0.0
      DO 700 I=1,LY
      IYR = IYR + 1
      TA = TA + SRKMND(I)
      TB = TB + SRKBKF(I)
      TC = TC + SRKHST(I)
      TD = TD + RKOFFS(I)
      TE = TE + ANNEX(I)
      TF = TF + ANFIELD(I)
      IF (IHSTFL(I).EQ.1) GO TO 725
      WRITE(IO,1024) IYR,SRKMND(I),SRKBKF(I),SRKHST(I),RKSURF(I),
1  RKOFFS(I),ANNEX(I),ANFIELD(I),ANPAR(I),CUMPAR(I),
2  AVL RPA(I)
      GO TO 700
725  CONTINUE
      IFL6 = 1
      WRITE(IO,1390) IYR,SRKMND(I),SRKBKF(I),SRKHST(I),RKSURF(I),
1  RKOFFS(I),ANNEX(I),ANFIELD(I),ANPAR(I),CUMPAR(I),
2  AVL RPA(I)
700  CONTINUE
      DO 710 I=LB,LEE
      IYR = IYR + 1
      TB = TB + SRKBKF(I)
      TC = TC + SRKHST(I)
      WRITE(IO,1304) IYR,SRKBKF(I),SRKHST(I),RKSURF(I)
710  CONTINUE
      WRITE(IO,1025) TA,TB,TC,TD,TE,TF
      IF (IFL6.EQ.1) WRITE(IO,1400)

C
C
C      TABLE 10

      DO 180 L = 1,NST
      SFTSC(L) = SFTSC(L) / ONEMIL
1 * SFTNUM(L)
      SFTWC(L) = SFTWC(L) / ONEMIL
1 * SFTNUM(L)
      SFTLC(L) = SFTLC(L) / ONEMIL
1 * SFTNUM(L)
      SFTHE(L) = SFTHE(L) / ONEMIL
1 * SFTNUM(L)
      SFTSS(L) = SFTSS(L) / ONEMIL
1 * SFTNUM(L)
      SHDFC(L) = SHDFC(L) / ONEMIL
1 * SFTNUM(L)
      SFCTOT(1) = SFCTOT(1) + SFTSC(L)

```

***** RECON2 OUTPUT *****

```

      SFCTOT(2) = SFCTOT(2) + SFTWC(L)
      SFCTOT(3) = SFCTOT(3) + SFTLC(L)
      SFCTOT(4) = SFCTOT(4) + SFTHE(L)
      SFCTOT(5) = SFCTOT(5) + SFTSS(L)
      SFCTOT(6) = SFCTOT(6) + SHDFC(L)
180  CONTINUE
      WRITE(IO,1000)
      WRITE(IO,1055)  TITLE
      WRITE(IO,1001)  DA
      WRITE(IO,1002)  TI
      WRITE(IO,1123)
      WRITE(IO,1147)
      WRITE(IO,1124)
      WRITE(IO,1125)
      WRITE(IO,1126)
      WRITE(IO,1127)
      WRITE(IO,1128)  (SFTDD(L),L=1,7)
      WRITE(IO,1129)  (SFTXR(L),L=1,7)
      WRITE(IO,1130)  (SFTXD(L),L=1,7)
      WRITE(IO,1131)  (SFTLO(L),L=1,7)
      WRITE(IO,1132)
      NTPS = MTRPSD + HTCPSD
      WRITE(IO,1133)  MTRPSD,HTCPSD,NTPS
      WRITE(IO,1134)
      NPKPTT = 0.0
      DO 203 K=1,NWT
      IF (SFTNUM(4).EQ.0)
      + WRITE(IO,1148)  (WSTYP(L,K),L=1,3),NPKPTR(K)
      IF (SFTNUM(4).GT.0)
      + WRITE(IO,1380)  (WSTYP(L,K),L=1,3),NPKPTC(K)
200  CONTINUE
      IF(SFTNUM(7).GT.0) NTPSMP = MXMPRH
      IF(SFTNUM(7).GT.0) TONPT = TNPT1
      WRITE(IO,1135)
      WRITE(IO,1149)  MXMPRH,NTPSMP
      WRITE(IO,1136)  TNPT2,TONPT
      DO 210 L=1,7
      NSFTT = NSFTT + SFTNUM(L)
210  CONTINUE
      WRITE(IO,1138)  (SFTNUM(L),L=1,7),NSFTT
      WRITE(IO,1139)  IYRDIS
      WRITE(IO,1140)  (SFTSC(L),L=1,7), SFCTOT(1)
      WRITE(IO,1141)  (SFTWC(L),L=1,7), SFCTOT(2)
      WRITE(IO,1142)  (SFTLC(L),L=1,7), SFCTOT(3)
      WRITE(IO,1143)  (SFTHE(L),L=1,7), SFCTOT(4)
      WRITE(IO,1144)  (SFTSS(L),L=1,7), SFCTOT(5)
      WRITE(IO,1146)
      WRITE(IO,1145)  (SHDFC(L),L=1,7), SFCTOT(6)
C
C
C
      TABLE 11
      TCRHRM = TCRHRM / ONEMIL
      TCCHRM = TCCHRM / ONEMIL
      TCRHPM = TCRHPM / ONEMIL
      TTCAPC = TTCAPC / ONEMIL
      TECAPC = TECAPC / ONEMIL
      TUCAPC = TUCAPC / ONEMIL

```

***** RECON2 OUTPUT *****

```

      SEQCST = SEQCST / ONEMIL
      WRITE(IO,1000)
      WRITE(IO,1055)  TITLE
      WRITE(IO,1001)  DA
      WRITE(IO,1002)  TI
      WRITE(IO,1065)  (RPTYP(L),L=1,4)
      WRITE(IO,1066)
      WRITE(IO,1067)  IYRDIS
      WRITE(IO,1068)
      WRITE(IO,1069)  TCRHRM
      WRITE(IO,1070)  TCCHRM
      WRITE(IO,1071)  TCRHPM
      WRITE(IO,1301)  TTCAPC
      WRITE(IO,1302)  TECAPC
      WRITE(IO,1305)  TUCAPC
      DO 150 L=1,NSC
      SFCST(L) = SFCST(L) / ONEMIL
      WRITE(IO,1076) (SFTITL(N,L),N=1,12),SFCST(L)
      SSFCST = SSFCST + SFCST(L)
150  CONTINUE
      WRITE(IO,1090)
      TOTSFC = TOTSFC + TCRHRM + TCCHRM + TCRHPM + TTCAPC + TECAPC +
1    TUCAPC + SSFCST
      WRITE(IO,1089) TOTSFC

C
C
C      TABLE 12

      DO 160 L = 1,3
      TVEC(L) = TVEC(L) / ONEMIL
160  CONTINUE
      DO 164 L = 1,2
      TTEC(L) = TTEC(L) / ONEMIL
      TUEC(L) = TUEC(L) / ONEMIL
164  CONTINUE
      DO 166 L = 1,5
      TREC(L) = TREC(L) / ONEMIL
166  CONTINUE
      TEQPT = TEQPT / ONEMIL
      WRITE(IO,1000)
      WRITE(IO,1055)  TITLE
      WRITE(IO,1001)  DA
      WRITE(IO,1002)  TI
      WRITE(IO,1091)  (RPTYP(L),L=1,4)
      WRITE(IO,1092)
      WRITE(IO,1093)
      WRITE(IO,1094)
      WRITE(IO,1095)
      WRITE(IO,1096)
      WRITE(IO,1097)  WOEQPL(1), TVEC(1)
      WRITE(IO,1098)  WOEQPL(2), TVEC(2)
      WRITE(IO,1099)  WOEQPL(3), TVEC(3)
      WRITE(IO,1100)
      WRITE(IO,1101)  TOEQPL(1),TTEC(1)
      WRITE(IO,1102)  TOEQPL(2),TTEC(2)
      WRITE(IO,1103)  UOEQPL(1),TUEC(1)
      WRITE(IO,1104)  UOEQPL(2),TUEC(2)
      WRITE(IO,1105)

```

***** RECON2 OUTPUT *****

```

WRITE(IO,1106) ROEQPL(1), TREC(1)
WRITE(IO,1108) ROEQPL(2), TREC(2)
WRITE(IO,1109) ROEQPL(3), TREC(3)
WRITE(IO,1110) ROEQPL(4), TREC(4)
WRITE(IO,1111) ROEQPL(5), TREC(5)
WRITE(IO,1112)
DO 170 L=1,NSC
TSFEC(L) = TSFEC(L) / ONEMIL
TEQPT = TEQPT+TSFEC(L)
WRITE(IO,1113) (SFTITL(N,L),N=1,12), SFEQPL(L), TSFEC(L)
170 CONTINUE
WRITE(IO,1077)
DO 175 L=1,NEE
TEEEC(L) = TEEEC(L) / ONEMIL
175 CONTINUE
WRITE(IO,1107) EEEQPL(1),TEEEC(1)
WRITE(IO,1114) EEEQPL(2),TEEEC(2)
WRITE(IO,1115) EEEQPL(3),TEEEC(3)
WRITE(IO,1330)
WRITE(IO,1122) TEQPT

```

C
C
C

TABLE 13

```

TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
TG = 0.0
TH = 0.0
TTI = 0.0
WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1056) (RPTYP(L),L=1,4)
WRITE(IO,1057)
WRITE(IO,1058) IYRDIS
WRITE(IO,1059)
WRITE(IO,1060)
WRITE(IO,1061)
WRITE(IO,1062)
WRITE(IO,1063)
IYR = IYRCON - 1
DO 100 I=1,LL
CSTLND(I) = CSTLND(I) / ONEMIL
CSTLIC(I) = CSTLIC(I) / ONEMIL
CSTSHT(I) = CSTSHT(I) / ONEMIL
CSTUGF(I) = CSTUGF(I) / ONEMIL
CSTSP (I) = CSTSP (I) / ONEMIL
CSTSF (I) = CSTSF (I) / ONEMIL
CSTAE (I) = CSTAE (I) / ONEMIL
CSTSU (I) = CSTSU (I) / ONEMIL
CSTOT(I) = CSTLND(I) + CSTLIC(I) + CSTSP(I) + CSTSHT(I)+CSTSF(I)
1+CSTUGF(I)+CSTAE(I)+CSTSU(I)
TA = TA+CSTLND(I)

```

***** RECON₂ OUTPUT *****

```

    TB = TB+CSTLIC(I)
    TC = TC+CSTSP(I)
    TD = TD+CSTSHT(I)
    TE = TE+CSTSFI(I)
    TF = TF+CSTUGF(I)
    TG = TG+CSTAE(I)
    TH = TH+CSTSU(I)
    TTI = TTI+CSTOT(I)
    IYR = IYR + 1
    WRITE(IO,1064) IYR,CSTLND(I), CSTLIC(I), CSTSP(I), CSTSHT(I),
1    CSTSFI(I),CSTUGF(I),CSTAE(I),CSTSU(I),CSTOT(I)
100 CONTINUE
    LB = LL + 1
    DO 110 I=LB,LY
    IYR = IYR + 1
    CSTSFI(I) = CSTSFI(I) / ONEMIL
    CSTOT(I) = CSTSFI(I)
    TTI = TTI+CSTSFI(I)
    TE = TE+CSTSFI(I)
    WRITE(IO,1300) IYR,CSTSFI(I),CSTSFI(I)
110 CONTINUE
    WRITE(IO,1310) TA,TB,TC,TD,TE,TF,TG,TH,TTI
C
C
C
    TABLE 14
    DO 200 I=1,LEE
    RRCMIN(I) = RRCMIN(I) / ONEMIL
    RRCHST(I) = RRCHST(I) / ONEMIL
    RRCHAS(I) = RRCHAS(I) / ONEMIL
    RRCOSD(I) = RRCOSD(I) / ONEMIL
    RRCTOT(I) = RRCTOT(I) / ONEMIL
200 CONTINUE
    WRITE(IO,1000)
    WRITE(IO,1055) TITLE
    WRITE(IO,1001) DA
    WRITE(IO,1002) TI
    WRITE(IO,1150) (RPTYP(L),L=1,4)
    WRITE(IO,1151) IYRDIS
    WRITE(IO,1153)
    WRITE(IO,1154)
    WRITE(IO,1155)
    WRITE(IO,1156)
    WRITE(IO,1010)
    IYR = IYRCON - 1
    DO 300 I=1,LEE
    RRCTOT(I) = RRCMIN(I)+RRCHST(I)+RRCHAS(I)+ RRCOSD(I)
    IYR = IYR + 1
    WRITE(IO,1157) IYR,RRCMIN(I),RRCHST(I),RRCHAS(I),RRCOSD(I),
1    RRCTOT(I)
    TRCC(1) = TRCC(1) + RRCMIN(I)
    TRCC(2) = TRCC(2) + RRCHST(I)
    TRCC(3) = TRCC(3) + RRCHAS(I)
    TRCC(4) = TRCC(4) + RRCOSD(I)
    TRCC(5) = TRCC(5) + RRCTOT(I)
300 CONTINUE
    WRITE(IO,1121)
    WRITE(IO,1158) (TRCC(I),I=1,5)

```

***** RECON2 OUTPUT *****

C
C
C

TABLE 15

```

WRITE(10,1000)
WRITE(10,1055)  TITLE
WRITE(10,1001)  DA
WRITE(10,1002)  TI
WRITE(10,1208)  (RPTYP(L),L=1,4)
WRITE(10,1209)
WRITE(10,1196)  IYRDIS
WRITE(10,1197)
WRITE(10,1226)
WRITE(10,1199)
WRITE(10,1010)
IYR = IYRCON - 1
TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
TG = 0.0
DO 1205 I = 1,LY
  ARLBCT(I) = ARLBCT(I)/ONEMIL
  APLBCT(I) = APLBCT(I)/ONEMIL
  ATLBCT(I) = ATLBCT(I)/ONEMIL
  AXLBCT(I) = AXLBCT(I)/ONEMIL
  AMLBCT(I) = AMLBCT(I)/ONEMIL
  OWLBR(I) = OWLBR(I)/ONEMIL
  TALBCT(I) = TALBCT(I)/ONEMIL
  TA = TA+ARLBCT(I)
  TB = TB+APLBCT(I)
  TC = TC+ATLBCT(I)
  TD = TD+AXLBCT(I)
  TE = TE+AMLBCT(I)
  TF = TF+OWLBR(I)
  TG = TG+TALBCT(I)
  IYR = IYR + 1
  WRITE(10,1200) IYR,ARLBCT(I),APLBCT(I),ATLBCT(I),AXLBCT(I),
1  AMLBCT(I),OWLBR(I),TALBCT(I)
1205 CONTINUE
  WRITE(10,1314)
  WRITE(10,1315) TA,TB,TC,TD,TE,TF,TG

```

C
C
C

TABLE 16

```

WRITE(10,1000)
WRITE(10,1055)  TITLE
WRITE(10,1001)  DA
WRITE(10,1002)  TI
WRITE(10,1212)  (RPTYP(L),L=1,4)
WRITE(10,1209)
WRITE(10,1196)  IYRDIS
WRITE(10,1197)
WRITE(10,1226)
WRITE(10,1199)
WRITE(10,1010)

```

***** RECON2 OUTPUT *****

```

IYR = IYRCON - 1
TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
TG = 0.0
DO 1206 I = 1,LY
  REMTCT(I) = REMTCT(I)/ONEMIL
  PAMTCT(I) = PAMTCT(I)/ONEMIL
  TRMTCT(I) = TRMTCT(I)/ONEMIL
  EXMTCT(I) = EXMTCT(I)/ONEMIL
  EMMTCT(I) = EMMTCT(I) / ONEMIL
  OTMTCT(I) = OTMTCT(I)/ONEMIL
  TMTCT(I) = TMTCT(I)/ONEMIL
  TA = TA+REMTCT(I)
  TB = TB+PAMTCT(I)
  TC = TC+TRMTCT(I)
  TD = TD+EXMTCT(I)
  TE = TE+EMMTCT(I)
  TF = TF+OTMTCT(I)
  TG = TG+TMTCT(I)
  IYR = IYR + 1
  WRITE(IO,1200) IYR,REMTCT(I),PAMTCT(I),TRMTCT(I),EXMTCT(I),
1 EMMTCT(I),OTMTCT(I), TMTCT(I)
1206 CONTINUE
  WRITE(IO,1314)
  WRITE(IO,1315) TA,TB,TC,TD,TE,TF,TG
C
C   TABLE 17
C
  WRITE(IO,1000)
  WRITE(IO,1055)  TITLE
  WRITE(IO,1001)  DA
  WRITE(IO,1002)  TI
  WRITE(IO,1213)  (RPTYP(L),L=1,4)
  WRITE(IO,1209)
  WRITE(IO,1196)  IYRDIS
  WRITE(IO,1197)
  WRITE(IO,1228)
  WRITE(IO,1199)
  WRITE(IO,1010)
  IYR = IYRCON - 1
  TA = 0.0
  TB = 0.0
  TC = 0.0
  TD = 0.0
  TE = 0.0
  TF = 0.0
  TG = 0.0
DO 1207 I = 1,LY
  REEQCT(I) = REEQCT(I)/ONEMIL
  PARQCT(I) = PARQCT(I)/ONEMIL
  TREQCT(I) = TREQCT(I)/ONEMIL
  EXEQCT(I) = EXEQCT(I)/ONEMIL

```


***** RECON2 OUTPUT *****

```

EMEQCT(I) = EMEQCT(I)/ONEMIL
SFEQCT(I) = SFEQCT(I)/ONEMIL
TWOEQC(I) = TWOEQC(I)/ONEMIL
TA = TA+REEQCT(I)
TB = TB+PARQCT(I)
TC = TC+TREQCT(I)
TD = TD+EXEQCT(I)
TE = TE+EMEQCT(I)
TF = TF+SFEQCT(I)
TG = TG+TWOEQC(I)
IYR = IYR + 1
WRITE(IO,1200) IYR,REEQCT(I),PARQCT(I),TREQCT(I),EXEQCT(I),
I EMEQCT(I),SFEQCT(I),TWOEQC(I)

```

```

1207 CONTINUE
WRITE(IO,1063)
WRITE(IO,1314)
WRITE(IO,1315) TA,TB,TC,TD,TE,TF,TG

```

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TABLE 18

```

WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1279) (RPTYP(L),L=1,4)
WRITE(IO,1296)
WRITE(IO,1280)
WRITE(IO,1281)
WRITE(IO,1282) IYRDIS
WRITE(IO,1283)
WRITE(IO,1284)
WRITE(IO,1297)
IYR = IYRCON -1
NN = NWPI
TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
TG = 0.0
TH = 0.0
TTI = 0.0
DO 750 I=1,LY
IYR = IYR + 1
POWER (NN,I) = POWER (NN,I) / ONETHO
STEAM (NN,I) = STEAM (NN,I) / ONETHO
DIESEL(NN,I) = DIESEL(NN,I) / ONETHO
POWCST(NN,I) = POWCST(NN,I) / ONEMIL
STMCST(NN,I) = STMCST(NN,I) / ONEMIL
WATERC(NN,I) = WATERC(NN,I) / ONEMIL
DSL CST(NN,I) = DSL CST(NN,I) / ONEMIL
ANUTC (NN,I) = ANUTC (NN,I) / ONEMIL
TA = TA+POWER(NN,I)
TB = TB+STEAM(NN,I)
TC = TC+WATER(NN,I)
TD = TD+DIESEL(NN,I)

```

***** RECON₂ OUTPUT *****

```

TE = TE+POWCST(NN,I)
TF = TF+STMCST(NN,I)
TG = TG+WATERC(NN,I)
TH = TH+DSL CST(NN,I)
TTI = TTI+ANUTC(NN,I)
WRITE(IO,1285) IYR,POWER(NN,I),STEAM(NN,I),WATER(NN,I),DIESEL(N
11),POWCST(NN,I),STMCST(NN,I),WATERC(NN,I),DSL CST(NN,I),ANUTC(NN,
75C CONTINUE
WRITE(IO,1063)
WRITE(IO,1317)
WRITE(IO,1318) TA,TB,TC,TD,TE,TF,TG,TH,TTI
WRITE(IO,1286)

```

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TABLE 19

```

IFLAG = 0
KB = 1
KE = NWT
M = 0
1201 CONTINUE
DO 1204 K=KB,KE
M = M+1
WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
IF(K.NE.NWP1) WRITE(IO,1193) NTA(M),(WSTYP(L,K),L=1,3)
IF(K.EQ.NWP1) WRITE(IO,1194) NTA(M),(RPTYP(L),L=1,4)
IF(K.NE.NWP1) WRITE(IO,1178) (RPTYP(L),L=1,4)
IF(K.EQ.NWP1) WRITE(IO,1335)
WRITE(IO,1196) IYRDIS
WRITE(IO,1197)
WRITE(IO,1226)
WRITE(IO,1199)
WRITE(IO,1010)
IYR = IYRCON - 1
TA = 0.0
TB = 0.0
TC = 0.0
TD = 0.0
TE = 0.0
TF = 0.0
TG = 0.0
DO 1202 I=1,LY
RECST(K,I) = RECST(K,I)/ONEMIL
PACST(K,I) = PACST(K,I)/ONEMIL
TRCST(K,I) = TRCST(K,I)/ONEMIL
ECOST(K,I) = ECOST(K,I)/ONEMIL
EMCST(K,I) = EMCST(K,I)/ONEMIL
OWOPC(K,I) = OWOPC(K,I) / ONEMIL
TWOPCT(K,I) = TWOPCT(K,I)/ONEMIL
TA = TA+RECST(K,I)
TB = TB+PACST(K,I)
TC = TC+TRCST(K,I)
TD = TD+ECOST(K,I)

```

***** RECON2 OUTPUT *****

```

      TE = TE+EMCST(K,I)
      TF = TF+OWOPC(K,I)
      TG = TG+TWOPCT(K,I)
      IYR = IYR + 1
      WRITE(IO,1200) IYR,RECST(K,I),PACST(K,I),TRCST(K,I),ECOST(K,I),
1     EMCST(K,I), OWOPC(K,I), TWOPCT(K,I)
1202 CONTINUE
      WRITE(IO,1063)
      WRITE(IO,1319)
      WRITE(IO,1320) TA,TB,TC,TD,TE,TF,TG
1204 CONTINUE
      IF(IFLAG.EQ.1) GO TO 1203
      KB = NWP1
      KE = NWP1
      IFLAG = 1
      GO TO 1201
1203 CONTINUE
C
C      TABLE 20
C
      DO 520 I=1,LEE
      ANBFCT(I) = ANBFCT(I) / ONEMIL
      ANSLCT(I) = ANSLCT(I) / ONEMIL
      ANDDOCT(I) = ANDDOCT(I) / ONEMIL
      TSURVC(I) = TSURVC(I) / ONEMIL
      ABDCST(I) = ANBFCT(I) + ANSLCT(I) + ANDDOCT(I) + TSURVC(I)
520 CONTINUE
      DO 530 I=1,LEE
      SOTBKF(I) = SOTBKF(I) / ONETHO
      SUMBKF(I) = SUMBKF(I) / ONETHO
530 CONTINUE
      WRITE(IO,1000)
      WRITE(IO,1055) TITLE
      WRITE(IO,1001) DA
      WRITE(IO,1002) TI
      WRITE(IO,1230) (RPTYP(L),L=1,4)
      WRITE(IO,1231)
      WRITE(IO,1232) IYRDIS
      WRITE(IO,1233)
      WRITE(IO,1234)
      WRITE(IO,1235)
      WRITE(IO,1010)
      IYR = IYRCON - 1
      TA = 0.0
      TB = 0.0
      TC = 0.0
      TD = 0.0
      TE = 0.0
      TF = 0.0
      TG = 0.0
      TH = 0.0
      DO 550 I=1,LEE
      IYR = IYR + 1
      TA = TA+SRKBKF(I)
      TB = TB+SOTBKF(I)
      TC = TC+SUMBKF(I)
      TD = TD+ANBFCT(I)

```

***** RECON2 OUTPUT *****

```

      TE = TE+ANSLCT(I)
      TF = TF+ANDDCT(I)
      TG = TG+TSURVC(I)
      TH = TH+ABDCST(I)
      WRITE(IO,1236) IYR,SRKBKF(I),SOTBKF(I),SUMBKF(I),ANBFCT(I),
1      IANSLCT(I),ANDDCT(I), TSURVC(I),ABDCST(I)
550  CONTINUE
      WRITE(IO,1063)
      WRITE(IO,1322)
      WRITE(IO,1324) TA,TB,TC,TD,TE,TF,TG,TH

```

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TABLE 21

```

      DO 580 K=1,NWP1
      TLDCST(K) = TLDCST(K) / ONEMIL
      TLCCST(K) = TLCCST(K) / ONEMIL
      TSPCST(K) = TSPCST(K) / ONEMIL
      TSHCST(K) = TSHCST(K) / ONEMIL
      TSFCST(K) = TSFCST(K) / ONEMIL
      TUF CST(K) = TUF CST(K) / ONEMIL
      TAECST(K) = TAECST(K) / ONEMIL
      TSUCST(K) = TSUCST(K) / ONEMIL
      TSUBCN(K) = TSUBCN(K) / ONEMIL
      TOMCST(K) = TOMCST(K) / ONEMIL
      THSCST(K) = THSCST(K) / ONEMIL
      TSSCST(K) = TSSCST(K) / ONEMIL
      TODCST(K) = TODCST(K) / ONEMIL
      TSUBRO(K) = TSUBRO(K) / ONEMIL
      TRCCST(K) = TRCCST(K) / ONEMIL
      TPKCST(K) = TPKCST(K) / ONEMIL
      TTRCST(K) = TTRCST(K) / ONEMIL
      TExcST(K) = TExcST(K) / ONEMIL
      TEMCST(K) = TEMCST(K) / ONEMIL
      TUTCST(K) = TUTCST(K) / ONEMIL
      TOPCST(K) = TOPCST(K) / ONEMIL
      TBFCST(K) = TBFCST(K) / ONEMIL
      TSLCST(K) = TSLCST(K) / ONEMIL
      TDCCST(K) = TDCCST(K) / ONEMIL
      TSVCST(K) = TSVCST(K) / ONEMIL
      TBDCST(K) = TBDCST(K) / ONEMIL
      TCNCST(K) = TCNCST(K) / ONEMIL
      TWT CST(K) = TWT CST(K) / ONEMIL
580  CONTINUE
      WRITE(IO,1000)
      WRITE(IO,1055) TITLE
      WRITE(IO,1001) DA
      WRITE(IO,1002) TI
      WRITE(IO,1237) (RPTYP(L),L=1,4)
      WRITE(IO,1238) IYRDIS
      WRITE(IO,1239)
      LX = (NWT+1) * 13 -3
      WRITE(IO,1240) (DASH,L=1,LX)
      WRITE (IO,1241) ((WSTYP(L,K),L=1,3),K=1,NWT),TOT
      LX = (NWT+1) * 10
      WRITE(IO,1242) (DASH,L=1,LX)
      WRITE(IO,1243)
      WRITE(IO,1244) (TLDCST(K),K=1,NWT) , TLDCST(NWP1)

```

***** RECON2 OUTPUT *****

```

WRITE(IO,1245) (TLCCST(K),K=1,NWT), TLCCST(NWP1)
WRITE(IO,1246) (TSPCST(K),K=1,NWT), TSPCST(NWP1)
WRITE(IO,1247) (TSHCST(K),K=1,NWT), TSHCST(NWP1)
WRITE(IO,1249) (TSFCST(K),K=1,NWT), TSFCST(NWP1)
WRITE(IO,1214) (TUFCST(K),K=1,NWT), TUFCST(NWP1)
WRITE(IO,1250) (TAECST(K),K=1,NWT), TAECST(NWP1)
WRITE(IO,1251) (TSUCST(K),K=1,NWT), TSUCST(NWP1)
WRITE(IO,1288) (TSUBCN(K),K=1,NWT), TSUBCN(NWP1)
WRITE(IO,1292)
WRITE(IO,1252) (TOMCST(K),K=1,NWT), TOMCST(NWP1)
WRITE(IO,1253) (THSCST(K),K=1,NWT), THSCST(NWP1)
WRITE(IO,1254) (TSSCST(K),K=1,NWT), TSSCST(NWP1)
WRITE(IO,1255) (TODCST(K),K=1,NWT), TODCST(NWP1)
WRITE(IO,1288) (TSUBRO(K),K=1,NWT), TSUBRO(NWP1)
WRITE(IO,1293)
WRITE(IO,1256) (TRCCST(K),K=1,NWT), TRCCST(NWP1)
WRITE(IO,1257) (TPKCST(K),K=1,NWT), TPKCST(NWP1)
WRITE(IO,1258) (TTRCST(K),K=1,NWT), TTRCST(NWP1)
WRITE(IO,1291) (TEXCST(K),K=1,NWT), TExcST(NWP1)
WRITE(IO,1259) (TEMCST(K),K=1,NWT), TEMCST(NWP1)
WRITE(IO,1260) (TUTCST(K),K=1,NWT), TUTCST(NWP1)
WRITE(IO,1288) (TOPCST(K),K=1,NWT), TOPCST(NWP1)
WRITE(IO,1294)
WRITE(IO,1261) (TBFCST(K),K=1,NWT), TBFCST(NWP1)
WRITE(IO,1262) (TSLCST(K),K=1,NWT), TSLCST(NWP1)
WRITE(IO,1263) (TDCCST(K),K=1,NWT), TDCCST(NWP1)
WRITE(IO,1287) (TSVCST(K),K=1,NWT), TSVCST(NWP1)
WRITE(IO,1288) (TBOCST(K),K=1,NWT), TBOCST(NWP1)
WRITE(IO,1289) (TCNCST(K),K=1,NWT), TCNCST(NWP1)
WRITE(IO,1290) (TWTCTST(K),K=1,NWT), TWTCTST(NWP1)

```

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TABLE 22

```

WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1264) (RPTYP(L),L=1,4)
WRITE(IO,1265) IYRDIS
WRITE(IO,1267)
WRITE(IO,1268)
WRITE(IO,1269)
WRITE(IO,1270)
WRITE(IO,1271)
WRITE(IO,1010)
  TA = 0.0
  TB = 0.0
  TC = 0.0
  TD = 0.0
  TE = 0.0
  TF = 0.0
IYR = IYRCON - 1
DO 650 I=1,LY
  IYR = IYR + 1
  ACONTG(I) = ACONTG(I) / ONEMIL
  TACCST(I)=CSTOT(I) + PRCTOT(I) + TWOPCT(NWP1,I) + ABOCST(I)
  I + ACONTG(I)

```

***** RECON2 OUTPUT *****

```

      TA = TA + CSTOT(I)
      TB = TB + RRCTOT(I)
      TC = TC + TWOPCT(NWP1,I)
      TD = TD + ABDCST(I)
      TE = TE + ACONTG(I)
      TF = TF + TACCST(I)
      WRITE(I0,1272) IYR,CSTOT(I),RRCTOT(I),TWOPCT(NWP1,I),ABDCST(I),
1ACONTG(I),TACCST(I)
650 CONTINUE
      IB = LY + 1
      LE = NBKF + IDD
      DO 660 I=IB,LE
      IYR = IYR + 1
      ACONTG(I) = ACONTG(I) / ONEMIL
      TACCST(I) = RRCTOT(I) + ABDCST(I)
      I + ACONTG(I)
      TB = TB + RRCTOT(I)
      TD = TD + ABDCST(I)
      TE = TE + ACONTG(I)
      TF = TF + TACCST(I)
      WRITE(I0,1298) IYR,RRCTOT(I),ABDCST(I),ACONTG(I),TACCST(I)
660 CONTINUE
      WRITE(I0,1339)
      WRITE(I0,1340) TA,TB,TC,TD,TE,TF

```

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TABLE 23

```

WRITE(I0,1000)
WRITE(I0,1055) TITLE
WRITE(I0,1001) DA
WRITE(I0,1002) TI
WRITE(I0,1273) (RPTYP(L),L=1,4)
WRITE(I0,1274) IYRDIS
WRITE(I0,1239)
LX = NWT * 13 - 3
WRITE(I0,1240) (DASH,L=1,LX)
WRITE(I0,1241) ((WSTYP(L,K),L=1,3),K=1,NWT)
LX = NWT * 10
WRITE(I0,1242) (DASH,L=1,LX)
WRITE(I0,1243)
WRITE(I0,1244) (ULDCST(K,1),K=1,NWT)
WRITE(I0,1245) (ULCCST(K,1),K=1,NWT)
WRITE(I0,1246) (USPCST(K,1),K=1,NWT)
WRITE(I0,1247) (USHCST(K,1),K=1,NWT)
WRITE(I0,1249) (USFCST(K,1),K=1,NWT)
WRITE(I0,1214) (UUF CST(K,1),K=1,NWT)
WRITE(I0,1250) (UAECST(K,1),K=1,NWT)
WRITE(I0,1251) (USUCST(K,1),K=1,NWT)
WRITE(I0,1288) (USUBCN(K,1),K=1,NWT)
WRITE(I0,1292)
WRITE(I0,1252) (UOMCST(K,1),K=1,NWT)
WRITE(I0,1253) (UHSCST(K,1),K=1,NWT)
WRITE(I0,1254) (USSCST(K,1),K=1,NWT)
WRITE(I0,1255) (UODCST(K,1),K=1,NWT)
WRITE(I0,1288) (USUBRO(K,1),K=1,NWT)
WRITE(I0,1293)
WRITE(I0,1256) (URCCST(K,1),K=1,NWT)

```

***** RECON2 OUTPUT *****

```
WRITE(I0,1257) (UPKCST(K,1),K=1,NWT)
WRITE(I0,1258) (UTRCST(K,1),K=1,NWT)
WRITE(I0,1291) (UEXCST(K,1),K=1,NWT)
WRITE(I0,1259) (UEMCST(K,1),K=1,NWT)
WRITE(I0,1260) (UUTCST(K,1),K=1,NWT)
WRITE(I0,1288) (UOPCST(K,1),K=1,NWT)
WRITE(I0,1294)
WRITE(I0,1261) (UBFCST(K,1),K=1,NWT)
WRITE(I0,1262) (USLCST(K,1),K=1,NWT)
WRITE(I0,1263) (UDCCST(K,1),K=1,NWT)
WRITE(I0,1287) (USVCST(K,1),K=1,NWT)
WRITE(I0,1288) (UBDCST(K,1),K=1,NWT)
WRITE(I0,1289) (UCMCST(K,1),K=1,NWT)
WRITE(I0,1290) (UWTCST(K,1),K=1,NWT)
```

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TABLE 24

```
WRITE(I0,1000)
WRITE(I0,1055) TITLE
WRITE(I0,1001) DA
WRITE(I0,1002) TI
WRITE(I0,1275) (RPTYP(L), L=1,4)
WRITE(I0,1276) IYRDIS
WRITE(I0,1239)
LX = NWT * 13 -3
WRITE(I0,1240) (DASH,L=1,LX)
WRITE(I0,1241) (IWTYP(L,K),L=1,3),K=1,NWT)
LX = NWT * 10
WRITE(I0,1242) (DASH,L=1,LX)
WRITE(I0,1243)
WRITE(I0,1244) (ULDCST(K,2),K=1,NWT)
WRITE(I0,1245) (ULCCST(K,2),K=1,NWT)
WRITE(I0,1246) (USPCST(K,2),K=1,NWT)
WRITE(I0,1247) (USHCST(K,2),K=1,NWT)
WRITE(I0,1249) (USFCST(K,2),K=1,NWT)
WRITE(I0,1214) (UUF CST(K,2),K=1,NWT)
WRITE(I0,1250) (UAECST(K,2),K=1,NWT)
WRITE(I0,1251) (USUCST(K,2),K=1,NWT)
WRITE(I0,1288) (USUBCN(K,2),K=1,NWT)
WRITE(I0,1292)
WRITE(I0,1252) (UOMCST(K,2),K=1,NWT)
WRITE(I0,1253) (UHSCST(K,2),K=1,NWT)
WRITE(I0,1254) (USSCST(K,2),K=1,NWT)
WRITE(I0,1255) (UODCST(K,2),K=1,NWT)
WRITE(I0,1288) (USUBRO(K,2),K=1,NWT)
WRITE(I0,1293)
WRITE(I0,1256) (URCCST(K,2),K=1,NWT)
WRITE(I0,1257) (UPKCST(K,2),K=1,NWT)
WRITE(I0,1258) (UTRCST(K,2),K=1,NWT)
WRITE(I0,1291) (UEXCST(K,2),K=1,NWT)
WRITE(I0,1259) (UEMCST(K,2),K=1,NWT)
WRITE(I0,1260) (UUTCST(K,2),K=1,NWT)
WRITE(I0,1288) (UOPCST(K,2),K=1,NWT)
WRITE(I0,1294)
WRITE(I0,1261) (UBFCST(K,2),K=1,NWT)
WRITE(I0,1262) (USLCST(K,2),K=1,NWT)
WRITE(I0,1263) (UDCCST(K,2),K=1,NWT)
```

***** RECON2 OUTPUT *****

```

WRITE(IO,1287) (USVCST(K,2),K=1,NWT)
WRITE(IO,1288) (UBDCST(K,2),K=1,NWT)
WRITE(IO,1289) (UCNCST(K,2),K=1,NWT)
WRITE(IO,1290) (UWTCST(K,2),K=1,NWT)

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TABLE 25

WRITE(IO,1000)
WRITE(IO,1055) TITLE
WRITE(IO,1001) DA
WRITE(IO,1002) TI
WRITE(IO,1277) (RPTYP(L), L=1,4)
WRITE(IO,1278) IYRDIS
WRITE(IO,1239)
LX = NWT * 13 -3
WRITE(IO,1240) (DASH,L=1,LX)
WRITE(IO,1241) ((WSTYP(L,K),L=1,3),K=1,NWT)
LX = NWT * 10
WRITE(IO,1242) (DASH,L=1,LX)
WRITE(IO,1243)
WRITE(IO,1244) (ULDCST(K,3),K=1,NWT)
WRITE(IO,1245) (ULCCST(K,3),K=1,NWT)
WRITE(IO,1246) (USPCST(K,3),K=1,NWT)
WRITE(IO,1247) (USHCST(K,3),K=1,NWT)
WRITE(IO,1248) (UPMCST(K,3),K=1,NWT)
WRITE(IO,1249) (USFCST(K,3),K=1,NWT)
WRITE(IO,1250) (UUF CST(K,3),K=1,NWT)
WRITE(IO,1251) (UAECST(K,3),K=1,NWT)
WRITE(IO,1252) (USUCST(K,3),K=1,NWT)
WRITE(IO,1253) (USUBCN(K,3),K=1,NWT)
WRITE(IO,1254)
WRITE(IO,1255) (UOMCST(K,3),K=1,NWT)
WRITE(IO,1256) (UHSCST(K,3),K=1,NWT)
WRITE(IO,1257) (USSCST(K,3),K=1,NWT)
WRITE(IO,1258) (UQDCST(K,3),K=1,NWT)
WRITE(IO,1259) (USUBRO(K,3),K=1,NWT)
WRITE(IO,1260)
WRITE(IO,1261) (URCCST(K,3),K=1,NWT)
WRITE(IO,1262) (UPKCST(K,3),K=1,NWT)
WRITE(IO,1263) (UTRCST(K,3),K=1,NWT)
WRITE(IO,1264) (UEXCST(K,3),K=1,NWT)
WRITE(IO,1265) (UEMCST(K,3),K=1,NWT)
WRITE(IO,1266) (UUTCST(K,3),K=1,NWT)
WRITE(IO,1267) (UOPCST(K,3),K=1,NWT)
WRITE(IO,1268)
WRITE(IO,1269) (UBFCST(K,3),K=1,NWT)
WRITE(IO,1270) (USLCST(K,3),K=1,NWT)
WRITE(IO,1271) (UDCCST(K,3),K=1,NWT)
WRITE(IO,1272) (USVCST(K,3),K=1,NWT)
WRITE(IO,1273) (UBDCST(K,3),K=1,NWT)
WRITE(IO,1274) (UCNCST(K,3),K=1,NWT)
WRITE(IO,1275) (UWTCST(K,3),K=1,NWT)

C
1000 FORMAT('1')
1001 FORMAT(' ',T111,'DATE; ',A8)
1002 FORMAT(' ',T111,'TIME; ',A8)
1003 FORMAT('C',T34,'TABLE 1 MINE DEVELOPMENT PARAMETERS FOR A REPOS

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***** RECON2 OUTPUT *****

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1000 10RY IN '4A4)
1004 FORMAT(' ',T34,7('-'))
1005 FORMAT('LOCATION',T60,4A4)
1006 FORMAT('CYEAR CONSTRUCTION BEGINS',T62,I4)
1007 FORMAT('CYEAR OPERATION BEGINS',T62,I4)
1008 FORMAT('DEPTH, METERS (A)',T59,F8.1)
1009 FORMAT(' ',T20,7('-'))
1010 FORMAT(' ')
1011 FORMAT('D',T20,'TABLE 8',A1,'. REPOSITORY DEVELOPMENT SCHEDULE F
1 '3A4)
1012 FORMAT('D',T17,'ROCK, THOUSAND OF TONNES',/
1 ,T12,4C('-'),T67,'ROOMS',T87,'AREA REQUIRED, ACRES')
1013 FORMAT(' ',T42,'TRANSPORT',T57,25('-'),T87,25('-'))
1014 FORMAT(' YEAR',T12,'MINED',T27,'BACKFILLED',T42,'TO SURFACE',
1T57,'EXCAVATED',T72,'FILLED',T87,'ANNUAL',T102,'CUMULATIVE')
1015 FORMAT(' ----',6X ,7(10('-'),5X))
1016 FORMAT(' ',I4,T11,3(F10.0,5X),4(F10.2,5X))
1017 FORMAT('C',T20,'TABLE 9 SUMMARY DEVELOPMENT SCHEDULE FOR A REPO
1TORY IN '4A4)
1018 FORMAT(' ',T20,9('-'),2X,'IN '4A4)
1019 FORMAT('D',T25,'ROCK, THOUSAND OF TONNES',T97,'WASTE STORAGE ARE
+ ACRES')
1020 FORMAT(' ',T11,58('-'),T79,'ROOMS',T95,34('-'))
1021 FORMAT(' ',T35,'TRANSPORT',T47,'SURFACE',T59,'TRANSPORT'
1,T71,22('-'),T95,'ANNUAL',T107,'CUMULATIVE REMAINING')
1022 FORMAT(' YEAR',T11,'MINED',T23,'BACKFILLED TO SURFACE STORAGE'
1T59,'OFFSITE',T71,'EXCAVATED',T83,'FILLED',T95,2('REQUIRED',4X),
2T119,'AVAILABLE')
1023 FORMAT(' ----',T11,10(10('-'),2X))
1024 FORMAT(' ',I4,5X,5(F10.0,2X),5(F10.1,2X))
1025 FORMAT('D',T11,3(10('-'),2X),12X,3(10('-'),2X)//
+ ' TOTAL',T11,3(F10.0,2X),12X,F10.0,2(2X,F10.1))
1026 FORMAT('GTOTAL SURFACE AREA, HECTARES (B)',T59,F8.1)
1027 FORMAT('CTOTAL UNDERGROUND AREA, HECTARES (B)',T59,F8.1)
1028 FORMAT('GMINING METHOD',T51,4A4)
1029 FORMAT('GCENTRAL PILLAR AREA, HECTARES (B)',T59,F8.1)
1030 FORMAT('C',12A4)
1031 FORMAT(' ',T4,'WIDTH, METERS (A)',T59,F8.1)
1032 FORMAT(' ',T4,'LENGTH, METERS (A)',T59,F8.1)
1033 FORMAT(' ',T4,'HEIGHT, METERS (A)',T59,F8.1)
1034 FORMAT('GPANEL WIDTH, METERS (A)',T59,F8.1)
1035 FORMAT(' PANEL LENGTH, METERS (A)',T59,F8.1)
1036 FORMAT(' GEOMETRIC EXCLUSION FACTOR',T59,F8.1)
1037 FORMAT('OSITE PREPARATION COST, $/HECTARE (B)',T59,F8.1)
1038 FORMAT('ODISCOUNT RATE, PERCENT',T59,F8.1)
1039 FORMAT('1',T41,'WASTE TYPE')
1040 FORMAT(' ',T41,89A1)
1041 FORMAT(' ',T41,7(3A4,1X))
1042 FORMAT(' ',T41,7(11A1 ,2X))
1043 FORMAT('CEXTRACTION RATIO',T38,7(5X,F8.3))
1044 FORMAT('GROOM WIDTH, METERS (A)',T38,7(5X,F8.1))
1045 FORMAT(' ROOM HEIGHT, METERS (A)',T38,7(5X,F8.1))
1046 FORMAT('GROOMS PER PANEL',T38,7(5X,I8))
1047 FORMAT(' ',T4,'CORRIDORS/PANEL',T63,I3)
1052 FORMAT('C',35('-'))
1053 FORMAT(' (A) 1 METER = 3.281 FEET')
1054 FORMAT(' (B) 1 HECTARE = 2.471 ACRES')

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***** RECON2 OUTPUT *****

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1055 FORMAT(' CASE DESCRIPTION - ',20A4)
1056 FORMAT('C',T30,'TABLE 13 CONSTRUCTION AND PREPARATION COSTS FOR
      1 REPOSITORY IN ',4A4)
1057 FORMAT(' ',T30,8(' '))
1058 FORMAT(' ',T50,'(MILLIONS OF ',I4,' DOLLARS)')
1059 FORMAT('C',T61,'FACILITY CONSTRUCTION')
1060 FORMAT(' ',T34,'SITE',T47,'SHAFT',T60,23(' '),T86,'ARCHITECT')
1061 FORMAT(' YEAR LAND',T21,'LICENSE',T34,'PREPARE',T47,'CONSTRUCT'
      1 T60,'SURFACE',T73,'SUBSURFACE',T86,'ENGINEER',T99,'STARTUP',
      2 T112,'TOTAL')
1062 FORMAT(' ----',2X,9(10(' '),3X))
1063 FORMAT(' ')
1064 FORMAT(' ',I4,2X,8(F8.2,5X),F8.2)
1065 FORMAT('TABLE 11 WASTE FACILITY CAPITAL COSTS FOR A REPOSITORY
      1 ',4A4)
1066 FORMAT(' -----')
1067 FORMAT('Q',T51,'MILLIONS OF ',I4,' $')
1068 FORMAT(' ',T51,18(' '))
1069 FORMAT('QWASTE RECEIVING MODULE - REMOTE HANDLED' ,T51,F12.
1070 FORMAT('QWASTE RECEIVING MODULE - CONTACT HANDLED' ,T51,F12.
1071 FORMAT('QWASTE PACKAGING MODULE',T51,F12.2)
1072 FORMAT('C',T41,'RECEIVING',T51,'PACKAGING')
1073 FORMAT(' ',T41,9(' '),T51,9(' '))
1076 FORMAT('Q',12A4,T51,F12.2)
1077 FORMAT('QEMPLACEMENT EXCAVATION METHODS')
1078 FORMAT('Q',T17,'TABLE 2 RECEIVING AND PROCESSING FOR A REPOSITO
      1 IN ',4A4)
1079 FORMAT(' ',T17,7(' '))
1080 FORMAT('GR.H. WASTE PROCESSING CAPACITY',T41,F8.1,T51,F8.1)
1081 FORMAT(' PER MODULE, UNITS/SHIFT')
1082 FORMAT('GC.H. WASTE PROCESSING CAPACITY',T41,F8.1)
1083 FORMAT(' PER MODULE, UNITS/SHIFT')
1084 FORMAT(' ',T41,7(3A4,1X))
1085 FORMAT(' ',T41,7(11A1,2X))
1086 FORMAT(' RAIL CONTAINER CAPACITY, UNITS',T41,7(F8.1,5X))
1087 FORMAT('QTRUCK CONTAINER CAPACITY, UNITS',T41,7(F8.1,5X))
1089 FORMAT(' TOTAL' ,T51,F12.
1090 FORMAT('Q-----')
1091 FORMAT('Q',T15,'TABLE 12 EQUIPMENT LIFE AND COST FOR A REPOSITOR
      1 IN ',4A4)
1092 FORMAT(' ',T15,8(' '))
1093 FORMAT('Q',T83,'COSTS,')
1094 FORMAT(' ',T51,'LIFE',T81,'MILLIONS $')
1095 FORMAT(' ',T51,25(' '),T81,10(' '))
1096 FORMAT('QSURFACE WASTE OPERATIONS')
1097 FORMAT(' RECEIVING MODULE - REMOTE HANDLED WASTE',T49,F10.0,
      1T61,'RECEIVING UNITS',T81,F10.2)
1098 FORMAT(' RECEIVING MODULE - CONTACT HANDLED WASTE',T49,F10.0,
      1T61,'RECEIVING UNITS',T81,F10.2)
1099 FORMAT(' PACKAGING MODULE',T49,F10.0,T61,'RECEIVING UNITS',
      1T81,F10.2)
1100 FORMAT('QUNDERGROUND WASTE OPERATIONS')
1101 FORMAT(' TRANSPORTER - REMOTE HANDLED WASTE',T49,F10.0,T61,
      1'PACKAGES',T81,F10.2)
1102 FORMAT(' TRANSPORTER - CONTACT HANDLED WASTE',T49,F10.0,T61,
      1'PACKAGES',T81,F10.2)
1103 FORMAT(' EMLACEMENT - REMOTE HANDLED WASTE',T49,F10.0,T61,

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***** RECON2 OUTPUT *****

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1*PACKAGES*,T81,F10.2)
1104 FORMAT('  EMPLACEMENT - CONTACT HANDLED WASTE',T49,F10.0,T61,
1*PACKAGES*,T81,F10.2)
1105 FORMAT('CROCK OPERATIONS')
1106 FORMAT('  EXCAVATION AND HAULAGE',T49,F10.0,T61,'TONNES ROCK',
1T81,F10.2)
1107 FORMAT(' ',T4,'HOLE DRILLING',T49,F10.0,T61,'PACKAGES',T81,F10.2
1108 FORMAT('  HOISTING',T49,F10.0,T61,'TONNES ROCK',T81,F10.2)
1109 FORMAT('  ROCK STOCKPILE',T49,F10.0,T61,'TONNES ROCK',T81,F10.2
1110 FORMAT('  OFFSITE DISPOSAL',T49,F10.0,T61,'TONNES ROCK',T81,
1F10.2)
1111 FORMAT('  BACKFILLING AND HAULAGE',T49,F10.0,T61,'TONNES ROCK',
1T81,F10.2)
1112 FORMAT('GSUPPORT OPERATIONS')
1113 FORMAT(' ',T4,12A4,T49,F10.0,T61,'YEARS',T81,F10.2)
1114 FORMAT(' ',T4,'ROOM EMPLACEMENT',T49,F10.0,T61,'PACKAGES',T81,F1
12)
1115 FORMAT(' ',T4,'TRENCHING',T49,F10.0,T61,'PACKAGES',T81,F10.2)
1121 FORMAT('C',T11,5(10(' '),5X))
1122 FORMAT(' TOTAL',T81,F10.2)
1123 FORMAT('C',T47,'TABLE 10 SHAFT PARAMETERS AND COSTS')
1124 FORMAT('C',T63,'WASTE TRANSPORT',T85,'EXHAUST')
1125 FORMAT(' ',T41,'MEN AND',T52,'MINING',T63,2(20(' '),2X),'ROCK')
1126 FORMAT(' ',T41,'MATERIALS',T52,'VENT',T63,'REMOTE',T74,'CONTACT'
1T85,'MINING',T96,'WASTE',T107,'HOISTING',T118,'TOTAL')
1127 FORMAT(' ',T41,8(9(' '),2X))
1128 FORMAT('CDESIGN DIAMETER, METERS' ,T41,7(F7.1,4X
1129 FORMAT('CINCREMENTAL EXCAVATED RADIUS, METERS' ,T41,7(F7.1,4X
1130 FORMAT('CEXCAVATED DEPTH, METERS' ,T41,7(F7.1,4X
1131 FORMAT('CLINED DEPTH, METERS' ,T41,7(F7.1,4X
1132 FORMAT('CWASTE TRANSPORT CAPACITY')
1133 FORMAT('  TRIPS PER SHIFT',T63,2(I7,4X),T118,I7)
1134 FORMAT('  PACKAGES PER TRIP')
1135 FORMAT('CROCK HOISTING CAPACITY')
1136 FORMAT('  TONNES PER TRIP',T41,F7.0,T107,F7.7)
1138 FORMAT('CNUMBER OF SHAFTS' ,T41,8(4X,I2,5X
1139 FORMAT('CSHAFT COSTS, MILLIONS OF ',I4,' DOLLARS')
1140 FORMAT('  SINKING' ,T41,8(F7.1,4X
1141 FORMAT('  WATER CONTROL' ,T41,8(F7.1,4X
1142 FORMAT('  LINING' ,T41,8(F7.1,4X
1143 FORMAT('  EQUIPMENT' ,T41,8(F7.1,4X
1144 FORMAT('  SHAFT STATIONS' ,T41,8(F7.1,4X
1145 FORMAT('  TOTAL' ,T41,8(F7.1,4X
1146 FORMAT(' -----')
1147 FORMAT(' ',T47,8(' '),)
1148 FORMAT(' ',T6,3A4,T66,I3)
1149 FORMAT('  TRIPS PER SHIFT',T41,I7,T107,I7)
1150 FORMAT('C',T8,'TABLE 14 MINING AND ROCK REMOVAL OPERATIONS COSTS
SUMMARY FOR A REPOSITORY IN ',4A4)
1151 FORMAT(' ',T8,8(' '),2X,'COSTS IN MILLIONS OF ',I4,' DOLLARS')
1153 FORMAT(' ',T41,'SURFACE')
1154 FORMAT(' ',T41,'HANDLE AND',T56,'OFFSITE')
1155 FORMAT(' YEAR',T11,'MINING',T26,'HOISTING',T41,'SLOPE',T56,
1'DISPOSAL',T71,'TOTAL')
1156 FORMAT(' ---',T11,5(10(' '),5X))
1157 FORMAT(' ',I4,T11,5(F8.2,7X))
1158 FORMAT(' TOTAL',T11,5(F8.2,7X))

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***** RECON2 OUTPUT *****

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1160 FORMAT('C', T6, 'TABLE 3 WASTE SHIPPING DISTRIBUTION FOR A REPO
      ITORY IN ', 4A4)
1161 FORMAT(' ', T6, 7(' '))
1162 FORMAT('C', T11, 'PERCENTAGE OF UNITS SHIPPED BY RAIL FOR:')
1163 FORMAT(' ', T11, 70A1)
1164 FORMAT(' YEAR', T11, 7(3A4, 1X))
1165 FORMAT(' ---', T11, 7(11A1, 2X))
1166 FORMAT(' ', I4, T11, 7(F 8.1, 5X))
1167 FORMAT('C', T26, 'TABLE 6 EMPLACEMENT PACKAGE THERMAL OUTPUT FOR
      1 REPOSITORY IN ', 4A4)
1168 FORMAT(' ', T26, 7(' '))
1169 FORMAT('C', T8, 5(3A4, 10X))
1170 FORMAT(' ', T8, 5(20A1, 2X))
1171 FORMAT(' ', T7, 5(10X, A1, 'AVERAGE', 4X))
1172 FORMAT(' ', T7, 5(A1, 'NUMBER OF HEAT RATE', ' ', 1X))
1173 FORMAT(' YEAR', T7, 5(A1, 'PACKAGES KW/PACKAGE', 1X))
1174 FORMAT(' ---', T8, 5(9A1, 1X, 10A1, 2X))
1175 FORMAT(' ', I4, T8, 5(I9, 1X, F10.2, 2X))
1176 FORMAT('C', T35, 'TABLE 7 WASTE LOADING PARAMETERS FOR A REPOSIT
      1Y IN ', 4A4)
1177 FORMAT(' ', T35, 7(' '))
1178 FORMAT(' ', T27, 10(' '), 1X, 'IN ', 4A4)
1180 FORMAT('C', T8, 5(3A4, 14X))
1181 FORMAT(' ', T8, 5(24A1, 2X))
1182 FORMAT(' ', T7, 5(A1, 'PITCH, PACKAGES PACKAGES', 1X))
1183 FORMAT(' YEAR', T7, 5(A1, 'METERS PER ROW PER ROOM', 1X))
1184 FORMAT(' ---', T8, 5(6A1, 1X, 8A1, 1X, 8A1, 2X))
1185 FORMAT(' ', I4, T8, 5(F6.1, 1X, I8, 1X, I8, 2X))
1186 FORMAT('C', T27, 'TABLE 5, A1, ' WASTE OPERATIONS PARAMETERS FOR
      + , 3A4)
1187 FORMAT(' ', T27, 9(' '), 2X, 'IN ', 4A4)
1188 FORMAT('C', T61, 'NUMBER OF', T77, 'NUMBER OF', T92, 'NUMBER OF',
      1 T105, 'NUMBER OF')
1189 FORMAT(' ', T10, 'NUMBER OF', T23, 'UNITS', T35, 'NUMBER OF', T48,
      1 'NUMBER OF', T61, 'UNDERGROUND', T77, 'EMPLACEMENT', T92, 'DRILLING',
      2 T105, 'ROOMS')
1190 FORMAT(' YEAR', T10, 'SHIFTS', T23, 'RECEIVED', T35, 'PACKAGES', T48,
      1 'PERSONNEL', T61, 'TRANSPORTERS', T77, 'MACHINES', T92, 'MACHINES', T10
      2 'FILLED')
1191 FORMAT(' ---', T10, 9(' '), T23, 8(' '), T35, 9(' '), T48, 9(' '),
      1 T61, 12(' '), T77, 11(' '), T92, 9(' '), T105, 9(' '))
1192 FORMAT(' ', I4, T10, F9.1, 4X, F8.1, 4X, I9, 4X, F9.1, 4X, F12.1, 4X, F11.1,
      1 4X, F9.1, 4X, F9.1)
1193 FORMAT('C', T27, 'TABLE 19, A1, ' WASTE OPERATIONS COST SUMMARY FC
      + , 3A4)
1194 FORMAT('C', T27, 'TABLE 19, A1, ' WASTE OPERATIONS COST SUMMARY FC
      1A REPOSITORY IN ', 4A4)
1195 FORMAT(' ', T27, 8(' '))
1196 FORMAT(' ', T54, ' MILLIONS OF ', I4, ' DOLLARS ', /, T55, 24(' '))
1197 FORMAT('C', T60, 'EMPLACEMENT', T77, 'EMPLACEMENT')
1199 FORMAT(' ---', T9, 7(14(' '), 3X))
1200 FORMAT(' ', I4, T9, 7(F9.2, 8X))
1208 FORMAT('C', T24, 'TABLE 15 WASTE OPERATIONS LABOR COST SUMMARY FC
      1A REPOSITORY IN ', 4A4)
1209 FORMAT(' ', T24, 8(' '))
1210 FORMAT(' YEAR RECEIVING', T26, 'PACKAGING', T43, 'TRANSPORTATION',
      1 T6C, 'EXCAVATION', T77, 'OPERATIONS', T4, 'TOTAL')

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***** RECON2 OUTPUT *****

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1211 FORMAT(' ---',T9,6(14(' '),3X))
1212 FORMAT('G',T24,'TABLE 16 WASTE OPEATIONS MATERIALS COST SUMMAR
      IFOR A REPOSITORY IN ',4A4)
1213 FORMAT('C',T24,'TABLE 17 WASTE OPERATIONS EQUIPMENT COST SUMMAR
      IFOR A REPOSITORY IN ',4A4)
1214 FORMAT(' ',T11,'UNDERGROUND FACILITES',T47,6(F10.2,3X))
1215 FORMAT('Q',T38,'TABLE 4 RECEIVING AND PROCESSING FOR A REPOSIT
      IY IN ',4A4)
1216 FORMAT(' ',T38,7(' '))
1217 FORMAT('Q',T18,'NUMBER OF MODULES REQUIRED',T65,'NUMBER OF CONTA
      IER SHIPMENTS FOR:')
1218 FORMAT(' ',T8,47(' '),T57,70A1)
1219 FORMAT(' ',T8,26'REMOTE-HANDLED',2X),T40,'CONTACT-HANDLED')
1220 FORMAT(' YEAR',T8,'RECEIVING',T24,'PACKAGING',T40,'RECEIVING',T5
      I 5(3A4,1X),2X,A4,A1)
1221 FORMAT(' ---',T8,2(14(' '),2X),T40,15(' '),T57,5(11A1,2X),1X,
      I A4,A1)
1222 FORMAT(' ',I4,T8,3(I10,6X),4(F8.1,5X),F8.1)
1223 FORMAT('Q',T41,'WASTE TYPE')
1224 FORMAT(' ',T41,70A1)
1225 FORMAT('Q',T27,'TABLE 5',A1,' WASTE OPERATIONS PARAMETERS SUMMA
      I FOR A REPOSITORY IN ',4A4)
1226 FORMAT(' YEAR RECEIVING',T26,'PACKAGING',T43,'TRANSPORTATION',
      IT60,'EXCAVATION',T77,'OPERATIONS',T94,'OTHER',T111,'TOTAL')
1228 FORMAT(' YEAR RECEIVING',T26,'PACKAGING',T43,'TRANSPORTATION',
      IT60,'EXCAVATION',T77,'OPERATIONS',T94,'OTHER ',T111,'TOTAL')
1230 FORMAT('Q',T21,'TABLE 20 BACKFILLING AND DECOMMISSIONING SUMMARY
      IOR A REPOSITORY IN ',4A4)
1231 FORMAT(' ',T21,8(' '))
1232 FORMAT('Q',T8,'BACKFILL MATERIALS, THOUSAND TONNES',T53,'COSTS I
      I MILLIONS OF ',I4,' DOLLARS')
1233 FORMAT(' ',T8,42(' '),T53,72(' '))
1234 FORMAT(' YEAR ROCK',T23,'OTHER',T38,'TOTAL',T53,'BACKFILLING',
      IT68,'SEALING',T83,'DECOMMISSION',T98,'SURVEILLANCE',T113,'TOTAL')
1235 FORMAT(' ---',T8,8(12(' '),3X))
1236 FORMAT(' ',I4,T8,8(F11.2,4X))
1237 FORMAT('Q',T31,'TABLE 21 COST SUMMARY FOR A REPOSITORY IN ',4A4)
1238 FORMAT(' ',T31,8(' '),2X,'MILLIONS OF ',I4,' DOLLARS')
1239 FORMAT('Q',T47,'WASTE TYPE')
1240 FORMAT(' FROM',T47,86A1)
1241 FORMAT(' TABLE COST CATEGORY',T47,5(3A4,1X),2X,A4,A1)
1242 FORMAT(' ---',T9,35(' '),T47,5(10A1,3X),A4,A1)
1243 FORMAT('Q 13',T9,'CONSTRUCTION AND PREOPERATION')
1244 FORMAT(' ',T11,'LAND',T47,6(F10.2,3X))
1245 FORMAT(' ',T11,'LICENSE',T47,6(F10.2,3X))
1246 FORMAT(' ',T11,'SITE PREPARATION',T47,6(F10.2,3X))
1247 FORMAT(' ',T11,'SHAFT',T47,6(F10.2,3X))
1248 FORMAT(' ',T11,'PRE OPERATION MINING',T47,6(F10.2,3X))
1249 FORMAT(' ',T11,'SURFACE FACILITIES',T47,6(F10.2,3X))
1250 FORMAT(' ',T11,'ARCHITECT ENGINEER',T47,6(F10.2,3X))
1251 FORMAT(' ',T11,'STARTUP',T47,6(F10.2,3X))
1252 FORMAT(' ',T11,'MINING',T47,6(F10.2,3X))
1253 FORMAT(' ',T11,'HOISTING',T47,6(F10.2,3X))
1254 FORMAT(' ',T11,'SURFACE HANDLE AND STORE',T47,6(F10.2,3X))
1255 FORMAT(' ',T11,'OFFSITE DISPOSAL',T47,6(F10.2,3X))
1256 FORMAT(' ',T11,'RECEIVING',T47,6(F10.2,3X))
1257 FORMAT(' ',T11,'PACKAGING',T47,6(F10.2,3X))

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***** RECON2 OUTPUT *****

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1258 FORMAT(' ',T11,'TRANSPORTATION' ,T47,6(F10.2,3X))
1259 FORMAT(' ',T11,'EMPLACEMENT OPERATIONS' ,T47,6(F10.2,3X))
1260 FORMAT(' ',T11,'OTHER' ,T47,6(F10.2,3X))
1261 FORMAT(' ',T11,'BACKFILLING' ,T47,6(F10.2,3X))
1262 FORMAT(' ',T11,'SEALING' ,T47,6(F10.2,3X))
1263 FORMAT(' ',T11,'DECOMMISSIONING' ,T47,6(F10.2,3X))
1264 FORMAT('Q',T29,'TABLE 22 CASH FLOW SUMMARY FOR A REPOSITORY IN
14A4)
1265 FORMAT(' ',T29,8(' '),T40,'MILLIONS OF ',I4,' DOLLARS')
1267 FORMAT('Q',T29,'OPERATING COSTS')
1268 FORMAT(' ',T29,52(' '))
1269 FORMAT(' ',T9,'CONSTRUCTION',T29,'OPERATIONS',
1T47,'WASTE',T65,'BACKFILLING AND')
1270 FORMAT(' YEAR',T9,'STARTUP COSTS',T29,'MINING',T47,
1'OPERATIONS',T65,'DECOMMISSIONING CONTINGENCIES TOTAL')
1271 FORMAT(' ----',T9,15(' '),T29,5(15(' '),3X))
1272 FORMAT(' ',I4,T9,F10.2,T29,5(F12.2,6X))
1273 FORMAT('Q',T31,'TABLE 23 UNIT COST SUMMARY FOR A REPOSITORY IN
1,4A4)
1274 FORMAT(' ',T31,8(' '),T42,I4,' DOLLARS PER KILOGRAM HEAVY METAL')
1275 FORMAT('Q',T31,'TABLE 24 UNIT COST SUMMARY FOR A REPOSITORY IN
1,4A4)
1276 FORMAT(' ',T31,8(' '),T42,I4,' DOLLARS PER CUBIC METER OF WASTE')
1277 FORMAT('Q',T31,'TABLE 25 UNIT COST SUMMARY FOR A REPOSITORY IN
1,4A4)
1278 FORMAT(' ',T31,8(' '),T42,I4,' DOLLARS PER PACKAGE ')
1279 FORMAT('Q',T29,'TABLE 18 UTILITIES REQUIREMENTS AND COST SUMMA
1 FOR A REPOSITORY IN ',4A4)
1280 FORMAT('Q',T9,'REQUIREMENTS')
1281 FORMAT(' ',T9,49(' '))
1282 FORMAT(' ',T9,'ELECTRICITY',T22,'STEAM',T35,'WATER',T48,'DIESEL'
1 T61,'COSTS, MILLIONS OF ',I4,' DOLLARS')
1283 FORMAT(' ',T9,'THOUSANDS',T22,'THOUSANDS',T35,'MILLIONS',T48,'TH
1SANDS',T61,62(' '))
1284 FORMAT(' ',T9,'OF KWH',T22,'OF MJ(A)',T35,'OF LITERS',T48,'OF LI
1RS',T61,'ELECTRICITY',T74,'STEAM',T87,'WATER',T100,'DIESEL',T113
2TOTAL')
1285 FORMAT(' ',I4,T9,9(F9.2,4X))
1286 FORMAT('Q (A) MJ(MEGA JOULE)= .977 POUNDS OF STEAM AT 100C.')
1287 FORMAT(' ',T11,'SURVEILLANCE' ,T47,6(F10.2,3X))
1288 FORMAT('Q',T9,'SUBTOTAL' ,T47,6(F10.2,3X))
1289 FORMAT('Q',T9,'CONTINGENCY' ,T47,6(F10.2,3X))
1290 FORMAT('Q',T3,'TOTAL' ,T47,6(F10.2,3X))
1291 FORMAT(' ',T11,'EMPLACEMENT EXCAVATION',T47,6(F10.2,3X))
1292 FORMAT('Q 14',T9,'MINING AND ROCK REMOVAL OPERATIONS')
1293 FORMAT('Q 19',T9,'WASTE OPERATIONS')
1294 FORMAT('Q 20',T9,'BACKFILLING AND DECOMMISSIONING')
1296 FORMAT(' ',T29,8(' '))
1297 FORMAT(' ----',T9,9(10(' '),3X))
1298 FORMAT(' ',I4,T29,F12.2,T65,3(F12.2,6X))
1299 FORMAT('Q SUPPORT FACILITY EQUIPMENT COST',T51,F12.2)
1300 FORMAT(' ',I4,T60,F8.2,T112,F8.2)
1301 FORMAT('Q UNDERGROUND TRANSPORTATION FACILITY',T51,F12.2)
1302 FORMAT('Q EMPLACEMENT EXCAVATION FACILITY',T51,F12.2)
1303 FORMAT(' ',I4,T26,2(F10.0,5X))
1304 FORMAT(' ',I4,17X,3(F10.0,2X))
1305 FORMAT('Q EMPLACEMENT SUPPORT FACILITY',T51,F12.2)

```

***** RECON2 OUTPUT *****

```

C
1306      FORMAT('D',* TOTAL*,T54,5(F10.1,3X))
1307      FORMAT('D',T23,9(' '),4X,8(' '),T105,9(' '))//
+ * TOTAL*,T22,F9.1,4X,I9,T105,F9.1)
1308      FORMAT('D',* TOTAL*,T8,5(I9,13X))
1309      FORMAT('D',T11,3(10(' '),5X),2(10(' '),5X))//
+ * TOTAL*,T11,3(F10.0,5X),2(F10.2,5X))
1310      FORMAT('D',T8,9(10(' '),3X))// * TOTAL*,1X,8(F8.2,5X),F8.2)
1311      FORMAT(* ----*,T11,5(10(' '),5X))
1312      FORMAT('D',T9,6(14(' '),3X))
1313      FORMAT('D',*TOTAL*,T9,7(F9.2,8X))
1314      FORMAT('D',T9,7(14(' '),3X))
1315      FORMAT('D',*TOTAL*,T9,7(F9.2,8X))
1317      FORMAT('D',T9,9(10(' '),3X))
1318      FORMAT(* TOTAL*,T8,9(F10.2,3X))
1319      FORMAT(* *,T9,7(14(' '),3X))
1320      FORMAT(* *,*TOTAL*,T9,7(F9.2,8X))
1322      FORMAT('D',T8,8(12(' '),3X))
1324      FORMAT(* *,*TOTAL*,T8,8(F11.2,4X))
1330      FORMAT('D-----')
1335      FORMAT(* *,T27,10(' '))
1336      FORMAT(* *,T27,9(' '))
1339      FORMAT('D',T9,15(' '),T29,5(15(' '),3X))
1340      FORMAT('DTOTAL',T9,F10.2,T29,5(F12.2,6X))
1350      FORMAT(* *,I4,T10,F9.1,4X,F8.1,4X,I9,4X,F9.1,48X,F9.1)
      RETURN
1360      FORMAT(* *,T8,5(9A1,13X))
1370      FORMAT(* *,T57,5(10A1,2X))
1380      FORMAT(* *,T6,3A4,T76,I3)
1390      FORMAT(* *,I4,5X,2(F10.0,2X),F10.0,* *,2(F10.0,2X),5(F10.1,2X))
1400      FORMAT('D          * ROCK HOISTING CAPACITY WAS EXCEEDED')
      END

```

ERRORS: NONE. TIME: 5.054 SEC. IMAGE COUNT: 1569

***** RECON2 POSTOP *****

***** RECON2 POSTOP *****

7/83 08:53:22 (C)

```

      SUBROUTINE POSTOP
C
      INCLUDE PAPAM
      INCLUDE PSTCOM
      INCLUDE SSTCOM
      INCLUDE INCOM
      INCLUDE MNDCOM
      INCLUDE WAFCOM
      INCLUDE SFTCOM
C
C      SHAFT SEALING
      LB = NBKF + 1
      LE = NBKF + IDD
      DO 450 L = 1,NST
      IF(SFTNUM(L).EQ.0) GO TO 450
      D = SFTDD(L) + 2 * SFTXR(L)
      DO 400 K=1,NWT
      WAF = WAFMV(K)
      IF(L.EQ.1) WAF = WAFAL(K)
      IF(L.EQ.3) WAF = WAFRHP(K)
      IF(L.EQ.3.AND.SFTNUM(4).EQ.0) WAF = WAFUGW(K)
      IF(L.EQ.4) WAF = WAFNC(K)
      II = 0
      DO 400 I=LB,LE
      II = II + 1
      SEALCT(K,I) = SKFUNC(SSCON1,SSCON2,D,IEQTP5) * SFTXD(L) * SSDF(I)
      + * WAF + SEALCT(K,I)
      400 CONTINUE
      450 CONTINUE
      DO 475 K=1,NWT
      DO 475 I=LB,LE
      ANSLCT(I) = ANSLCT(I)+SEALCT(K,I)
      475 CONTINUE
C
C      FACILITY DECOM
C
      DO 500 K=1,NWT
      II = 0
      DO 500 I=LB,LE
      II = II + 1
      DECOMC(K,I) = SFCCST(K) * DCOMCF * FDDF(II)
      ANDDCT(I) = ANDDCT(I) + DECOMC(K,I)
      500 CONTINUE
C
C      SURVAILANCE COST
C
      SURVC = 0.0
      IT = LE + 1
      ITE = ITSURV + IT
      DO 600 I = IT,ITE
      SURVC = SURCST / ((1. + DRATE) **I) + SURVC
      600 CONTINUE
      I = LE
      DO 700 K=1,NWT
      SURVCT(K,I) = SURVC * WAFMV(K)

```


***** RECON2 POSTOP *****

TSURVC(I) = TSURVC(I) + SURVCT(K,I)
700 CONTINUE

C

RETURN
END

ERRORS: NONE. TIME: 0.844 SEC. IMAGE COUNT: 60

***** RECON2 PREOP *****

***** RECON2 PREOP *****

7/83 08:53:22 (0)

SUBROUTINE PREOP

```
C
    INCLUDE PARAM
    INCLUDE PRECOM
    INCLUDE WAFCOM
    INCLUDE HUBCOM
    INCLUDE SSTCOM

C
    DO 100 I=1,LL
    CSTSU(I) = 0.0
    CSTAE(I) = 0.0
    DO 100 K=1,NW
    PRODC(K,I) = 0.0
    FLDCST(K,I) = 0.0
100  CONTINUE
    DO 300 K=1,NWT
    PRODC(K,1) = TCLAND * WAFMV(K)
    DO 200 I=1,-L
    FLDCST(K,I) = OSFC(K,I) + UGFC(K,I) + SHCPY(K,I) + CSTSP(I) *
1 WAFMV(K)
200  CONTINUE
    DO 250 I=1,LL
    STARTC(K,I) = STPCT * FLDCST(K,I)
    AESERV(K,I) = SKFUNC(AECON1,AECON2,FLDCST(K,I),IEQTP4)
    PRODC(K,I) = PRODC(K,I) + STARTC(K,I) + AESERV(K,I)
250  CONTINUE
300  CONTINUE

C
    DO 350 I=1,LL
    CSTLND(I) = TCLAND * CLNOF(I)
    CSTLIC(I) = TCLICE * CLCDF(I)
    DO 350 K=1,NWT
    COSTLD(K,I) = CSTLND(I) * WAFMV(K)
    COSTLC(K,I) = CSTLIC(I) * WAFMV(K)
    CSTAE(I) = CSTAE(I) + AESERV(K,I)
    CSTSU(I) = CSTSU(I) + STARTC(K,I)
350  CONTINUE

C
    RETURN
END
```

ERRORS: NONE. TIME: 0.738 SEC. IMAGE COUNT: 40

***** RECON2 RECEVE *****

***** RECON2 RECEVE *****

7/83 08:53:24 (0)

```

SUBROUTINE RECEVE
C
  INCLUDE PARAM
  INCLUDE RECCOM
  INCLUDE SOPCOM
C
C
C
  DO 125 I=1,NY
    SRHSHP(I) = 0.0
    SCHSHP(I) = 0.0
    TRSHP(I) = 0.
  125 CONTINUE
  DO 300 I=1,LY
    DO 200 K=1,NMT
      IF(RECUNT(K,I).EQ.0.OR.(RCCAP(K) + TCCAP(K)).EQ.0.) GO TO 200
      TSHPCN(K,I) = RECUNT(K,I) / (CRRAIL(K,I) * RCCAP(K)
      1 + (1.-CRRAIL(K,I)) * TCCAP(K))
      IF(KIND(K).EQ.2) GO TO 150
      SRHSHP(I) = SRHSHP(I) + TSHPCN(K,I)
      GO TO 175
    150 CONTINUE
      SCHSHP(I) = SCHSHP(I) + TSHPCN(K,I)
    175 CONTINUE
      TRSHP(I) = TRSHP(I) + (SRHSHP(I) + SCHSHP(I)) * CRRAIL(K,I)
    200 CONTINUE
  300 CONTINUE
C
  DO 400 I=1,LY
    NMODRH = MAX0(NMODRH,NMRH(I))
    NMODCH = MAX0(NMODCH,NRMCH(I))
    NMODPH = MAX0(NMODPH,NPMRH(I))
  400 CONTINUE
C
  TCRHRM = WQCST(1) * NMODRH
  TCCHRM = WQCST(2) * NMODCH
  TCRHPM = WQCST(3) * NMODPH
  RETURN
END

```

ERRORS: NONE. TIME: 0.815 SEC. IMAGE COUNT: 39

***** RECON2 REPLAS *****

***** RECON₂ REPLAS *****

7/83 08:53:25 (C)

```

      SUBROUTINE REPLAS (NA,NB,KD,NU,TP,AC,EL,NW,IFY)
C
C      NA= INTEGER MODULE REQUIREMENT FOR CURRENT YEAR
C
C      NB= INTEGER MODULE REQUIREMENT FOR PREVIOUS YEAR
C
C      AC = ANNUAL CAPACITY
C
C      KD= NOT USED
C
C      NU = NEW EQUIPMENT
C
C      TP = ANNUAL THRUPUT
C
C      EL= EQUIPMENT LIFE IN PROCESS UNITS
C
C      IFY= FIRST YEAR
C
C      NW= NOT USED
C
C      EL = EQUIPMENT LIFE
C
C      PARAMETER MEOP = 200
C      DIMENSION EXPLIF(MEOP), USDLIF(MEOP)
C
C      IF(IFY.NE.1) GO TO 200
C      DO 100 M=1,MEOP
C      EXPLIF(M) = 0.
C      USDLIF(M) = 0.
100 CONTINUE
200 CONTINUE
C      IF(NA.LE.NB) GO TO 630
C      NU = NA - NB
C      NAA = NA
C      GO TO 635
630 CONTINUE
C      NU = 0
C      NA = NB
C      NAA = NB
635 CONTINUE
C      IRP = 0
C      N = 1
C      DO 650 M=1,NAA
C      USDLIF(N) = EXPLIF(N)
C      EXPLIF(N) =AMINI(TP,AC,(EL-EXPLIF(N)))+ EXPLIF(N)
C      TP = TP -AMINI(TP,AC,(EL - EXPLIF(N)))
C      IEQPL = (EXPLIF(N)+.1)
C      IEL = (EL)
C      IF(IEQPL.LT.IEL) GO TO 645
C      IRP = IRP+1
C      NA = NA-1
C      IF(NA.NE.0.CR.TP.LE.0.0) GO TO 645
C      NU = NU+1
C      NA = 1
C      N = N+1

```

***** RECON2 REPLAS *****

```
      EXPLIF(N) = USDLIF(N-1)+TP-EL
645  CONTINUE
      N = N+1
650  CONTINUE
      NB = NA
C
C      STACK DOWN
C
      IF(IRP.EQ.0) GO TO 690
      DO 670 L=1,IRP
      NM = NA-
      IF(NM.EQ.0) NM = 1
      DO 660 M=1,NM
      EXPLIF(M) = EXPLIF(M+1)
660  CONTINUE
      EXPLIF(NM+1) = 0.
670  CONTINUE
690  CONTINUE
C
C      RETURN
C
      END
```

ERRORS: NONE. TIME: 0.932 SEC. IMAGE COUNT: 77

***** RECON2 PCKOP *****

```

/83 10:00:29 (0)
      SUBROUTINE ROCKOP
C
      INCLUDE PARAM
      INCLUDE PSTCOM
      INCLUDE MNDCOM
      INCLUDE WAFCOM
      INCLUDE SFTCOM
C
      DIMENSION RCKREM(200)
C
C
C      BACKFILLING - ROOMS + CORRIDORS
C
      LB = NBYR+IYRPRO-IYRCON+1
      LBB = LY+1
      IF(LB.LT.LBB) LB = LBB
      IF(BKRATE.NE.0.) GO TO 50
C  ASSUME BACKFILLING RATE = SHAFT ROCK LOWERING RATE SINCE NO
C  BACKFILLING RATE
C  IS INPUT
      BKRATE = (MXMMRH * TNPT2 * SFTNUM(1)
      1 + MXMPRH * TNPT1 * NDSMP) * 3. * DPY
      50 CONTINUE
C  CALCULATE ROOMS REMAINING TO BE BACKFILLED
      BFLEFF = PCTFIL / XPANFC
      DO 100 K=1,NWT
      REMBK(K) = UBKVOL(K) * (DENSTY*(1.-OTHBFL)+OTBDEN*OTHBFL)
      1 * BFLEFF
      TREM = TREM + REMBK(K)
      100 CONTINUE
C  CALCULATE BACKFILLING PERIOD PRIOR TO DECOMMISSIONING
      BKFYRS = TREM / BKRATE
      NBKYRS = BKFYRS + .999
      BKFLYR = BKFYRS - NBKYRS + 1.
      NBKF = NBKYRS + LB-1
C
C  BACKFILL REMAINING ROOMS
C
      IF(LB.GT.NBKF) GO TO 155
      DO 150 I=LB,NBKF
      DO 150 K=1,NWT
      RKBKF(K,I) = UBKVOL(K) / BKFYRS * (1 - OTHBFL) * DENSTY*BFLEFF
      OTBKF(K,I) = UBKVOL(K) / BKFYRS * OTHBFL * OTBDEN*BFLEFF
      IF(I.EQ.NBKF)RKBKF(K,I) = UBKVOL(K) * BKFLYR / BKFYRS
      1 * (1-OTHBFL) * DENSTY*BFLEFF
      IF(I.EQ.NBKF) OTBKF(K,I) = UBKVOL(K) * BKFLYR / BKFYRS
      1 * OTHBFL * OTBDEN*BFLEFF
      150 CONTINUE
      155 CONTINUE
C
C  BACKFILL MAIN CORRIDORS
C
      II = 0
      LB = NBKF + 1
      LE = NBKF + IDD

```

```

DO 160 I=LB,LE
II = II + 1
DO 160 K=1,NWT
RK6KF(K,I) = CORAPA*M2ACRE*COPHT(1)*DENSTY*SRMM(K)/SRM*DBDF(II)
1+ TCPCLN * CORWTH(1)*CORHT(1)*DENSTY*SRMM(K)/SRM*DBDF(II)
2 *(1-OTHBFL) * BFLEFF
OTBKF(K,I) = RK6KF(K,I) / (1 - OTHBFL) * OTHBFL * OTBDEN / DENSTY
160 CONTINUE
C ASSUME SHAFT BACKFILLING INCLUDED IN SEALING COSTS
LB = LY + 1
DO 166 I=LB,LE
DO 165 K=1,NWT
SRKBKF(I) = SRKBKF(I) + RK6KF(K,I)
SOTBKF(I) = SOTBKF(I) + OTBKF(K,I)
165 CONTINUE
166 CONTINUE
C ASSUME THE SAME RESOURCE REQUIREMENTS PER TONNE FOR ROCK AND
C SUPPLEMENTARY BACKFILL
C
C CALCULATE NUMBER OF BACKFILLING MACHINES OVER ALL OPERATING PERIODS
C
IF(MSWTCH.EQ.0) GO TO 190
NLAST = 0
II = 0
DO 185 I=1,LE
IF(I.GT.LY) SRRMR(I) = 3.
IF(SRRMR(I).EQ.0.) GO TO 185
II = II+1
NRON=5
TP=0
DO 170 K=1,NWT
TP=SRKBKF(K,I) + OTBKF(K,I) + TP
170 CONTINUE
ANEQCP=ROEQPC(NRON)*SRRMR(I)*DPY
NBEQP = TP / ANEQCP + .9999
CALL REPLAS(NBEQP,NLAST,K,NEQRPL(NRON,I),TP,ANEQCP,ROEQPL(NRON),
I NW,II)
C
C ASSUME THREE SHIFT OPERATION FOR BACKFILLING AFTER WASTE OPERATIONS
C HAVE ENDED
BKSHFT(I) = SRRMR(I)
C CALCULATE BACKFILLING LABOR
DO 180 K=1,NWT
BKFLBR(K,I) = ROLBR(NRON)*DPY*BKSHFT(I)*WAFMV(K)
+ * INT(TP / ANEQCP + .9999)
C CALCULATE BACKFILL MATERIALS (BESIDES SUPPLEMENTARY BACKFILL)
BKFMAT(K,I) = ROMATU(NRON) * (SRKBKF(K,I) + OTBKF(K,I))
180 CONTINUE
185 CONTINUE
190 CONTINUE
C
C ROCK LOWERING DURING BACKFILL OPERATIONS AFTER MINING HAS ENDED
C
DO 300 I=LE,LE
DO 300 K=1,NWT
RCKHST(K,I) = -PKBKF(K,I) - OTBKF(K,I)
SRKHST(I) = SRKHST(I) + RCKHST(K,I)

```

```

      RCKREM(I) = -RKBKF(K,I) + RCKREM(I)
300 CONTINUE
C
C   CALCULATE ROCK HOISTING RESOURCE REQUIREMENTS
C
      IF(MSWTCH.EQ.0) GO TO 330
      NRON = 2
      NLAST = 0
      II = 0
      DO 325 I=1,LE
C   CALCULATE ROCK HOISTING EQUIPMENT REQUIREMENTS
      IF(I.LT.LL+1) BKSHT(I) = 3.
      IF (BKSHT(I).EQ.0.) GO TO 325
      II = II+1
      DSRKHT = ABS(SRKHST(I))
      ANEQCP = ROEQPC(NRON) * BKSHT(I) * DPY
      NBEQP = SRKHST(I) / ANEQCP + .9999
      CALL REPLAS(NBEQP,NLAST,K,NEQRPL(NRON,I),DSRKHT,ANEQCP,
1 ROEQPL(NRON),NW,II)
C   CALCULATE ROCK HOISTING LABOR
      DO 320 K=1,NWT
      RKHLBR(K,I) = ROLBRR(NRON) * DPY * BKSHT(I)
1      * WAFMV(K) * INT(SRKHST(I) / ANEQCP + .9999)
C   CALCULATE ROCK HOISTING MATERIALS
      RKHMAT(K,I) = ROMATU(NRON) * RCKHST(K,I)
320 CONTINUE
      325 CONTINUE
      330 CONTINUE
      K = 0
C
C   SURFACE ROCK HANDLING OPERATIONS
C
      NRON = 3
      DO 350 I=LB,LE
      RKSURF(I) = RKSURF(I-1) + RCKREM(I)
350 CONTINUE
      IF(MSWTCH.EQ.0) GO TO 380
      NLAST = 0
      II = 0
      DO 370 I=1,LE
C   CALCULATE RESOURCE REQUIREMENTS
      IF(BKSHT(I).EQ.0.) GO TO 370
      II = II+1
      DSRKHT = SRKHST(I)
      ANEQCP = ROEQPC(NRON) * BKSHT(I) * DPY
      NBEQP = SRKHST(I) / ANEQCP + .9999
      CALL REPLAS(NBEQP,NLAST,K,NEQRPL(NRON,I),DSRKHT,ANEQCP
1 ROEQPL(NRON),NW,II)
      DO 360 K=1,NWT
      SRHLBR(K,I) = ROLBRR(NRON) * DPY * BKSHT(I) *
1      WAFMV(K) * INT(SRKHST(I) / ANEQCP + .9999)
      SRHMAT(K,I) = ROMATU(NRON) * RCKHST(K,I)
360 CONTINUE
370 CONTINUE
380 CONTINUE
C
      RETURN

```


00

END

ND ELT. ERRORS: NONE. TIME: 1.492 SEC. IMAGE COUNT: 170

***** RECON2 SHAFT *****

7/83 08:53:28 (0)

```

      SUBROUTINE SHAFT
C
      INCLUDE PARAM
      INCLUDE SFTCOM
      INCLUDE MNDCOM
      INCLUDE SOPCOM
C
      DIMENSION TSRRMR(200), HSTCAP(200)
C
C
C
C
      ROCK HOISTING SHAFT REQUIREMENTS
C
      NDSMP = 0
      DO 350 I=1,LY
      IF(MXMPRH.EQ.0) GO TO 370
      IF(TNPT1.EQ.0) GO TO 370
      TPYP = MXMPRH * 3. * TNPT1 * DPY
      TPYM = MXMPRH * 3. * TNPT2 * DPY
      NX = (SRKHST(I) - TPYM) / TPYP + .999
      NDSMP = MAX0(NDSMP,NX)
      TSRRMR(I) = SRRMR(I)
      IF(I.LE.LL) TSRRMR(I) = 3.
      HSTCAP(I) = (MXMPRH * NDSMP * TNPT1 + MXMPRH * SFTNUM(1)
1          * TNPT2) * TSRRMR(I) * DPY
      IHSTFL(I) = 0
      IF(SRKHST(I).GT.HSTCAP(I)) IHSTFL(I) = 1
350  CONTINUE
      SFTNUM(7) = NDSMP
370  CONTINUE
C
C
C
      SHAFT COST
C
      DO 400 L=1,NST
      IF(SFTNUM(L).EQ.0) GO TO 400
      D = SFTDD(L) + 2 * SFTXR(L)
      SFTLC(L) = SKFUNC(CCCON1,CCCON2,D,IEQTP2) * SFTLD(L)
      SFTWC(L) = SKFUNC(WCCON1,WCCON2,D,IEQTP3)
      SFTSC(L) = SKFUNC(SCCON1,SCCON2,D,IEQTP1) * SFTXD(L)
      SHDFC(L) = SFTSC(L) + SFTLC(L) + SFTHE(L) + SFTWC(L)
400  CONTINUE
C
C
      RETURN
      END

```

ERRORS: NONE. TIME: 0.779 SEC. IMAGE COUNT: 44

***** RECON2 SKFUNC *****

***** RECON2 SKFUNC *****

ON2.SKFUNC

401C 0: 7/83 08:53:29 (C)

FUNCTION SKFUNC(A,B,D,I)

C
C

IF (I.EQ.1) GO TO 10

SKFUNC = A*EXP(B*D)

GO TO 20

10 CONTINUE

SKFUNC = A+B*D

20 CONTINUE

RETURN

END

ERRORS: NONE. TIME: 0.675 SEC. IMAGE COUNT: 11

***** RECON2 SURFST *****

***** RECON2 SURFST *****

7/83 08:53:30 (0)

```
C
C      SUBROUTINE SURFST
C
C      INCLUDE PARAM
C      INCLUDE SSTCOM
C      INCLUDE WAFCOM
C      INCLUDE INCOM
C      INCLUDE RECCOM
C      INCLUDE MNDCOM
C      INCLUDE SOPCOM
C      INCLUDE UOPCOM
C
C      IB = LL + 2
C      LE = LY + 100
C
C      CALL WAFAM2
C
C      SURFACE FACILITY SECTION
C
C      SUPPORT FACILITY CAPITAL COSTS
C
C      DO 200 I=1,LL
C      DO 200 K=1,NWT
C      DO 200 L=1,NSC
C      SFCAPC(K,I) = SFCST(L) * WAFMV(K) * SFCS(I) + SFCAPC(K,I)
C 200 CONTINUE
C
C      SURFACE WASTE OPERATIONS CAPITAL COSTS ARE CALCULATED IN HUB
C
C      UNDERGROUND WASTE OPERATIONS CAPITAL COSTS
C
C      DO 300 I=1,LL
C      DO 300 K=1,NWT
C      DO 210 L=1,NUO
C      UFCAPC(K,I) = UOCST(L) * WAFMV(K) * SFCS(I)
C      1 + UFCAPC(K,I)
C 210 CONTINUE
C
C      TRANSPORTATION OPERATIONS CAPITAL COSTS
C
C      L = KIND(K)
C      WAF = WAFCN(K)
C      IF(KIND(K).EQ.2) WAF = WAFNC(K)
C      TRCAPC(K,I) = TOCST(L) * WAF * SFCS(I) + TRCAPC(K,I)
C
C      ROCK OPERATIONS CAPITAL COSTS
C
C      DO 250 L=1,NRO
C      ROCAPC(K,I) = ROCST(L) * WAFMV(K) * SFCS(I)
C      1 + ROCAPC(K,I)
C 250 CONTINUE
C
```

***** RECON2 SURFST *****

C WASTE EMPLACEMENT EXCAVATION CAPITAL COSTS

C
 DO 270 L=1,NEE
 EECAPC(K,I) = EECST(L) * WAFMET(K,L) * SFCS(I)
 1 + EECAPC(K,I)
 270 CONTINUE
 300 CONTINUE

C
 C SUPPORT FACILITY EQUIPMENT COSTS
 C

LB = LL + 1
 DO 400 L=1,NSC
 DO 400 K=1,NWT
 DO 350 I=1,LL
 SFEQPC(K,LB) = SFECST(L) * SFCS(I) * WAFMV(K) + SFEQPC(K,LB)
 TSFEC(L) = TSFEC(L) + SFECST(L) * SFCS(I) * WAFMV(K)
 350 CONTINUE
 II = 0
 DO 400 I=LB,LY
 II = II + 1
 NSFELF = SFEQPL(L)
 IF(II.GT.NSFELF) GO TO 360
 GO TO 400
 360 CONTINUE
 SFEQPC(K,I) = SFEQPC(K,I) + SFECST(L) * WAFMV(K)
 TSFEC(L) = TSFEC(L) + SFECST(L) * WAFMV(K)
 II = 0
 400 CONTINUE
 DO 450 I=LB,LY
 DO 450 K=1,NWT
 SFEQCT(I) = SFEQCT(I) + SFEQPC(K,I)
 450 CONTINUE

C
 C SITE PREPARATION COSTS
 C

DO 650 I=1,LL
 CSTSP(I) = SPUC * SFCS(I) * SOA
 DO 650 K=1,NWT
 ASPC(K,I) = SPUC * SOA * WAFMV(K) * SFCS(I)
 650 CONTINUE

C
 C SUPPORT FACILITY LABOR REQUIRMENTS
 C

DO 800 L=1,NSC
 S = SLBR(L)
 DO 800 I=LB,LY
 IF(S.EQ.-1) S=SRRMR(I)
 IF(S.EQ.-2) S=SRRMC(I)
 DO 800 K=1,NWT
 OWLBR(I) = SFLBRR(L) * S * SFLBRC(L) * WAFAL(K) * OVRHOF
 1 + OWLBR(I)
 OWOPC(K,I) = OWOPC(K,I) + SFMATU(L) * SFMATC(L) * WAFMV(K)
 + SFLBRR(L) * S * SFLBRC(L) * WAFAL(K) * OVRHOF
 800 CONTINUE
 RETURN
 END

33 15:29:06 (0)

SUBROUTINE UTILITY

C

```
INCLUDE PARAM
INCLUDE UTLCOM
INCLUDE WAFCON
INCLUDE RECCOM
INCLUDE SOPCOM
INCLUDE MNDCOM
```

C

```
LE=LY
LB = LL + 1
```

C

C

ELECTRIC POWER

C

```
DO 200 I=LB,LE
HPY = 8760
IF(MOD(I,4).EQ.0) HPY = 8784
DO 200 K=1,NWT
RPPOW= RAPP*NRMRH(I)*WAFCN(K)*8.*AMAX1(SRRMR(I),SRRMC(I))*WPKYR
SFSPOW= SFSP*8.*AMAX1(SRRMR(I),SRRMC(I))*WRKYR*WAFCN(K)
OWHPOW= OWHP*8.*AMAX1(SRRMR(I),SRRMC(I))*WRKYR*WAFAL(K)
SFPPOW = SFP * HPY * WAFAL(K)
ROPOW= MROP*RKMSH(K,I)*8.*AMAX1(SRRMR(I),SRRMC(I))*WRKYR
VNTPOW = RVP * SIZE * HPY * WAFMVY(K,I)
ACPOW = ACP * HPY * WAFMVY(K,I)
POWER(K,I) = RPPOW + SFSPOW + OWHPOW + SFPPOW + ROPOW + VNTPOW +
1 ACPOW
POWER(NWP1,I) = POWER(NWP1,I) + POWER(K,I)
POWCST(K,I) = POWER(K,I) * UPC / 1000.
POWCST(NWP1,I) = POWCST(NWP1,I) + POWCST(K,I)
```

200 CONTINUE

C

C

STEAM POWER

C

```
DO 300 I=LB,LE
DO 300 K=1,NWT
HEAT = HEATS * ((UBFRPY(I) * RMLN(K) * RMWTH(K) + TCPCLN
1 * CORWTH(I))/ M2ACRE + CORARA) * WAFMVY(K,I)
RSTEAM = RAPS * NRMRH(I) * WAFCN(K)
STEAM(K,I) = HEAT + RSTEAM + ORS * WAFAL(K)
STEAM(NWP1,I)=STEAM(NWP1,I) + STEAM(K,I)
STMCST(K,I) = STEAM(K,I) * STMC
STMCST(NWP1,I) = STMCST(NWP1,I) + STMCST(K,I)
```

300 CONTINUE

C

C

WATER REQUIREMENTS

C

```
DO 400 I=LB,LE
DO 400 K=1,NWT
WATER(K,I) = (VOLW + VOLDW)*WAFAL(K)
WATER(NWP1,I) = WATER(NWP1,I) + WATER(K,I)
WATERC(K,I) = (VOLW * WTRC + VOLDW * D.WTRC) * WAFAL(K)
WATERC(NWP1,I) = WATERC(NWP1,I) + WATERC(K,I)
```

400 CONTINUE

C

```

C      DIESEL FUEL REQUIREMENTS
C
      DO 500 I=LB,LE
      DO 500 K=1,NWT
      DSURF = SUD * WPKYR * WAFAL(K)
      DSMINE = UGD * NUPKRG(K,I)
      DSRAIL = RED * TSHPCN(K,I)
      DIESEL(K,I) = DSURF + DSMINE + DSRAIL
      DIESEL(NWP1,I) = DIESEL(NWP1,I) + DIESEL(K,I)
      DSLCST(K,I) = (DSURF + DSMINE + DSRAIL) * DSLC
      DSLCST(NWP1,I) = DSLCST(NWP1,I) + DSLCST(K,I)
500 CONTINUE
C
C      TOTAL
C
      DO 600 I=LB,LE
      DO 600 K=1,NWT
      ANUTC(K,I) = POWCST(K,I) + STMCST(K,I) + WATERC(K,I) + DSLCST(K,I)
      ANUTC(NWP1,I) = ANUTC(NWP1,I) + ANUTC(K,I)
600 CONTINUE
C
      RETURN
      END

```

RORS: NONE. TIME: 1.062 SEC. IMAGE COUNT: 78

***** DECON2 WAFAM *****

7/83 08:53:33 (C)

SUBROUTINE WAFAM

C

INCLUDE PARAM
INCLUDE WAFCOM
INCLUDE SOPCOM
INCLUDE MNDCOM
INCLUDE SSTCOM
INCLUDE RECCOM
INCLUDE UTLCOM
INCLUDE UOPCOM

C

LE = LY + IDD

C

DO 30 K=1,NWT
NPSMWT(K)=0.0
RECUWT(K) = 0.0
RHPKG(K) = 0.
CHRECW(K)=0.0
SMNDWT(K) = 0.0
RHRECW(K) = 0.0
NPSMWT(K) = 0

30 CONTINUE

DO 50 I=1,LE
NPKSTM(I) = 0

50 CONTINUE

C

SUMREC = 0.0
NPKSUM = 0.0
RHRECU = 0.0
CHRECU = 0.0
SRHPKG = 0.
DO 100 I=1,LE
DO 100 K=1,NWT
SUMREC = SUMREC + RECUNT(K,I)
NPKSTM(I) = NPKSTM(I) + NUMPKG(K,I)
NPKSUM = NPKSUM + NUMPKG(K,I)
NPSMWT(K) = NPSMWT(K) + NUMPKG(K,I)
RECUWT(K) = RECUWT(K) + RECUNT(K,I)
IF(KIND(K).EQ.2) GO TO 70
RHRECU = RHRECU + RECUNT(K,I)
RHRECW(K) = RHRECW(K) + RECUNT(K,I)
RHPKG(K) = RHPKG(K) + NUMPKG(K,I)
SRHPKG = SRHPKG + NUMPKG(K,I)
GO TO 100

70 CONTINUE

CHRECU = CHRECU + RECUNT(K,I)
CHRECW(K) = CHRECW(K) + RECUNT(K,I)

100 CONTINUE

SUMIND = 0.
DO 200 I=1,LE
DO 200 K=1,NWT
SUMIND = SUMIND + RKMSH(K,I)
SMNDWT(K) = SMNDWT(K) + RKMSH(K,I)

200 CONTINUE

DO 300 K=1,NWT

***** RECON2 WAFAM *****

```

      WAFAL (K) = RECUWT(K)/SUMREC
      WAFCN (K) = RHRECW(K) / RHRECU
      WAFRHP(K) = RHPKG(K) / SRHPKG
      IF(CHRECU.NE.0.0) WAFNC(K) = CHRECW(K)/CHRECU
      WAFMV(K) = SMNDWT(K)/SUMIND
300  CONTINUE
      DO 400 K=1,NWT
      WAFUGW(K) = FLOAT(NPSMWT(K))/FLOAT(NPKSUM)
      DO 400 I=1,LE
      IF(SRKHND(I).EQ.0.0) GO TO 400
      WAFMVY(K,I) = RKMSH(K,I)/SRKHND(I)
400  CONTINUE
C
      DO 435 L=1,NEE
      DO 430 K=1,NWT
      IF(IMET(K).NE.L) GO TO 430
      DO 425 I=1,LY
      SUMMET(K,L) = SUMMET(K,L) + NUMPKG(K,I)
      SUMET(L) = SUMET(L) + NUMPKG(K,I)
425  CONTINUE
430  CONTINUE
435  CONTINUE
      DO 440 K=1,NWT
      DO 440 L=1,NEE
      IF(SUMET(L).EQ.0.0) GO TO 440
      WAFMET(K,L) = SUMMET(K,L) / SUMET(L)
440  CONTINUE
C
C
      RETURN
C
      ENTRY WAFAM2
C
C
      DO 450 K=1,NWT
      WAFUTL(K) = 0.
      WAFSHC(K) = 0.
      WAFRSH(K) = 0.
450  CONTINUE
      SUMUTL = 0.
      SUMSHC = 0.
      SUMRSH = 0.
      DO 500 I=1,LE
      DO 500 K=1,NWT
      WAFUTL(K) = WAFUTL(K) + ANUTC(K,I)
      SUMUTL = SUMUTL + ANUTC(K,I)
      WAFSHC(K) = WAFSHC(K) + TSHPCN(K,I)
      SUMSHC = SUMSHC + TSHPCN(K,I)
      WAFRSH(K) = WAFRSH(K) + TSHPCN(K,I) * CRRAIL(K,I)
      SUMRSH = SUMRSH + TSHPCN(K,I) * CRRAIL(K,I)
500  CONTINUE
      DO 700 K=1,NWT
      WAFUTL(K) = WAFUTL(K) / SUMUTL
      WAFSHC(K) = WAFSHC(K) / SUMSHC
      WAFRSH(K) = WAFRSH(K) / SUMRSH
700  CONTINUE
      RETURN

```

***** RECON2 WASTOP *****

7/83 08:53:34 (Q)

```

SUBROUTINE WASTOP
C
  INCLUDE PARAM
  INCLUDE SFTCOM
  INCLUDE SOPCOM
  INCLUDE UOPCOM
  INCLUDE INCOM
C
  DIMENSION EXMAC(5), RMSPBS(NW), BSFILD(NW,NY)
  DIMENSION SRMPM601, TTANF(NW)
C
C
  DO 100 I=1,NY
    AVLIPA(I) = 0.
    DO 100 K=1,NWT
      NPKGPR(K,I) = 0
      WSTVOL(K,I) = 0.
100  CONTINUE
C
C
  AREAPP=PANLEN*PANWTH/M2ACRE
C
  LABOR SECTION
C
C
  ROOM PILLAR UNITS AND MAX PACKAGES/ROW
C
  DO 190 K=1,NWT
    RMPILU(K)=PANLEN*XRASHQ(K)/RMWTH(K)
    RMSPBS(K) = FLOAT(RMPILU(K)) / FLOAT(NBSPPA(K))
    HOLD(K) = PKGLN(K) * NPKPEU(K) + CAPLEN(K) + HOLOEL(K)
    TANF(K)=RMLN(K)*RMWTH(K)/XRASHQ(K)/M2ACRE
    IF(IMET(K).EQ.4) TANF(K) = HPMIN(K) * (HOLD(K) + RMWTH(K))
1    /M2ACRE
190  CONTINUE
C
  OPY = WRKYR
  NM = 1
  LB = LL + 1
  DO 150 K=1,NWT
    IF(KIND(K).EQ.2) GO TO 130
    NMRH(LB) = 1
    NPMRH(LB) = 1
    GO TO 150
130  CONTINUE
    NRMCH(LB) = 1
150  CONTINUE
    DO 900 I=LB,LY
      DO 300 K=1,NWT
        RECUNT(K,I) = WSTSUP(K,I)
300  CONTINUE
400  CONTINUE
    SURR= 0.
    SRMCAP = 0.
    SURC = 0.

```

***** RECON2 WASTOP *****

```

SRSFTR = 0.
SRSFTC = 0.
SUPR = 0.
SUPC = 0.
SCMCAP = 0.
SPMCAP = 0.
DO 430 K=1,NWT
IF(KIND(K).EQ.2) GO TO 420
C
C   SUM RECEIVING UNITS - RH
C
SURRE = SURRE + RECUNT(K,I)
C
C   SUM PACKAGING UNITS - RH
C
SUPR = SUPR + RECUNT(K,I) / WUPP(K)
C
C   RECEIVING REQUIREMENTS RH
C
RMCAP = 0.0
IF(TTTR(K).EQ.0.0) GO TO 410
RMCAP = ( TTTR(K) * RECUNT(K,I)/RCCAP(K) * CRRAIL(K,I))
410 CONTINUE
IF(TTTK(K).EQ.0.0) GO TO 415
RMCAP = RMCAP + ( TTTK(K) * RECUNT(K,I) / TCCAP(K)
+ * (1. - CRRAIL(K,I)))
415 CONTINUE
C
C   SUM RECEIVING MODULE CAPACITY - RH
C
SRMCAP = SRMCAP + RMCAP
C
C   PACKAGING MODULE CAPACITY
C
C   SUM PACKAGING MODULE CAPACITY OVER WASTE TYPE
C
SPMCAP = SPMCAP + RECUNT(K,I) / WUPP(K) / PKGCAP(K)
GO TO 430
420 CONTINUE
C
C   RECEIVING REQUIREMENTS - CH
C
CMCAP = 0.0
IF (TTTR(K).NE.0.0)
1 CMCAP = (TTTR(K) * RECUNT(K,I) / RCCAP(K) * CRRAIL(K,I))
IF (TTTK(K).NE.0.0)
1 CMCAP = CMCAP + ( TTTK(K) * RECUNT(K,I) / TCCAP(K)
+ * (1. - CRRAIL(K,I)))
C
C   SUM RECEIVING MODULE CAPACITY - CH
C
SCMCAP = SMCAP + CMCAP
C
C   SUM RECEIVING UNITS - CH
C
SURC = SURC + RECUNT(K,I)

```

```

***** RECON2 WASTOP *****

      SUPC = SUPC + RECUNT(K,I) / WUPP(K)
430 CONTINUE
C
C   MODULE REQUIREMENTS - RH RECEIVING
C
      FMOD = 0.0
      IF(NRBPRM.EQ.0) GOTO 460
      FMOD = SRMCAP / DPY / NALSH / NRBPRM
      NRMHR(I) = FMOD + .999
      NRMHR(I) = MAX0(NRMHR(I),NRMHR(I-1))
      IF(NRMHR(I).LE.NRHRMA) GO TO 450
C
C   MAX MODULE EXCEEDED - REDUCE RECEIVING UNITS
C
      NRMHR(I) = NRHRMA
      DO 440 K=1,NWT
      IF(KIND(K).EQ.2) GOTO 440
      RECUNT(K,I) = RECUNT(K,I) * NRHRMA / FMOD
      IF(RECUNT(K,I).LE.0.) RECUNT(K,I)= 0.
440 CONTINUE
      GO TO 400
450 CONTINUE
C
C   SHIFT REQUIRMENT FOR RECEIVING MODULE - REMOTE HANDLED WASTE
C
      SRRMR(I) = SRMCAP / NRMHR(I) / DPY / NRBPRM
C
460 CONTINUE
C   RH PACKAGING MODULE REQUIREMENTS
C
      ASSUME SHIFT REQUIREMENTS FOR RH PACKAGING & RECEIVING ARE EQUAL
C
      FMOD = SPMCAP / NALSH / DPY
      NPMHR(I) = FMOD + .999
      NPMHR(I) = MAX0(NPMHR(I) , NPMHR(I-1))
      SRRMP(I) = SPMCAP/DPY/NPMHR(I)
      IF (SRRMP(I).GT.SRRMR(I)) SRRMR(I) = SRRMP(I)
C
C   MODULE REQUIREMENTS - CH RECEIVING
C
      FMOD = 0.0
      IF(NCBPRM.EQ.0) GOTO 490
      FMOD = SCMCAP / DPY / NALSH / NCBPRM
      NRMCH(I) = FMOD + .999
      NRMCH(I) = MAX0(NRMCH(I) , NRMCH(I-1))
      IF(NRMCH(I).LE.NCHRMA) GO TO 500
C
C   MAX MODULE EXCEEDED - REDUCE RECEIVING UNITS
C
      NRMCH(I) = NCHRMA
      DO 480 K=1,NWT
      IF(KIND(K).EQ.1) GO TO 460
      RECUNT(K,I) = RECUNT(K,I) * NCHRMA / FMOD
      IF(RECUNT(K,I).LE.0.) RECUNT(K,I)= 0.
480 CONTINUE
      GO TO 400
500 CONTINUE

```

***** RECON2 LASTOP *****

```

C
C   SHIFT REQUIREMENTS - CH RECEIVING
C
470  CONTINUE
    SRRMC(I) = 0.0
    IF (SCHCAP.NE.0.0) SRRMC(I) = SCHCAP / NRMCH(I) / DPY / NCBPRM
C
C   SHAFT SHIFT REQUIREMENTS
C
490  CONTINUE
    DO 540 K=1,NWT
    IF(KIND(K).EQ.2) GO TO 520
    SRSFTR = SRSFTR + (RECUNT(K,I)/WUPP(K))/(NPKPTR(K)*MTRPSD*DP
    GO TO 540
520  CONTINUE
    SRSFTC = SRSFTC + (RECUNT(K,I)/WUPP(K))/(NPKPTC(K)*MTCPSD*DP
540  CONTINUE
    NFLG = 0
    NFLG1 = 0
555  CONTINUE
    IF(SFTNUM(3).LT.0) GO TO 570
    IF(SFTNUM(3).EQ.0) GO TO 580
    IF(SRSFTR.LE.NALSH * SFTNUM(3)) GO TO 580
    IF(NFLG1.GT.0) GO TO 580
    FMOD = SRSFTR / (NALSH * SFTNUM(3))
    DO 560 K=1,NWT
    IF(KIND(K).EQ.2. AND.SFTNUM(4).NE.0) GO TO 560
    RECUNT(K,I) = AINT(RECUNT(K,I) / FMOD)
    IF(RECUNT(K,I).LT.0.) RECUNT(K,I) = 0.
560  CONTINUE
    NFLG1 = NFLG1+1
    GO TO 400
570  CONTINUE
    IF(SFTNUM(4).NE.0) GO TO 575
    SRSFTR = SRSFTR + SRSFTC
    SRSFTC = 0.
    NFLG = 1
575  SFTNUM(3) = (SRSFTR / NALSH) + .999
580  CONTINUE
    IF(NFLG.EQ.1) GO TO 610
    IF(SFTNUM(4).LT.0) GO TO 600
    IF(SFTNUM(4).GT.0) GO TO 585
    IF(SFTNUM(3).EQ.0) GO TO 1600
    SRSFTR = SRSFTR + SRSFTC
    SRSFTC = 0.
    NFLG = 1
    GO TO 555
585  CONTINUE
    IF(SRSFTC.LE. NALSH * SFTNUM(4)) GO TO 610
    FMOD = SRSFTC / (NALSH * SFTNUM(4))
    DO 590 K=1,NWT
    IF(KIND(K).EQ.1) GO TO 590
    RECUNT(K,I) = RECUNT(K,I) / FMOD
    IF(RECUNT(K,I).LT.0.) RECUNT(K,I) = 0.
590  CONTINUE
    GO TO 400
600  CONTINUE

```

```

***** RECGN2 WASTOP *****

      SFTNUM(4) = (SRSFTC / NALSH) + .999
610 CONTINUE
      SRRMR(I) = AMAX1(SRRMR(I),SRSFTC)
      SRRMC(I) = AMAX1(SRRMC(I),SPSFTC)
      DO 650 K=1,NWT
      IF(SRRMP(I).EQ.0.0) GO TO 620
      IF(WUPP(K).EQ.0.) GO TO 650
      NUMPKG(K,I) = RECUNT(K,I) / WUPP(K) + .999
      NEMPU(K,I) = NUMPKG(K,I) / NPKPEU(K) + .999
      IF(KIND(K).EQ.2) GO TO 620
      SUMRPK(I) = SUMRPK(I) + NUMPKG(K,I)
      SUMRRC(I) = SUMRRC(I) + RECUNT(K,I)
      TRNSPT(1,I) = NUMPKG(K,I) / TOEQPC(1) / DPY / SRRMR(I) +
      + TRNSPT(1,I)
      EMPMCH(1,I) = NEMPU(K,I)*NPKPEU(K) / (UOEQPC(1) * SRRMR(I) * DPY
      + EMPMCH(1,I)
      GO TO 650
620 CONTINUE
      IF(SRRMC(I).EQ.0.0) GO TO 650
      SUMCPK(I) = SUMCPK(I) + NUMPKG(K,I)
      SUMCRC(I) = SUMCRC(I) + RECUNT(K,I)
      TRNSPT(2,I) = NUMPKG(K,I) / TOEQPC(2) / DPY / SRRMC(I) +
      + TRNSPT(2,I)
      EMPMCH(2,I) = NEMPU(K,I) / ( UOEQPC(2) * SRRMC(I) * DPY )
      + EMPMCH(2,I)
650 CONTINUE
      TRNSPT(1,I) = AINT(TRNSPT(1,I) + .9999)
      TRNSPT(2,I) = AINT(TRNSPT(2,I) + .9999)
      EMPMCH(1,I) = AINT(EMPMCH(1,I) + .9999)
      EMPMCH(2,I) = AINT(EMPMCH(2,I) + .9999)
655 CONTINUE
      A = SURR / SRMCAP
      B = SURC / SCMCAP
      C = SUPR / SPMCAP
      RMMAX = AMAX1(RMMAX,A)
      CMMAX = AMAX1(CMMAX,B)
      PMMAX = AMAX1(PMMAX,C)
C
C      MANPOWER REQUIREMENTS
C
      ISR = SRRMR(I) + .999
      DO 670 L=1,ISR
      SFTC(L) = AMIN1(SRRMR(I) - (L-1), 1.)
670 CONTINUE
      ISC = SRRMC(I) + .999
      DO 680 L=1,ISC
      SFTC(L) = AMIN1(SRRMC(I) - (L-1), 1.)
680 CONTINUE
C
C      RH
C
      DO 690 L=1,ISR
C
C      RECEIVING
C
      RHRLBR(I,L) = WCLBRP(1) * SFTC(L) * NRMPH(I)
C

```

```

***** RECON2 WASTOP *****

C   PACKAGING
C   RHPLBR(I,L) = WOLBRR(3) * SFTP(L) * NRMPI(I)
C
C   UNDERGROUND
C   TRANSPORTATION
C   TRRLBR(I,L) = TRRLBR(I,L) + TOLBRR(1) * SFTR(L) * TRNSPT(1,I)
C   EMPLACEMENT
C   ERRLBR(I,L) = ERRLBR(I,L) + UOLBRR(1) * SFTR(L) * EMPMCH(1,I)
690  CONTINUE
C
C   CH
C
C   DO 750 L=1,ISC
C   RECEIVING
C   CHRLBR(I,L) = WOLBRR(2) * SFTC(L) * NRMCH(I)
C
C   UNDERGROUND
C   TRANSPORTATION
C   TRCLBR(I,L) = TRCLBR(I,L) + TOLBRR(2) * SFTC(L) * TRNSPT(2,I)
C   EMPLACEMENT
C   ERCLBR(I,L) = ERCLBR(I,L) + UOLBRR(2) * SFTR(L) * EMPMCH(2,I)
750  CONTINUE
C   DO 756 K=1,NWT
C   IS = ISR
C   IF(KIND(K).EQ.2) IS = ISC
C   DO 755 L=1,IS
C   IF(KIND(K).EQ.2) GO TO 754
C   IF(SUMRRC(I).NE.0.0)
C   +RECLBR(K,I) = RECLBR(K,I) + RHRLBR(I,L) * RECUNT(K,I) / SUMRRC(I)
C   IF(SUMRPK(I).NE.0.0)
C   +PKGLBR(K,I) = PKGLBR(K,I) + RHPLBR(I,L) * NUMPKG(K,I) / SUMRPK(I)
C   IF(SUMRPK(I).NE.0.0)
C   +TRNLBR(K,I) = TRNLBR(K,I) + TRRLBR(I,L) * NUMPKG(K,I) / SUMRPK(I)
C   IF(SUMRPK(I).NE.0.0)
C   +EMPLBR(K,I) = EMPLBR(K,I) + ERRLBR(I,L) * NUMPKG(K,I) / SUMRPK(I)
C   GO TO 755
754  CONTINUE
C   RECLBR(K,I) = RECLBR(K,I) + CHRLBR(I,L) * NUMPKG(K,I) / SUMCPK(I)
C   TRNLBR(K,I) = TRNLBR(K,I) + TRCLBR(I,L) * NUMPKG(K,I) / SUMCPK(I)
C   EMPLBR(K,I) = EMPLBR(K,I) + ERCLBR(I,L) * NUMPKG(K,I) / SUMCPK(I)
755  CONTINUE
C   WOLABR(K,I) = RECLBR(K,I) + PKGLBR(K,I) + TRNLBR(K,I) + EMPLBR(K,I)
756  CONTINUE

C   MATERIALS REQUIREMENTS FOR RECEIVING
C
C   DO 1100 K=1,NWT
C   RCMATR(K,I) = (WOMATU(1,K) + WOMATU(2,K)) * RECUNT(K,I)

```

***** RECON2 WASTOP *****

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C  MATERIALS REQUIREMENTS FOR PACKAGING
    PKMATR(K,I) = WOMATU(3,K) * NUNPKG(K,I)
C  MATERIALS REQUIREMENTS FOR TRANSPORT
    TRMATR(K,I) = (UCMATU(1,K) + UCMATU(2,K)) * UGRMOD(I)
1100 CONTINUE
C
C
C  EMLACEMENT DENSITY
C
    DO 700 K=1,NWT
      IF(PITCH(K,I).EQ.0.) PITCH(K,I)=HPMIN(K)
      NPPRW (K,I) = AINT((RMLN(K)-CLSEMP(K))/PITCH (K,I)) * PKGPUP(K)
      NPKGPR(K,I)=NPPRW(K,I)*NRWSPR(K)
      HTLONF(K,I)=NPKGPR(K,I)*TDWI(I,K)*WUPP(K)/TANF(K)
      IF(IMET(K).EQ.4) HTLONF(K,I) = PKGPUP(K)*TDWI(I,K)
      I  *WUPP(K)/TANF(K)
      IF(HTLONF(K,I).LE.NFTL) GO TO 645
C  NEAR FIELD THERMAL LIMIT EXCEEDED
      IF(IMET(K).NE.4) GO TO 640
      TTANF(K) = PKGPUP(K)*TDWI(I,K)*WUPP(K)/NFTL
      PITCH(K,I) = TTANF(K)*M2ACRE/(HOLD(K)+RMWTH(K))
      NPPRW (K,I) = (RMLN(K)-CLSEMP(K))/PITCH (K,I) * PKGPUP(K)
      NPKGPR(K,I)=NPPRW(K,I)*NRWSPR(K)
      HTLONF(K,I) = PKGPUP(K)*TDWI(I,K)*WUPP(K)/TTANF(K)
      GO TO 645
640  CONTINUE
      PKGTD=TDWI(I,K)*WUPP(K)
      NHLPPA=NFTL/PKGTD
      NPKGPR(K,I) = NHLPPA * TANF(K)
      NPPRW (K,I)=NPKGPR(K,I)/NRWSPR(K)
      PITCH(K,I)= (RMLN(K)-CLSEMP(K))/NPPRW(K,I) * PKGPUP(K)
      HTLONF(K,I)=NPKGPR(K,I)*TDWI(I,K)*WUPP(K)/TANF(K)
645  CONTINUE
      FFHTLD(K,I)=RMPILU(K)*NPKGPR(K,I)*TDWI(I,K)*WUPP(K)/AREAPP
      IF(IMET(K).EQ.4) FFHTLD(K,I) = FFHTLD(K,I)/RMPILU(K)*NBSPPA(K)
      IF(FFHTLD(K,I).LE.FFTL) GO TO 685
C  FAR FIELD THERMAL LIMIT EXCEEDED
      NHLPPA = FFTL/(TDWI(I,K)*WUPP(K))
      NPKGPR (K,I) = NHLPPA/(RMPILU (K)/AREAPP)
      IF(IMET(K).EQ.4) NPKGPR(K,I) = NHLPPA/(NBSPPA(K)/AREAPP)
      NPPRW (K,I) = NPKGPR (K,I)/NRWSPR(K)
      PITCH (K,I) = (RMLN(K) - CLSEMP(K))/NPPRW(K,I) * PKGPUP(K)
      FFHTLD(K,I) = RMPILU(K)*NPKGPR(K,I)*TDWI(I,K)*WUPP(K)/AREAPP
      IF(IMET(K).EQ.4) FFHTLD(K,I) = FFHTLD(K,I)/RMPILU(K)*NBSPPA(K)
685  CONTINUE
C
C  REPOSITORY LIFE
C
      BSFILO(K,I)=FLOAT(NUNPKG(K,I))/FLOAT(NPKGPR(K,I))
      PNLREQ(K,I)=BSFILO(K,I)*AREAPP/RMPILU(K)*RMSPBS(K)
      RMFILO(K,I) = BSFILO(K,I)*RMSPBS(K)
700  CONTINUE
      DO 720 K=1,NWT
        ANPAR(I)=ANPAP(I)+PNLREQ(K,I)
720  CONTINUE
870  CONTINUE
      IF(I.EQ.1) GO TO 730

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***** RECON2 WASTOP *****

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      CUMPAR(I)=CUMPAR(I-1)+ANPAR(I)
73C CONTINUE
      CORARA = TOTMCL*CORWTH(1)/M2ACRE
      BEGPA=(SIZE-CPA-CORARA)*(1.-GXEF)
      AVL RPA(I)=BEGPA-CUMPAR(I)
      IF(AVL RPA(I) .LE. 1.) GO TO 910
C 90C CONTINUE
      END TIME LOOP
      IF(I.GT.LY) I=LY
C
C 91C CONTINUE
      RHCAP = RMHAX
      PMCAP = PMMAX
      CMCAP = CMHAX
C RECALCULATE LAST YEAR
      I=I
      LY=I
      IF(AVL RPA(I).GE.0.) GO TO 960
      CUMPAR(I)=CUMPAR(I)+AVL RPA(I)
      ANPAR(I)=ANPAR(I)+AVL RPA(I)
      SRMF=0.
      DO 930 K=1,NWT
      SRMF=SRMF+BSFILD(K,I)
930 CONTINUE
      DO 940 K=1,NWT
      PNLREQ(K,I)=BSFILD(K,I)/SRMF*ANPAR(I)
940 CONTINUE
      DO 950 K=1,NWT
      BSFILD(K,I)=PNLREQ(K,I)/AREAPP*RMPILU(K)/RMSPBS(K)
      NUMPKG(K,I)=BSFILD(K,I)*NPKGPR(K,I)
      RECENT(K,I) = NUMPKG(K,I) * WUPP(K)
      RMFILD(K,I) = BSFILD(K,I)*RMSPBS(K)
950 CONTINUE
960 CONTINUE
      THEET = 0.0
      SRMFLD = 0.0
      DO 970 K=1,NWT
      DO 970 I=1,LY
      SRMFLD = SRMFLD + RMFILD(K,I)
970 CONTINUE
      DO 980 K=1,NWT
      DO 975 I=1,LY
      WTHEET(K) = WTHEET(K)+NPKGPR(K,I)*RMFILD(K,I)*TOWI(I,K)*WUPP(K)
      SRMWT(K) = SRMWT(K)+RMFILD(K,I)
975 CONTINUE
      THEET=THEET+WTHEET(K)
      TNFTA=TNFTA +TANF(K)
980 CONTINUE
C
C
C EQUIPMENT REQUIREMENTS FOR RECEIVING
C
C REMOTE
C
      KD = 2
      NEGLY = 0
      II = 0

```

***** RECON2 WASTOP *****

```

      DO 1220 I=1,LY
      DRECNT = SUMRRC(I)
      IF(SRRMR(I).EQ.0.) GO TO 1200
      II = II+1
      CAPCTY = WOEQPC(1) * SRRMR(I) * DPY
      NEQC = SUMRRC(I) / (WOEQPC(1) * SRRMR(I) * DPY)
      I + .999
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DRECNT,CAPCTY,WOEQPL(1),
6          NW,II)
      IF(SUMRRC(I).EQ.0.0) GO TO 1200
      DO 1220 K=1,NWT
      IF(KIND(K).EQ.2) GOTO 1220
      EQRREC(K,I) = NEWEQP*RECUNT(K,I)/SUMRRC(I)
1220  CONTINUE
1200  CONTINUE
C
      KD = 0
C  CONTACT
C
      NEQLY = 0
      II = 0
      DO 1250 I=1,LY
      IF(SRRMC(I).EQ.0.) GO TO 1250
      II = II+1
      CAPCTY = WOEQPC(2) * SRRMC(I) * DPY
      DRECNT = SUMCRC(I)
      NEQC = SUMCRC(I) / (WOEQPC(2) * SRRMC(I) * DPY)
      I + .999
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DRECNT,CAPCTY,WOEQPL(2),
6          NW,II)
      IF(SUMCRC(I).EQ.0) GOTO 1250
      DO 1260 K=1,NWT
      IF(KIND(K).EQ.1) GOTO 1260
      EQRREC(K,I) = NEWEQP*RECUNT(K,I)/SUMCRC(I)
1260  CONTINUE
1250  CONTINUE
C
C  EQUIPMENT REQUIREMENTS FOR PACKAGING
C
      II = 0
      NEQLY = 0
      DO 1270 I=1,LY
      IF(SRRMR(I).EQ.0.) GO TO 1270
      II = II +1
      CAPCTY = WOEQPC(3) * SRRMR(I) * DPY
      DRECNT = SUMRPK(I)
      NEQC = SUMRPK(I) / (WOEQPC(3) * SRRMR(I) * DPY)
      I + .999
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DRECNT,CAPCTY,WOEQPL(3),
6          NW,II)
      IF(SUMRPK(I).EQ.0.0) GOTO 1270
      DO 1275 K=1,NWT
      IF(KIND(K).EQ.2) GOTO 1275
      EQRPKG(K,I) = NEWEQP*NUMPKG(K,I)/SUMRPK(I)
1275  CONTINUE
1270  CONTINUE
C

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C EQUIPMENT REQUIREMENTS FOR TRANSPORTATION
C
      NEQLY = 0
      KD = 0
      DO 1300 I=1,LY
      NEQC = TRNSPT(1,I)+.9999
      DUMPKG = SUMRPK(I)
      CAPCTY = TOEQPC(1) * SRRMR(I) * DPY
      EQLIFE = TOEQPL(1)
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DUMPKG,CAPCTY,EQLIFE,
6          NW,I)
      IF(SUMRPK(I).EQ.0.0) GO TO 1300
      DO 1310 K=1,NWT
      IF(KIND(K).EQ.2) GO TO 1310
      EQRTN(K,I) = NEWEQP*NUMPKG(K,I)/SUMRPK(I)
1310 CONTINUE
1300 CONTINUE
      KD = 0
      NEQLY = 0
      DO 1325 I=1,LY
      NEQC = TRNSPT(2,I)+.9999
      DUMPKG = SUMCPK(I)
      CAPCTY = TOEQPC(2) * SRRMC(I) * DPY
      EQLIFE = TOEQPL(2)
      IF(I.EQ.1) NEQLY= 0
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DUMPKG,CAPCTY,EQLIFE,
6          NW,I)
      IF (SUMCPK(I).EQ.0.0) GOTO 1340
      DO 1330 K=1,NWT
      IF (KIND(K).EQ.1) GOTO 1330
      EQRTN(K,I) = NEWEQP*NUMPKG(K,I)/SUMCPK(I)
1330 CONTINUE
1340 CONTINUE
1325 CONTINUE
C
C EMPLACEMENT MATERIALS COST CALCULATIONS
C
C
C UNDERGROUND OPERATIONS
C
      DO 1660 K=1,NWT
      IF(IMET(K).NE.1.AND.IMET(K).NE.4) GO TO 1660
      WABOR(K) = REFDIA(K) / 2 + WABATH(K)
      SLEVOR(K) = WABOR(K) + SLEETH(K)
      HOLDIA(K) = PKGDIA(K) + (WABATH(K)+SLEETH(K)+BCKFTH(K))
1      * 2.
      HOLD(K) = PKGLN(K) * NPKPEU(K) + CAPLEN(K) + HOLDEL(K)
1660 CONTINUE
      IF(IDET.NE.1) GO TO 1305
      DO 1700 K=1,NWT
      IF(IMET(K).NE.1.AND.IMET(K).NE.4) GO TO 1650
      UOMATC(1,K) =HOLMC(WABATH(K),WABOR(K),SLEETH(K),SLEVOR(K),
      1BCKFTH(K),HOLDIA(K),REFDIA(K),REFMAT(K),
      2 PKGDIA(K),REFSLV(K),REFBKF(K),REFDEP(K),NTYP )
      1 * HOLD(K) / PKGUP(K)

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***** RECON2 WASTOP *****

      GO TO 1700
1650 CONTINUE
      IF (IMET(K).GT.2.AND.IMET(K).NE.4) GO TO 1670
      UOMATC(?,K) = CHMTEM(K) / PKGPPK(K)
      GO TO 1700
1670 CONTINUE
      UOMATC(1,K) = RCKCST(K) / PKGPRK(K)
1700 CONTINUE
1305 CONTINUE
      DO 1306 I=1,LY
      DO 1306 K=1,NWT
      IF (KIND(K).EQ.2) GO TO 1307
      IF (IUHDCM.EQ.1) EEMATR(K,I) = UOMATU(1,K)
      EMMATC(K,I) = UOMATC(1,K) * NEMPU(K,I) * UOMATU(1,K)
      GO TO 1306
1307 CONTINUE
      IF (IUHDCM.EQ.1) EEMATR(K,I) = UOMATU(2,K)
C  EMBLACEMENT MATERIALS COST CALCULATION
      EMMATC(K,I) = UOMATC(2,K) * NEMPU(K,I) * UOMATU(2,K)
1306 CONTINUE
C
C  EMBLACEMENT EXCAVATION OPERATIONS
C
      IICNT = 0
      ICNT = 0
      DO 1800 K=1,NWT
      NEQLY = 0
      II = 0
      IF (IMET(K).EQ.1) GO TO 1810
      IF (IMET(K).EQ.2) GO TO 1860
      IF (IMET(K).EQ.3) GO TO 1870
      IF (IMET(K).EQ.4) GO TO 1810
      WRITE(10,3000)
3000 FORMAT('1',T5,'***** ERROR *** NO EMBLACEMENT METHOD SPECIFIED
      STOP
C  HOLE DRILLING EXCAVATION REQUIREMENTS CALCULATIONS
1810 CONTINUE
      IF (IMET(K).EQ.4.AND.PKGLN(K).GT.RMWTH(K)) GOTO 1610
      IF (IUHDCM.EQ.1) GO TO 1830
      IF (ICNT.EQ.1) GOTO 1800
      DO 1820 I=1,LY
      SUMEPU(I) = 0.0
      DO 1815 KK=1,NWT
      IF (IMET(KK).NE.1.AND.IMET(K).NE.4) GOTO 1815
      SUMEPU(I) = SUMEPU(I) + NEMPU(KK,I)
1815 CONTINUE
      DNEMPU = SUMEPU(I)
      EEMATR(K,I) = EEMATU(1) * SUMEPU(I)
      IF (SRRMR(I).EQ.0.) GO TO 1820
      II = II + 1
      NEQC = SUMEPU(I) / EEEQPC(1) / SRRMR(I) / DPY
      1 + .999
      EXMACH(1,I) = NEQC
      CAPCTY = EEEQPC(1) * SRRMR(I) * DPY
      EQLIFE = EEEQPL(1)
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DNEMPU,CAPCTY,EQLIFE,NW,II)
      DO 1805 KK=1,NWT

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***** RECON2 WASTOP *****

      IF(IMET(KK).NE.1.AND.IMET(K).NE.4) GOTO 1805
      EQREEX(KK,I) = NEWECF*NEMPU(KK,I)/SUMEPU(I)
1805  CONTINUE
      DO 1825 L=1,ISR
      EXLBR(I,L) = EELBRR(1) * SFTR(L) * EXMACH(1,I) + EXLBR(I,L)
1825  CONTINUE
      DO 1840 KK=1,NWT
      IF(IMET(KK).NE.1.AND.IMET(K).NE.4) GOTO 1840
      IF(SUMRPK(I).EQ.0.0) GOTO 1840
      EEXLBR(KK,I) = EEXLBR(KK,I) + EXLBR(I,L)*NEMPU(KK,I)/SUMEPU(I)
      EEXRKM(KK,I) = PI*(HOLDIA(KK)**2)/4.*HOLD(KK)*DENSTY*NEMPU(KK,I)
1840  CONTINUE
      ICNT = ICNT+1
1820  CONTINUE
      GO TO 1800
1830  CONTINUE
      HOLXC(K) = HOLDC(HDCON1,HDCON2,HOLDIA(K),NTYP) * HOLD(K)
      DO 1835 I=1,LY
      IF(EEMATC(1).NE.0.0)
      *EEMATR(K,I) = HOLXC(K) * HDMCFC *NEMPU(K,I) / EEMATC(1)
      EXMAC(K) = EXMAC(K) + HOLXC(K) * NEMPU(K,I)
      IF(EELBRC(1).NE.0.0)
      *EEXLBR(K,I) = HOLXC(K) * HOLCFC *NEMPU(K,I) / EELBRC(1)
      DO 1837 KK=1,ISR
      EXLBR(I,KK) = EXLBR(I,KK) + EEXLBR(K,I) / ISR
1837  CONTINUE
      EEXRKM(K,I) = (HOLDIA(K)**2) / 4. * HOLD(K) * DENSTY *
      I NEMPU(K,I) * PI
1835  CONTINUE
      GO TO 1800
C  NO EMPLACEMENT EXCAVATION IS REQUIRED FOR SIMPLE ROOM PLACEMENT
1860  CONTINUE
      GO TO 1800
C  TRENCH EXCAVATION REQUIREMENTS CALCULATIONS
1870  CONTINUE
      IF(IIcnt.EQ.1) GOTO 1800
      II = 0
      DO 1875 I=1,LY
      SUMEPU(I) = 0.0
      DO 2000 KK = 1,NWT
      IF(IMET(KK).NE.3) GOTO 2000
      SUMEPU(I) = SUMEPU(I) + NEMPU(KK,I)
2000  CONTINUE
      IF(SRRMR(I).EQ.0.) GO TO 1875
      II = II+1
      DNEMPU = SUMEPU(I)
      EEMATR(K,I) = EEMATU(3) * SUMEPU(I)
      NEQC = SUMEPU(I) / EEEQPC(3) / SRRMR(I) / DPY
      1 + .999
      EXMACH(2,I) = NEQC
      CAPCTY = EEEQPC(3) * SRRMR(I) * DPY
      EQLIFE = EEEQPL(3)
      CALL REPLAS(NEQC,NECLY,KD,NEWECF,DNEMPU,CAPCTY,EQLIFE,NW,I)
      DO 2010 KK=1,NWT
      IF(IMET(KK).NE.3) GOTO 2010
      EQREEX(KK,I) = NEWECF * NEMPU(KK,I)/SUMEPU(I)
2010  CONTINUE

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***** RECON2 WASTOP *****

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      DO 1873 L=1,ISR
      EXLBR(I,L) = EXLBR(I,L) + EELBRR(3) * SFTR(L) * EXMACH(2,I)
1873  CONTINUE
      DO 2030 KK=1,NWT
      IF(SUMEPU(I).EQ.0.0) GOTO 2030
      IF(IMET(KK).NE.3) GO TO 2030
      EEXLBR(KK,I) = EEXLBR(KK,I) + EXLBR(I,L) * NEMPU(KK,I) /SUMEPU(I)
      EEXRKM(KK,I) = TRCHWD(KK) * (PKGLN(KK)+CAPLEN(KK)+HOLDEL(KK))
      I * DENSTY
2030  CONTINUE
      1875  CONTINUE
      IICNT = IICNT + 1
      1800  CONTINUE
C
      IF(IUMDCM.NE.1) GOTO 2040
      LLL = LL + 1
      DO 2050 I=LLL,LY
      DO 2060 K=1,NWT
      IF(IMET(K).NE.1.AND.IMET(K).NE.4) GOTO 2060
      IF(EEECST(1).EQ.0) GOTO 2060
      EQREEX(K,I) = EXMAC(K) * HDECFC / EEEEST(1) / (LY - LL)
      EXMACH(1,I) = EXMACH(1,I) + EQREEX(K,I)
2060  CONTINUE
2050  CONTINUE
2040  CONTINUE
C  EQUIPMENT REQUIREMENT FOR EMPLACEMENT
      DO 1350 I=1,LY
      IF(SUMRPK(I).EQ.0.0) GOTO 1350
      CAPCTY = UOEQPC(1) * SRRMR(I) * DPY
      EQLIFE = UOEQPL(1)
      DUMPKG = SUMRPK(I)
      NEQC = EMPMCH(1,I)
      IF(I.EQ.1) NEQLY = 0
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DUMPKG, CAPCTY,EQLIFE,NW,I)
      DO 1360 K=1,NWT
      IF(KIND(K).EQ.2) GO TO 1360
      EQREMP(K,I) = NEWEQP*NUMPKG(K,I)/SUMRPK(I)
1360  CONTINUE
      1350  CONTINUE
      DO 1370 I=1,LY
      IF(SUMCPK(I).EQ.0.0) GOTO 1370
      CAPCTY = UOEQPC(2)*SRRMC(I)*DPY
      EQLIFE = UOEQPL(2)
      DUMPKG = SUMCPK(I)
      NEQC = EMPMCH(2,I)
      IF(I.EQ.1) NEQLY = 0
      CALL REPLAS(NEQC,NEQLY,KD,NEWEQP,DUMPKG, CAPCTY,EQLIFE,NW,I)
      DO 1380 K=1,NWT
      IF(KIND(K).EQ.1) GOTO 1380
      EQREMP(K,I) = NEWEQP*NUMPKG(K,I)/SUMCPK(I)
1380  CONTINUE
1370  CONTINUE
C
C  LABOR COST CALCULATIONS
C
      DO 758 I=1,LY
      ARLBCT(I) = 0.

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***** RECON2 WASTOP *****

APLBCT(I) = 0.
ATLBCT(I) = 0.
AMLBCT(I) = 0.
REEQCT(I) = 0.
PARQCT(I) = 0.
TREQCT(I) = 0.
758 CONTINUE
DO 1500 I=1,LY
DO 760 K=1,NWT
IS = SRRMR(I)+.999
IF (KIND(K).EQ.2) IS = SRRMC(I)+.999
DO 760 L=1,IS
IF(KIND(K).EQ.2) GO TO 765
IF(SUMRRC(I).EQ.0.) GO TO 1910
RELBCT(K,I) = RHRLBR(I,L) * WOLBRC(1) * SHCFAC(L) * OVRHDF *
1 RECONT(K,I) / SUMRRC(I) + RELBCT(K,I)
1910 CONTINUE
IF(SUMRPK(I).EQ.0.) GO TO 1920
PALBCT(K,I) = RHPLBR(I,L) * WOLBRC(3) * SHCFAC(L) * OVRHDF *
1 NMPKG(K,I) / SUMRPK(I) + PALBCT(K,I)
TRLBCT(K,I) = TRRLBR(I,L) * UOLBRC(1) * SHCFAC(L) * OVRHDF *
1 NMPKG(K,I) / SUMRPK(I) + TRLBCT(K,I)
EMLBCT(K,I) = EMLBCT(K,I)+ERRLBR(I,L)*UOLBRC(1)*SHCFAC(L) *
1 OVRHDF * NMPKG(K,I) / SUMRPK(I)
EXLBCT(K,I) = EXLBCT(K,I) + EXLBR(I,L) * EELBRC(1) * SHCFAC(L) *
1 OVRHDF * NMPKG(K,I) / SUMRPK(I)
1920 CONTINUE
GO TO 770
765 CONTINUE
IF(SUMCPK(I).EQ.0.) GO TO 770
RELBCT(K,I) = CHRLBR(I,L) * WOLBRC(2) * SHCFAC(L) * OVRHDF *
1 NMPKG(K,I) / SUMCPK(I) + RELBCT(K,I)
TRLBCT(K,I) = TRCLBR(I,L) * UOLBRC(2) * SHCFAC(L) * OVRHDF *
1 NMPKG(K,I) / SUMCPK(I) + TRLBCT(K,I)
EMLBCT(K,I) = EMLBCT(K,I)+ERCLBR(I,L)*UOLBRC(2)*SHCFAC(L) *
1 OVRHDF * NMPKG(K,I) / SUMCPK(I)
770 CONTINUE
760 CONTINUE
DO 780 K=1,NWT
ARLBCT(I) = ARLBCT(I) + RELBCT(K,I)
APLBCT(I) = APLBCT(I) + PALBCT(K,I)
ATLBCT(I) = ATLBCT(I) + TRLBCT(K,I)
AMLBCT(I) = AMLBCT(I) + EMLBCT(K,I)
AXLBCT(I) = AXLBCT(I) + EXLBCT(K,I)
780 CONTINUE

C
C MATERIALS COST CALCULATIONS
C
DO 1110 K=1,NWT
C FOR RECEIVING
RCHATC(K,I) = RCHATR(K,I) * WOMATC(1,K)
C FOR PACKAGING
PKMATC(K,I) = PKMATR(K,I) * WOMATC(3,K)
C FOR TRANSPORT
C FOR EMPLACEMENT EXCAVATIONS
TRMATC(K,I) = TPHATR(K,I) * TOMATC(1,K)
IMETH = IMET(K)

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***** RECON2 WASTOP *****

      IF(IMET(K).EQ.4) IMETH = 1
      EXMATC(K,I) = EEMATP(K,I) * EEMATC(IMETH)
C MISCELLANEOUS MATERIALS COSTS
      OTMATC(K,I) = WOLABP(K,I) * FLUMM
      REMTCT(I) = REMTCT(I) + RCMATC(K,I)
      PAMTCT(I) = PAMTCT(I) + PKMATC(K,I)
      TRMTCT(I) = TPMTCT(I) + TRMATC(K,I)
      EMMTCT(I) = EMMTCT(I) + EMMATC(K,I)
      EXMTCT(I) = EXMTCT(I) + EXMATC(K,I)
      OTMTCT(I) = OTMTCT(I) + OTMATC(K,I)
1110 CONTINUE
      TMATCT(I) = REMTCT(I) + PAMTCT(I) + TRMTCT(I) + EMMTCT(I) + EXMTCT(I)
C
C EQUIPMENT COSTS
C
      DO 1400 K=1,NWT
      IF(KIND(K).EQ.2) GO TO 1410
      RCEQPC(K,I) = EORREC(K,I) * WOECS(1)
      GO TO 1400
1410 CONTINUE
      RCEQPC(K,I) = EORREC(K,I) * WOECS(2)
1400 CONTINUE
      DO 1420 K=1,NWT
      PKEOPC(K,I) = EORPKG(K,I) * WOECS(3)
1420 CONTINUE
      DO 1430 K=1,NWT
      IF(KIND(K).EQ.2) GO TO 1440
      TREQPC(K,I) = EQRTN(K,I) * TOECST(1)
      EMEQPC(K,I) = EQREMP(K,I) * UOECST(1)
      GO TO 1430
1440 CONTINUE
      TREQPC(K,I) = EQRTN(K,I) * TOECST(2)
      EMEQPC(K,I) = EQREMP(K,I) * UOECST(2)
1430 CONTINUE
      DO 1445 K=1,NWT
      IMETH = IMET(K)
      IF(IMET(K).EQ.4) IMETH = 1
      EXEQPC(K,I) = EOREEX(K,I) * EEECS(IMETH)
1445 CONTINUE
      DO 1450 K=1,NWT
      REEOCT(I) = REEOCT(I) + RCEQPC(K,I)
      PAROCT(I) = PAROCT(I) + PKEOPC(K,I)
      TREOCT(I) = TREOCT(I) + TREQPC(K,I)
      EMEOCT(I) = EMEOCT(I) + EMEQPC(K,I)
      EXEOCT(I) = EXEOCT(I) + EXEQPC(K,I)
1450 CONTINUE
1500 CONTINUE
C
C
C
      DO 1050 K=1,NWT
      DO 1050 I=1,LY
      WSTVOL(K,I) = WVOLPU(K)*RECUNT(K,I)
1050 CONTINUE
      RETURN
1600 CONTINUE
      WRITE(IO,1111)

```


***** RECON2 WASTOP *****

```
1111 FORMAT('1',T25,'STOP - STOP - STOP',T20,'NO WASTE SHAFTS
ICIFIED')
1610 CONTINUE
      WRITE(10,1620)
1620 FORMAT('C  -- STOP  -- STOP --')
1      ' PACKAGE LENGTH IS LONGER THAN SPECIFIED ROOM WIDTH')
      STOP
      END
```

ERRORS: NONE. TIME: 3.853 SEC. IMAGE COUNT: 861

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 1 MINE DEVELOPMENT PARAMETERS FOR A REPOSITORY IN SALT BED

LOCATION	GENERIC
YEAR CONSTRUCTION BEGINS	1992
YEAR OPERATION BEGINS	1998
DEPTH, METERS (A)	610.0
TOTAL SURFACE AREA, HECTARES (B)	500.0
TOTAL UNDERGROUND AREA, HECTARES (B)	3000.0
MINING METHOD	CONTINUOUS
CENTRAL PILLAR AREA, HECTARES (B)	91.8
MAIN CORR.	
WIDTH, METERS (A)	9.1
LENGTH, METERS (A)	14200.0
HEIGHT, METERS (A)	4.9
CORRIDORS/PANEL	0
BRANCH	
WIDTH, METERS (A)	9.1
LENGTH, METERS (A)	915.0
HEIGHT, METERS (A)	4.9
CORRIDORS/PANEL	1
VENT	
WIDTH, METERS (A)	9.1
LENGTH, METERS (A)	1067.0
HEIGHT, METERS (A)	4.9
CORRIDORS/PANEL	1
PERMITER	
WIDTH, METERS (A)	9.1
LENGTH, METERS (A)	213.0
HEIGHT, METERS (A)	4.9
CORRIDORS/PANEL	1
PANEL WIDTH, METERS (A)	215.0
PANEL LENGTH, METERS (A)	823.0
GEOMETRIC EXCLUSION FACTOR	.0
SITE PREPARATION COST, \$/HECTARE (B)	461312.0
DISCOUNT RATE, PERCENT	.0

WASTE TYPE

	PWR FUEL	BWR FUEL	SF HARDWARE
EXTRACTION RATIO	.146	.146	.146
ROOM WIDTH, METERS (A)	4.0	4.0	4.0
ROOM HEIGHT, METERS (A)	7.2	7.2	7.2
ROOMS PER PANEL	30	30	30

 (A) 1 METER = 3.281 FEET
 (B) 1 HECTARE = 2.471 ACRES

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 2 RECEIVING AND PROCESSING FOR A REPOSITORY IN SALT BED

	RECEIVING PACKAGING		
	-----	-----	-----
R.H. WASTE PROCESSING CAPACITY PER MODULE, UNITS/SHIFT	7.0	1.4	
C.H. WASTE PROCESSING CAPACITY PER MODULE, UNITS/SHIFT	.0		
	WASTE TYPE		
	-----	-----	-----
	PWR FUEL	BWR FUEL	SF HARDWARE
RAIL CONTAINER CAPACITY, UNITS	10.0	15.0	.0
TRUCK CONTAINER CAPACITY, UNITS	.0	.0	.0

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 3 WASTE SHIPPING DISTRIBUTION FOR A REPOSITORY IN SALT BED

YEAR	PERCENTAGE OF UNITS SHIPPED BY RAIL FOR:		
	PWR FUEL	BWR FUEL	SF HARDWARE
1992	100.0	100.0	100.0
1993	100.0	100.0	100.0
1994	100.0	100.0	100.0
1995	100.0	100.0	100.0
1996	100.0	100.0	100.0
1997	100.0	100.0	100.0
1998	100.0	100.0	100.0
1999	100.0	100.0	100.0
2000	100.0	100.0	100.0
2001	100.0	100.0	100.0
2002	100.0	100.0	100.0
2003	100.0	100.0	100.0
2004	100.0	100.0	100.0
2005	100.0	100.0	100.0
2006	100.0	100.0	100.0
2007	100.0	100.0	100.0
2008	100.0	100.0	100.0
2009	100.0	100.0	100.0
2010	100.0	100.0	100.0
2011	100.0	100.0	100.0
2012	100.0	100.0	100.0
2013	100.0	100.0	100.0
2014	100.0	100.0	100.0
2015	100.0	100.0	100.0
2016	100.0	100.0	100.0
2017	100.0	100.0	100.0
2018	100.0	100.0	100.0
2019	100.0	100.0	100.0
2020	100.0	100.0	100.0
2021	100.0	100.0	100.0
2022	100.0	100.0	100.0
2023	100.0	100.0	100.0

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 4 RECEIVING AND PROCESSING FOR A REPOSITORY IN SALT BED

YEAR	NUMBER OF MODULES REQUIRED			NUMBER OF CONTAINER SHIPMENTS FOR:			
	REMOTE-HANDLED RECEIVING	REMOTE-HANDLED PACKAGING	CONTACT-HANDLED RECEIVING	PWR FUEL	BWR FUEL	SF HARDWARE	TOTAL
1992	0	0	0	.0	.0	.0	.0
1993	0	0	0	.0	.0	.0	.0
1994	0	0	0	.0	.0	.0	.0
1995	0	0	0	.0	.0	.0	.0
1996	0	0	0	.0	.0	.0	.0
1997	0	0	0	.0	.0	.0	.0
1998	1	1	0	238.5	249.0	.0	487.5
1999	1	1	0	238.5	249.0	.0	487.5
2000	1	1	0	238.5	249.0	.0	487.5
2001	1	1	0	238.5	249.0	.0	487.5
2002	1	1	0	238.5	249.0	.0	487.5
2003	1	2	0	396.9	414.4	.0	811.3
2004	1	2	0	396.9	414.4	.0	811.3
2005	1	2	0	396.9	414.4	.0	811.3
2006	1	2	0	396.9	414.4	.0	811.3
2007	1	2	0	396.9	414.4	.0	811.3
2008	1	2	0	396.9	414.4	.0	811.3
2009	1	2	0	396.9	414.4	.0	811.3
2010	1	2	0	396.9	414.4	.0	811.3
2011	1	2	0	396.9	414.4	.0	811.3
2012	1	2	0	396.9	414.4	.0	811.3
2013	1	2	0	396.9	414.4	.0	811.3
2014	1	2	0	396.9	414.4	.0	811.3
2015	1	2	0	396.9	414.4	.0	811.3
2016	1	2	0	396.9	414.4	.0	811.3
2017	1	2	0	396.9	414.4	.0	811.3
2018	1	2	0	396.9	414.4	.0	811.3
2019	1	2	0	396.9	414.4	.0	811.3
2020	1	2	0	396.9	414.4	.0	811.3
2021	1	2	0	396.9	414.4	.0	811.3
2022	1	2	0	396.9	414.4	.0	811.3
2023	1	2	0	396.9	414.4	.0	811.3
TOTAL				9527.5	9946.9	.0	19474.4

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 5A. WASTE OPERATIONS PARAMETERS FOR PWR FUEL
----- IN SALT BED

YEAR	NUMBER OF SHIFTS	UNITS RECEIVED	NUMBER OF PACKAGES	NUMBER OF PERSONNEL	NUMBER OF UNDERGROUND TRANSPORTERS	NUMBER OF EMPLACEMENT MACHINES	NUMBER OF DRILLING MACHINES	NUMBER OF ROOMS FILLED
1992	.0	.0	0	.0				.0
1993	.0	.0	0	.0				.0
1994	.0	.0	0	.0				.0
1995	.0	.0	0	.0				.0
1996	.0	.0	0	.0				.0
1997	.0	.0	0	.0				.0
1998	2.2	2385.0	398	170.1				28.4
1999	2.2	2385.0	398	170.1				28.4
2000	2.2	2385.0	398	170.1				28.4
2001	2.2	2385.0	398	170.1				28.4
2002	2.2	2385.0	398	170.1				28.4
2003	3.0	3969.0	662	232.2				47.3
2004	3.0	3969.0	662	232.2				47.3
2005	3.0	3969.0	662	232.2				47.3
2006	3.0	3969.0	662	232.2				47.3
2007	3.0	3969.0	662	232.2				47.3
2008	3.0	3969.0	662	232.2				47.3
2009	3.0	3969.0	662	232.2				47.3
2010	3.0	3969.0	662	232.2				47.3
2011	3.0	3969.0	662	232.2				47.3
2012	3.0	3969.0	662	232.2				47.3
2013	3.0	3969.0	662	232.2				47.3
2014	3.0	3969.0	662	232.2				47.3
2015	3.0	3969.0	662	232.2				47.3
2016	3.0	3969.0	662	232.2				47.3
2017	3.0	3969.0	662	232.2				47.3
2018	3.0	3969.0	662	232.2				47.3
2019	3.0	3969.0	662	232.2				47.3
2020	3.0	3969.0	662	232.2				47.3
2021	3.0	3969.0	662	232.2				47.3
2022	3.0	3969.0	662	232.2				47.3
2023	3.0	3969.0	662	232.2				47.3

TOTAL		95275.0	15892					1135.1

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 5B. WASTE OPERATIONS PARAMETERS FOR BWR FUEL
----- IN SALT BED

YEAR	NUMBER OF SHIFTS	UNITS RECEIVED	NUMBER OF PACKAGES	NUMBER OF PERSONNEL	NUMBER OF UNDERGROUND TRANSPORTERS	NUMBER OF EMPLACEMENT MACHINES	NUMBER OF DRILLING MACHINES	NUMBER OF ROOMS FILLED
1992	.0	.0	0	.0				.0
1993	.0	.0	0	.0				.0
1994	.0	.0	0	.0				.0
1995	.0	.0	0	.0				.0
1996	.0	.0	0	.0				.0
1997	.0	.0	0	.0				.0
1998	2.2	3735.0	214	125.3				15.3
1999	2.2	3735.0	214	125.3				15.3
2000	2.2	3735.0	214	125.3				15.3
2001	2.2	3735.0	214	125.3				15.3
2002	2.2	3735.0	214	125.3				15.3
2003	3.0	6215.7	356	170.9				25.4
2004	3.0	6215.7	356	170.9				25.4
2005	3.0	6215.7	356	170.9				25.4
2006	3.0	6215.7	356	170.9				25.4
2007	3.0	6215.7	356	170.9				25.4
2008	3.0	6215.7	356	170.9				25.4
2009	3.0	6215.7	356	170.9				25.4
2010	3.0	6215.7	356	170.9				25.4
2011	3.0	6215.7	356	170.9				25.4
2012	3.0	6215.7	356	170.9				25.4
2013	3.0	6215.7	356	170.9				25.4
2014	3.0	6215.7	356	170.9				25.4
2015	3.0	6215.7	356	170.9				25.4
2016	3.0	6215.7	356	170.9				25.4
2017	3.0	6215.7	356	170.9				25.4
2018	3.0	6215.7	356	170.9				25.4
2019	3.0	6215.7	356	170.9				25.4
2020	3.0	6215.7	356	170.9				25.4
2021	3.0	6215.7	356	170.9				25.4
2022	3.0	6215.7	356	170.9				25.4
2023	3.0	6215.7	356	170.9				25.4

TOTAL		149204.2	8546					610.4

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 5C. WASTE OPERATIONS PARAMETERS FOR SF HARDWARE
----- IN SALT BED

YEAR	NUMBER OF SHIFTS	UNITS RECEIVED	NUMBER OF PACKAGES	NUMBER OF PERSONNEL	NUMBER OF UNDERGROUND TRANSPORTERS	NUMBER OF EMPLACEMENT MACHINES	NUMBER OF DRILLING MACHINES	NUMBER OF ROOMS FILLED
-----	-----	-----	-----	-----	-----	-----	-----	-----
1992	.0	.0	0	.0				.0
1993	.0	.0	0	.0				.0
1994	.0	.0	0	.0				.0
1995	.0	.0	0	.0				.0
1996	.0	.0	0	.0				.0
1997	.0	.0	0	.0				.0
1998	2.2	149.0	149	53.6				2.0
1999	2.2	149.0	149	53.6				2.0
2000	2.2	149.0	149	53.6				2.0
2001	2.2	149.0	149	53.6				2.0
2002	2.2	149.0	149	53.6				2.0
2003	3.0	247.6	248	73.3				3.4
2004	3.0	247.6	248	73.3				3.4
2005	3.0	247.6	248	73.3				3.4
2006	3.0	247.6	248	73.3				3.4
2007	3.0	247.6	248	73.3				3.4
2008	3.0	247.6	248	73.3				3.4
2009	3.0	247.6	248	73.3				3.4
2010	3.0	247.6	248	73.3				3.4
2011	3.0	247.6	248	73.3				3.4
2012	3.0	247.6	248	73.3				3.4
2013	3.0	247.6	248	73.3				3.4
2014	3.0	247.6	248	73.3				3.4
2015	3.0	247.6	248	73.3				3.4
2016	3.0	247.6	248	73.3				3.4
2017	3.0	247.6	248	73.3				3.4
2018	3.0	247.6	248	73.3				3.4
2019	3.0	247.6	248	73.3				3.4
2020	3.0	247.6	248	73.3				3.4
2021	3.0	247.6	248	73.3				3.4
2022	3.0	247.6	248	73.3				3.4
2023	3.0	247.6	248	73.3				3.4
		-----	-----					-----
TOTAL		5945.2	5953					81.5

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 5D. WASTE OPERATIONS PARAMETERS SUMMARY FOR A REPOSITORY IN SALT BED

YEAR	NUMBER OF SHIFTS	UNITS RECEIVED	NUMBER OF PACKAGES	NUMBER OF PERSONNEL	NUMBER OF UNDERGROUND TRANSPORTERS	NUMBER OF EMPLACEMENT MACHINES	NUMBER OF DRILLING MACHINES	NUMBER OF ROOMS FILLED
----	-----	-----	-----	-----	-----	-----	-----	-----
1992	.0	.0	0	.0	.0	.0	.0	.0
1993	.0	.0	0	.0	.0	.0	.0	.0
1994	.0	.0	0	.0	.0	.0	.0	.0
1995	.0	.0	0	.0	.0	.0	.0	.0
1996	.0	.0	0	.0	.0	.0	.0	.0
1997	.0	.0	0	.0	.0	.0	.0	.0
1998	2.2	6269.0	761	349.0	1.0	1.0	.4	45.8
1999	2.2	6269.0	761	349.0	1.0	1.0	.4	45.8
2000	2.2	6269.0	761	349.0	1.0	1.0	.4	45.8
2001	2.2	6269.0	761	349.0	1.0	1.0	.4	45.8
2002	2.2	6269.0	761	349.0	1.0	1.0	.4	45.8
2003	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2004	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2005	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2006	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2007	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2008	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2009	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2010	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2011	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2012	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2013	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2014	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2015	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2016	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2017	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2018	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2019	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2020	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2021	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2022	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
2023	3.0	10432.4	1266	476.4	1.0	1.0	.4	76.1
		-----	-----					
TOTAL		250424.4	30391	1827.1				

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 6 EMPLACEMENT PACKAGE THERMAL OUTPUT FOR A REPOSITORY IN SALT BED

YEAR	PWR FUEL		BWR FUEL		SF HARDWARE	
	NUMBER OF PACKAGES	AVERAGE HEAT RATE, KW/PACKAGE	NUMBER OF PACKAGES	AVERAGE HEAT RATE, KW/PACKAGE	NUMBER OF PACKAGES	AVERAGE HEAT RATE, KW/PACKAGE
1992	0	.55	0	.19	0	.13
1993	0	.55	0	.19	0	.13
1994	0	.55	0	.19	0	.13
1995	0	.55	0	.19	0	.13
1996	0	.55	0	.19	0	.13
1997	0	.55	0	.19	0	.13
1998	398	.55	214	.19	149	.13
1999	398	.55	214	.19	149	.13
2000	398	.55	214	.19	149	.13
2001	398	.55	214	.19	149	.13
2002	398	.55	214	.19	149	.13
2003	662	.55	356	.19	248	.13
2004	662	.55	356	.19	248	.13
2005	662	.55	356	.19	248	.13
2006	662	.55	356	.19	248	.13
2007	662	.55	356	.19	248	.13
2008	662	.55	356	.19	248	.13
2009	662	.55	356	.19	248	.13
2010	662	.55	356	.19	248	.13
2011	662	.55	356	.19	248	.13
2012	662	.55	356	.19	248	.13
2013	662	.55	356	.19	248	.13
2014	662	.55	356	.19	248	.13
2015	662	.55	356	.19	248	.13
2016	662	.55	356	.19	248	.13
2017	662	.55	356	.19	248	.13
2018	662	.55	356	.19	248	.13
2019	662	.55	356	.19	248	.13
2020	662	.55	356	.19	248	.13
2021	662	.55	356	.19	248	.13
2022	662	.55	356	.19	248	.13
2023	662	.55	356	.19	248	.13

TOTAL	15892		8546		5953	

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 7 WASTE LOADING PARAMETERS FOR A REPOSITORY IN SALT BED

YEAR	PWR FUEL			BWR FUEL			SF HARDWARE		
	PITCH, METERS	PACKAGES PER ROW	PACKAGES PER ROOM	PITCH, METERS	PACKAGES PER ROW	PACKAGES PER ROOM	PITCH, METERS	PACKAGES PER ROW	PACKAGES PER ROOM
1992	.0	0	0	.0	0	0	.0	0	0
1993	.0	0	0	.0	0	0	.0	0	0
1994	.0	0	0	.0	0	0	.0	0	0
1995	.0	0	0	.0	0	0	.0	0	0
1996	.0	0	0	.0	0	0	.0	0	0
1997	.0	0	0	.0	0	0	.0	0	0
1998	10.0	14	14	10.0	14	14	2.0	73	73
1999	10.0	14	14	10.0	14	14	2.0	73	73
2000	10.0	14	14	10.0	14	14	2.0	73	73
2001	10.0	14	14	10.0	14	14	2.0	73	73
2002	10.0	14	14	10.0	14	14	2.0	73	73
2003	10.0	14	14	10.0	14	14	2.0	73	73
2004	10.0	14	14	10.0	14	14	2.0	73	73
2005	10.0	14	14	10.0	14	14	2.0	73	73
2006	10.0	14	14	10.0	14	14	2.0	73	73
2007	10.0	14	14	10.0	14	14	2.0	73	73
2008	10.0	14	14	10.0	14	14	2.0	73	73
2009	10.0	14	14	10.0	14	14	2.0	73	73
2010	10.0	14	14	10.0	14	14	2.0	73	73
2011	10.0	14	14	10.0	14	14	2.0	73	73
2012	10.0	14	14	10.0	14	14	2.0	73	73
2013	10.0	14	14	10.0	14	14	2.0	73	73
2014	10.0	14	14	10.0	14	14	2.0	73	73
2015	10.0	14	14	10.0	14	14	2.0	73	73
2016	10.0	14	14	10.0	14	14	2.0	73	73
2017	10.0	14	14	10.0	14	14	2.0	73	73
2018	10.0	14	14	10.0	14	14	2.0	73	73
2019	10.0	14	14	10.0	14	14	2.0	73	73
2020	10.0	14	14	10.0	14	14	2.0	73	73
2021	10.0	14	14	10.0	14	14	2.0	73	73
2022	10.0	14	14	10.0	14	14	2.0	73	73
2023	10.0	14	14	10.0	14	14	2.0	73	73

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 8A. REPOSITORY DEVELOPMENT SCHEDULE FOR PWR FUEL
----- IN SALT BED

YEAR	ROCK, THOUSAND OF TONNES			ROOMS		AREA REQUIRED, ACRES	
	MINED	BACKFILLED	TRANSPORT TO SURFACE	EXCAVATED	FILLED	ANNUAL	CUMULATIVE
1992	83.	0.	83.	.00	.00	.00	.00
1993	250.	0.	250.	.00	.00	.00	.00
1994	334.	0.	334.	.00	.00	.00	.00
1995	367.	0.	367.	.00	.00	.00	.00
1996	384.	0.	384.	.00	.00	.00	.00
1997	718.	0.	718.	28.43	.00	.00	.00
1998	469.	0.	469.	28.43	28.43	41.43	41.43
1999	469.	0.	469.	28.43	28.43	41.43	82.86
2000	469.	0.	469.	28.43	28.43	41.43	124.30
2001	469.	0.	469.	28.43	28.43	41.43	165.73
2002	779.	0.	779.	47.29	28.43	41.43	207.16
2003	780.	778.	2.	47.29	47.29	68.92	276.08
2004	780.	778.	2.	47.29	47.29	68.92	344.99
2005	780.	778.	2.	47.29	47.29	68.92	413.91
2006	780.	778.	2.	47.29	47.29	68.92	482.82
2007	780.	633.	147.	47.29	47.29	68.92	551.74
2008	780.	468.	312.	47.29	47.29	68.92	620.65
2009	780.	468.	312.	47.29	47.29	68.92	689.57
2010	780.	468.	312.	47.29	47.29	68.92	758.48
2011	780.	468.	312.	47.29	47.29	68.92	827.40
2012	780.	468.	312.	47.29	47.29	68.92	896.31
2013	780.	468.	312.	47.29	47.29	68.92	965.23
2014	780.	468.	312.	47.29	47.29	68.92	1034.14
2015	780.	468.	312.	47.29	47.29	68.92	1103.06
2016	780.	468.	312.	47.29	47.29	68.92	1171.97
2017	780.	468.	312.	47.29	47.29	68.92	1240.89
2018	780.	468.	312.	47.29	47.29	68.92	1309.80
2019	780.	468.	312.	47.29	47.29	68.92	1378.72
2020	780.	468.	312.	47.29	47.29	68.92	1447.63
2021	780.	468.	312.	47.29	47.29	68.92	1516.55
2022	780.	468.	312.	47.29	47.29	68.92	1585.46
2023	2.	468.	-466.	.00	47.29	68.92	1654.38
2024		125.	-125.				
2025		188.	-188.				
2026		313.	-313.				
2027		375.	-375.				
2028		250.	-250.				
TOTAL	20388.	12482.	7906.	1135.14	1135.14		

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 8B. REPOSITORY DEVELOPMENT SCHEDULE FOR BWR FUEL
----- IN SALT BED

YEAR	ROCK, THOUSAND OF TONNES			ROOMS		AREA REQUIRED, ACRES	
	MINED	BACKFILLED	TRANSPORT TO SURFACE	EXCAVATED	FILLED	ANNUAL	CUMULATIVE
1992	45.	0.	45.	.00	.00	.00	.00
1993	135.	0.	135.	.00	.00	.00	.00
1994	179.	0.	179.	.00	.00	.00	.00
1995	197.	0.	197.	.00	.00	.00	.00
1996	206.	0.	206.	.00	.00	.00	.00
1997	386.	0.	386.	15.29	.00	.00	.00
1998	252.	0.	252.	15.29	15.29	22.28	22.28
1999	252.	0.	252.	15.29	15.29	22.28	44.56
2000	252.	0.	252.	15.29	15.29	22.28	66.83
2001	252.	0.	252.	15.29	15.29	22.28	89.11
2002	419.	0.	419.	25.43	15.29	22.28	111.39
2003	420.	418.	1.	25.43	25.43	37.06	148.45
2004	420.	418.	1.	25.43	25.43	37.06	185.51
2005	420.	418.	1.	25.43	25.43	37.06	222.57
2006	420.	418.	1.	25.43	25.43	37.06	259.63
2007	420.	340.	79.	25.43	25.43	37.06	296.69
2008	420.	252.	168.	25.43	25.43	37.06	333.75
2009	420.	252.	168.	25.43	25.43	37.06	370.81
2010	420.	252.	168.	25.43	25.43	37.06	407.87
2011	420.	252.	168.	25.43	25.43	37.06	444.93
2012	420.	252.	168.	25.43	25.43	37.06	481.99
2013	420.	252.	168.	25.43	25.43	37.06	519.05
2014	420.	252.	168.	25.43	25.43	37.06	556.11
2015	420.	252.	168.	25.43	25.43	37.06	593.17
2016	420.	252.	168.	25.43	25.43	37.06	630.23
2017	420.	252.	168.	25.43	25.43	37.06	667.29
2018	420.	252.	168.	25.43	25.43	37.06	704.35
2019	420.	252.	168.	25.43	25.43	37.06	741.41
2020	420.	252.	168.	25.43	25.43	37.06	778.47
2021	420.	252.	168.	25.43	25.43	37.06	815.53
2022	420.	252.	168.	25.43	25.43	37.06	852.59
2023	1.	252.	-250.	.00	25.43	37.06	889.65
2024		67.	-67.				
2025		101.	-101.				
2026		168.	-168.				
2027		202.	-202.				
2028		135.	-135.				
TOTAL	10969.	6712.	4256.	610.43	610.43		

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 8C. REPOSITORY DEVELOPMENT SCHEDULE FOR SF HARDWARE
IN SALT BED

YEAR	ROCK, THOUSAND OF TONNES			ROOMS		AREA REQUIRED, ACRES	
	MINED	BACKFILLED	TRANSPORT TO SURFACE	EXCAVATED	FILLED	ANNUAL	CUMULATIVE
1992	6.	0.	6.	.00	.00	.00	.00
1993	18.	0.	18.	.00	.00	.00	.00
1994	24.	0.	24.	.00	.00	.00	.00
1995	27.	0.	27.	.00	.00	.00	.00
1996	28.	0.	28.	.00	.00	.00	.00
1997	52.	0.	52.	2.04	.00	.00	.00
1998	34.	0.	34.	2.04	2.04	2.97	2.97
1999	34.	0.	34.	2.04	2.04	2.97	5.95
2000	34.	0.	34.	2.04	2.04	2.97	8.92
2001	34.	0.	34.	2.04	2.04	2.97	11.90
2002	56.	0.	56.	3.40	2.04	2.97	14.87
2003	57.	56.	1.	3.40	3.40	4.95	19.82
2004	57.	56.	1.	3.40	3.40	4.95	24.78
2005	57.	56.	1.	3.40	3.40	4.95	29.73
2006	57.	56.	1.	3.40	3.40	4.95	34.68
2007	57.	45.	11.	3.40	3.40	4.95	39.63
2008	57.	34.	23.	3.40	3.40	4.95	44.58
2009	57.	34.	23.	3.40	3.40	4.95	49.53
2010	57.	34.	23.	3.40	3.40	4.95	54.48
2011	57.	34.	23.	3.40	3.40	4.95	59.43
2012	57.	34.	23.	3.40	3.40	4.95	64.39
2013	57.	34.	23.	3.40	3.40	4.95	69.34
2014	57.	34.	23.	3.40	3.40	4.95	74.29
2015	57.	34.	23.	3.40	3.40	4.95	79.24
2016	57.	34.	23.	3.40	3.40	4.95	84.19
2017	57.	34.	23.	3.40	3.40	4.95	89.14
2018	57.	34.	23.	3.40	3.40	4.95	94.09
2019	57.	34.	23.	3.40	3.40	4.95	99.04
2020	57.	34.	23.	3.40	3.40	4.95	104.00
2021	57.	34.	23.	3.40	3.40	4.95	108.95
2022	57.	34.	23.	3.40	3.40	4.95	113.90
2023	1.	34.	-33.	.00	3.40	4.95	118.85
2024		9.	-9.				
2025		14.	-14.				
2026		23.	-23.				
2027		27.	-27.				
2028		18.	-18.				
TOTAL	1481.	898.	584.	81.55	81.55		

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 9 SUMMARY DEVELOPMENT SCHEDULE FOR A REPOSITORY IN SALT BED

YEAR	ROCK, THOUSAND OF TONNES					ROOMS		WASTE STORAGE AREA, ACRES		
	MINED	BACKFILLED	TRANSPORT TO SURFACE	SURFACE STORAGE	TRANSPORT OFFSITE	EXCAVATED	FILLED	ANNUAL REQUIRED	CUMULATIVE REQUIRED	REMAINING AVAILABLE
1992	134.	0.	134.	134.	0.	.0	.0	.0	.0	.0
1993	403.	0.	403.	537.	0.	.0	.0	.0	.0	.0
1994	537.	0.	537.	1074.	0.	.0	.0	.0	.0	.0
1995	591.	0.	591.	1665.	0.	.0	.0	.0	.0	.0
1996	618.	0.	618.	2283.	0.	.0	.0	.0	.0	.0
1997	1156.	0.	1156.	3439.	0.	45.8	.0	.0	.0	.0
1998	755.	0.	755.	4194.	0.	45.8	45.8	66.7	66.7	2809.4
1999	755.	0.	755.	4949.	0.	45.8	45.8	66.7	133.4	2742.8
2000	755.	0.	755.	5704.	0.	45.8	45.8	66.7	200.1	2676.1
2001	755.	0.	755.	6459.	0.	45.8	45.8	66.7	266.7	2609.4
2002	1255.	0.	1255.	7714.	0.	76.1	45.8	66.7	333.4	2542.7
2003	1256.	1253.	4.	7717.	0.	76.1	76.1	110.9	444.3	2431.8
2004	1256.	1253.	4.	7721.	0.	76.1	76.1	110.9	555.3	2320.9
2005	1256.	1253.	4.	7724.	0.	76.1	76.1	110.9	666.2	2209.9
2006	1256.	1253.	4.	7728.	0.	76.1	76.1	110.9	777.1	2099.0
2007	1256.	1019.	237.	7965.	0.	76.1	76.1	110.9	888.1	1988.1
2008	1256.	753.	503.	8468.	0.	76.1	76.1	110.9	999.0	1877.1
2009	1256.	753.	503.	8971.	0.	76.1	76.1	110.9	1109.9	1766.2
2010	1256.	753.	503.	9474.	0.	76.1	76.1	110.9	1220.8	1655.3
2011	1256.	753.	503.	9977.	0.	76.1	76.1	110.9	1331.8	1544.4
2012	1256.	753.	503.	10480.	0.	76.1	76.1	110.9	1442.7	1433.4
2013	1256.	753.	503.	10983.	0.	76.1	76.1	110.9	1553.6	1322.5
2014	1256.	753.	503.	11486.	0.	76.1	76.1	110.9	1664.5	1211.6
2015	1256.	753.	503.	11989.	0.	76.1	76.1	110.9	1775.5	1100.7
2016	1256.	753.	503.	12492.	0.	76.1	76.1	110.9	1886.4	989.7
2017	1256.	753.	503.	12995.	0.	76.1	76.1	110.9	1997.3	878.8
2018	1256.	753.	503.	13498.	0.	76.1	76.1	110.9	2108.2	767.9
2019	1256.	753.	503.	14001.	0.	76.1	76.1	110.9	2219.2	657.0
2020	1256.	753.	503.	14504.	0.	76.1	76.1	110.9	2330.1	546.0
2021	1256.	753.	503.	15007.	0.	76.1	76.1	110.9	2441.0	435.1
2022	1256.	753.	503.	15510.	0.	76.1	76.1	110.9	2551.9	324.2
2023	4.	753.	-749.	14761.	0.	.0	76.1	110.9	2662.9	213.3
2024		201.	-201.	14559.						
2025		302.	-302.	14257.						
2026		504.	-504.	13754.						
2027		604.	-604.	13149.						
2028		403.	-403.	12746.						
TOTAL	32838.	20092.	12746.		0.	1827.1	1827.1			

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 10 SHAFT PARAMETERS AND COSTS

	MEN AND MATERIALS	MINING VENT	WASTE TRANSPORT		EXHAUST		ROCK HOISTING	TOTAL
			REMOTE	CONTACT	MINING	WASTE		
DESIGN DIAMETER, METERS	9.5	5.8	5.5	.0	4.0	6.3	.0	
INCREMENTAL EXCAVATED RADIUS, METERS	.0	.0	.0	.0	.0	.0	.0	
EXCAVATED DEPTH, METERS	773.0	655.0	660.0	.0	519.0	608.0	.0	
LINED DEPTH, METERS	289.7	289.7	289.7	.0	289.7	289.7	.0	
WASTE TRANSPORT CAPACITY								
TRIPS PER SHIFT			13	0				13
PACKAGES PER TRIP								
PWR FUEL			1					
BWR FUEL			1					
SF HARDWARE			1					
ROCK HOISTING CAPACITY								
TRIPS PER SHIFT	36						0	
TONNES PER TRIP	28.						0.	
NUMBER OF SHAFTS	1	1	1	0	1	1	0	5
SHAFT COSTS, MILLIONS OF 1992 DOLLARS								
SINKING	10.3	2.8	2.6	.0	1.5	3.1	.0	20.2
WATER CONTROL	.6	.6	.6	.0	.6	.6	.0	2.9
LINING	2.2	1.0	1.0	.0	.7	1.1	.0	6.0
EQUIPMENT	52.3	13.1	29.3	.0	.0	.0	.0	94.7
SHAFT STATIONS	.0	.0	.0	.0	.0	.0	.0	.0

TOTAL	65.4	17.4	33.4	.0	2.8	4.8	.0	123.8

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 11 WASTE FACILITY CAPITAL COSTS FOR A REPOSITORY IN SALT BED

	MILLIONS OF 1982 \$ -----
WASTE RECEIVING MODULE - REMOTE HANDLED	127.30
WASTE RECEIVING MODULE - CONTACT HANDLED	.00
WASTE PACKAGING MODULE	509.20
UNDERGROUND TRANSPORTATION FACILITY	13.35
EMPLACEMENT EXCAVATION FACILITY	.00
EMPLACEMENT SUPPORT FACILITY	16.35
TOT. CAP. + EQUIP. + OPER.	737.68

TOTAL	1403.88

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 12 EQUIPMENT LIFE AND COST FOR A REPOSITORY IN SALT BED

	LIFE		COSTS, MILLIONS \$

SURFACE WASTE OPERATIONS			
RECEIVING MODULE - REMOTE HANDLED WASTE	102000.	RECEIVING UNITS	40.20
RECEIVING MODULE - CONTACT HANDLED WASTE	0.	RECEIVING UNITS	.00
PACKAGING MODULE	12000.	RECEIVING UNITS	60.60
UNDERGROUND WASTE OPERATIONS			
TRANSPORTER - REMOTE HANDLED WASTE	5000.	PACKAGES	14.00
TRANSPORTER - CONTACT HANDLED WASTE	0.	PACKAGES	.00
EMPLACEMENT - REMOTE HANDLED WASTE	5000.	PACKAGES	.00
EMPLACEMENT - CONTACT HANDLED WASTE	0.	PACKAGES	.00
ROCK OPERATIONS			
EXCAVATION AND HAULAGE	0.	TONNES ROCK	.00
HOISTING	0.	TONNES ROCK	.00
ROCK STOCKPILE	0.	TONNES ROCK	.00
OFFSITE DISPOSAL	0.	TONNES ROCK	.00
BACKFILLING AND HAULAGE	0.	TONNES ROCK	.00
SUPPORT OPERATIONS			
TOT. CAP. + EQUIP. + OPER.	30.	YEARS	.00
EMPLACEMENT EXCAVATION METHODS			
HOLE DRILLING	0.	PACKAGES	20.68
ROOM EMPLACEMENT	0.	PACKAGES	.00
TRENCHING	0.	PACKAGES	.00

TOTAL			135.48

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 13 CONSTRUCTION AND PREPARATION COSTS FOR A REPOSITORY IN SALT BED

(MILLIONS OF 1982 DOLLARS)

YEAR	LAND	LICENSE	SITE PREPARE	SHAFT CONSTRUCT	FACILITY CONSTRUCTION		ARCHITECT ENGINEER	STARTUP	TOTAL
					SURFACE	SUBSURFACE			
1992	2.05	.00	11.53	6.19	55.98	1.49	11.28	.00	88.51
1993	6.15	.00	34.60	18.57	167.94	4.46	33.83	.00	265.54
1994	9.20	.00	46.13	24.76	223.92	5.94	45.11	.00	354.06
1995	9.02	.00	50.74	27.23	246.31	6.53	49.62	.00	389.46
1996	9.43	.00	53.05	28.47	257.50	6.83	51.88	.00	407.16
1997	6.15	.00	34.60	18.57	180.67	4.46	35.74	.00	280.18
1998					38.19				38.19
1999					50.92				50.92
2000					56.01				56.01
2001					58.56				58.56
2002					38.19				38.19
2003					.00				.00
2004					.00				.00
2005					.00				.00
2006					.00				.00
2007					.00				.00
2008					.00				.00
2009					.00				.00
2010					.00				.00
2011					.00				.00
2012					.00				.00
2013					.00				.00
2014					.00				.00
2015					.00				.00
2016					.00				.00
2017					.00				.00
2018					.00				.00
2019					.00				.00
2020					.00				.00
2021					.00				.00
2022					.00				.00
2023					.00				.00
<hr/>									
TOTAL	41.00	.00	230.66	123.78	1374.18	29.70	227.47	.00	2026.79

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 14 MINING AND ROCK REMOVAL OPERATIONS COSTS SUMMARY FOR A REPOSITORY IN SALT BED
----- COSTS IN MILLIONS OF 1982 DOLLARS

YEAR	MINING	HOISTING	SURFACE HANDLE AND STORE	OFFSITE DISPOSAL	TOTAL
-----	-----	-----	-----	-----	-----
1992	1.34	.52	.05	.00	1.91
1993	4.03	1.56	.14	.00	5.73
1994	5.37	2.08	.15	.00	7.64
1995	5.91	2.29	.20	.00	8.40
1996	6.18	2.40	.21	.00	8.78
1997	11.56	4.48	.39	.00	16.44
1998	7.55	2.93	.26	.00	10.74
1999	7.55	2.93	.26	.00	10.74
2000	7.55	2.93	.26	.00	10.74
2001	7.55	2.93	.26	.00	10.74
2002	12.55	4.87	.43	.00	17.84
2003	12.56	.01	.00	.00	12.58
2004	12.56	.01	.00	.00	12.58
2005	12.56	.01	.00	.00	12.58
2006	12.56	.01	.00	.00	12.58
2007	12.56	.92	.08	.00	13.56
2008	12.56	1.95	.17	.00	14.68
2009	12.56	1.95	.17	.00	14.68
2010	12.56	1.95	.17	.00	14.68
2011	12.56	1.95	.17	.00	14.68
2012	12.56	1.95	.17	.00	14.68
2013	12.56	1.95	.17	.00	14.68
2014	12.56	1.95	.17	.00	14.68
2015	12.56	1.95	.17	.00	14.68
2016	12.56	1.95	.17	.00	14.68
2017	12.56	1.95	.17	.00	14.68
2018	12.56	1.95	.17	.00	14.68
2019	12.56	1.95	.17	.00	14.68
2020	12.56	1.95	.17	.00	14.68
2021	12.56	1.95	.17	.00	14.68
2022	12.56	1.95	.17	.00	14.68
2023	.04	2.91	.25	.00	3.20
2024	.00	.78	.07	.00	.85
2025	.00	1.17	.10	.00	1.28
2026	.00	1.95	.17	.00	2.13
2027	.00	2.34	.21	.00	2.55
2028	.00	1.56	.14	.00	1.70
TOTAL	328.38	70.90	6.21	.00	405.50

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 15 WASTE OPERATIONS LABOR COST SUMMARY FOR A REPOSITORY IN SALT BED

MILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	5.17	10.34	.27	.47	4.70	.00	20.94
1999	5.17	10.34	.27	.47	4.70	.00	20.94
2000	5.17	10.34	.27	.47	4.70	.00	20.94
2001	5.17	10.34	.27	.47	4.70	.00	20.94
2002	5.17	10.34	.27	.47	4.70	.00	20.94
2003	7.02	14.04	.36	.78	6.39	.00	28.59
2004	7.02	14.04	.36	.78	6.39	.00	28.59
2005	7.02	14.04	.36	.78	6.39	.00	28.59
2006	7.02	14.04	.36	.78	6.39	.00	28.59
2007	7.02	14.04	.36	.78	6.39	.00	28.59
2008	7.02	14.04	.36	.78	6.39	.00	28.59
2009	7.02	14.04	.36	.78	6.39	.00	28.59
2010	7.02	14.04	.36	.78	6.39	.00	28.59
2011	7.02	14.04	.36	.78	6.39	.00	28.59
2012	7.02	14.04	.36	.78	6.39	.00	28.59
2013	7.02	14.04	.36	.78	6.39	.00	28.59
2014	7.02	14.04	.36	.78	6.39	.00	28.59
2015	7.02	14.04	.36	.78	6.39	.00	28.59
2016	7.02	14.04	.36	.78	6.39	.00	28.59
2017	7.02	14.04	.36	.78	6.39	.00	28.59
2018	7.02	14.04	.36	.78	6.39	.00	28.59
2019	7.02	14.04	.36	.78	6.39	.00	28.59
2020	7.02	14.04	.36	.78	6.39	.00	28.59
2021	7.02	14.04	.36	.78	6.39	.00	28.59
2022	7.02	14.04	.36	.78	6.39	.00	28.59
2023	7.02	14.04	.36	.78	6.39	.00	28.59

TOTAL	173.26	346.53	8.89	18.62	157.71	.00	705.01

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 16 WASTE OPERATIONS MATERIALS COST SUMMARY FOR A REPOSITORY IN SALT BED

MILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	.59	17.89	.00	.05	.00	.00	18.53
1999	.59	17.89	.00	.05	.00	.00	18.53
2000	.59	17.89	.00	.05	.00	.00	18.53
2001	.59	17.89	.00	.05	.00	.00	18.53
2002	.59	17.89	.00	.05	.00	.00	18.53
2003	.98	29.76	.00	.09	.00	.00	30.83
2004	.98	29.76	.00	.09	.00	.00	30.83
2005	.98	29.76	.00	.09	.00	.00	30.83
2006	.98	29.76	.00	.09	.00	.00	30.83
2007	.98	29.76	.00	.09	.00	.00	30.83
2008	.98	29.76	.00	.09	.00	.00	30.83
2009	.98	29.76	.00	.09	.00	.00	30.83
2010	.93	29.76	.00	.09	.00	.00	30.83
2011	.93	29.76	.00	.09	.00	.00	30.83
2012	.98	29.76	.00	.09	.00	.00	30.83
2013	.93	29.76	.00	.09	.00	.00	30.83
2014	.98	29.76	.00	.09	.00	.00	30.83
2015	.98	29.76	.00	.09	.00	.00	30.83
2016	.98	29.76	.00	.09	.00	.00	30.83
2017	.98	29.76	.00	.09	.00	.00	30.83
2018	.98	29.76	.00	.09	.00	.00	30.83
2019	.98	29.76	.00	.09	.00	.00	30.83
2020	.93	29.76	.00	.09	.00	.00	30.83
2021	.98	29.76	.00	.09	.00	.00	30.83
2022	.98	29.76	.00	.09	.00	.00	30.83
2023	.98	29.76	.00	.09	.00	.00	30.83
TOTAL	23.47	714.53	.00	2.07	.00	.00	740.07

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 17 WASTE OPERATIONS EQUIPMENT COST SUMMARY FOR A REPOSITORY IN SALT BED

MILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	10.05	20.20	2.00	.80	.00	.00	33.05
1999	.00	.00	.00	.80	.00	.00	.80
2000	.00	.00	.00	.80	.00	.00	.80
2001	.00	.00	.00	.80	.00	.00	.80
2002	.00	.00	.00	.80	.00	.00	.80
2003	10.05	.00	2.00	.80	.00	.00	12.85
2004	.00	.00	.00	.80	.00	.00	.80
2005	.00	.00	.00	.80	.00	.00	.80
2006	.00	.00	.00	.80	.00	.00	.80
2007	.00	.00	2.00	.80	.00	.00	2.80
2008	.00	.00	.00	.80	.00	.00	.80
2009	.00	20.20	.00	.80	.00	.00	21.00
2010	10.05	.00	.00	.80	.00	.00	10.85
2011	.00	.00	2.00	.80	.00	.00	2.80
2012	.00	.00	.00	.80	.00	.00	.80
2013	.00	.00	.00	.80	.00	.00	.80
2014	.00	.00	.00	.80	.00	.00	.80
2015	.00	.00	2.00	.80	.00	.00	2.80
2016	.00	.00	.00	.80	.00	.00	.80
2017	.00	.00	.00	.80	.00	.00	.80
2018	.00	20.20	.00	.80	.00	.00	21.00
2019	10.05	.00	2.00	.80	.00	.00	12.85
2020	.00	.00	.00	.80	.00	.00	.80
2021	.00	.00	.00	.80	.00	.00	.80
2022	.00	.00	.00	.80	.00	.00	.80
2023	.00	.00	2.00	.80	.00	.00	2.80
TOTAL	40.20	60.60	14.00	20.68	.00	.00	135.48

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 18 UTILITIES REQUIREMENTS AND COST SUMMARY FOR A REPOSITORY IN SALT BED

	REQUIREMENTS				COSTS, MILLIONS OF 1982 DOLLARS				
	ELECTRICITY THOUSANDS OF KWH	STEAM THOUSANDS OF MJ(A)	WATER MILLIONS OF LITERS	DIESEL THOUSANDS OF LITERS	ELECTRICITY	STEAM	WATER	DIESEL	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00	.00	.00
1998	213601.12	252.13	364.30	1342.01	8.78	.86	.05	.56	10.25
1999	214138.04	252.13	364.30	1342.01	8.80	.86	.05	.56	10.28
2000	213601.12	252.13	364.30	1342.01	8.78	.86	.05	.56	10.25
2001	213601.12	252.13	364.30	1342.01	8.78	.86	.05	.56	10.25
2002	214066.64	252.13	364.30	1342.01	8.90	.86	.05	.56	10.27
2003	221110.75	267.30	364.30	1403.11	9.09	.91	.05	.59	10.64
2004	220573.82	263.01	364.30	1403.11	9.07	.89	.05	.59	10.60
2005	220573.82	258.71	364.30	1403.11	9.07	.88	.05	.59	10.59
2006	220573.82	254.41	364.30	1403.11	9.07	.87	.05	.59	10.57
2007	221110.75	252.13	364.30	1403.11	9.09	.86	.05	.59	10.59
2008	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2009	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2010	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2011	221110.75	252.13	364.30	1403.11	9.09	.86	.05	.59	10.59
2012	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2013	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2014	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2015	221110.75	252.13	364.30	1403.11	9.09	.86	.05	.59	10.59
2016	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2017	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2018	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2019	221110.75	252.13	364.30	1403.11	9.09	.86	.05	.59	10.59
2020	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2021	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2022	220573.82	252.13	364.30	1403.11	9.07	.86	.05	.59	10.57
2023	219457.45	252.13	364.30	1403.11	9.02	.86	.05	.59	10.52
TOTAL	5702646.37	6590.25	9471.80	36175.35	234.38	22.41	1.42	15.19	273.40

(A) MJ(MEGA JOULE)= .977 POUNDS OF STEAM AT 100C.

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 19A. WASTE OPERATIONS COST SUMMARY FOR PWR FUEL
----- IN SALT BEDMILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	6.02	25.96	1.18	.67	2.46	5.49	41.78
1999	2.20	15.40	.14	.67	2.46	5.50	26.36
2000	2.20	15.40	.14	.67	2.46	5.49	26.35
2001	2.20	15.40	.14	.67	2.46	5.49	26.35
2002	2.20	15.40	.14	.67	2.46	5.50	26.36
2003	6.88	23.96	1.23	.85	3.34	5.66	41.92
2004	3.05	23.96	.19	.85	3.34	5.64	37.03
2005	3.05	23.96	.19	.85	3.34	5.63	37.02
2006	3.05	23.96	.19	.85	3.34	5.62	37.01
2007	3.05	23.96	1.23	.85	3.34	5.63	38.06
2008	3.05	23.96	.19	.85	3.34	5.62	37.01
2009	3.05	34.52	.19	.85	3.34	5.62	47.57
2010	6.88	23.96	.19	.85	3.34	5.62	40.83
2011	3.05	23.96	1.23	.85	3.34	5.63	38.06
2012	3.05	23.96	.19	.85	3.34	5.62	37.01
2013	3.05	23.96	.19	.85	3.34	5.62	37.01
2014	3.05	23.96	.19	.85	3.34	5.62	37.01
2015	3.05	23.96	1.23	.85	3.34	5.63	38.06
2016	3.05	23.96	.19	.85	3.34	5.62	37.01
2017	3.05	23.96	.19	.85	3.34	5.62	37.01
2018	3.05	34.52	.19	.85	3.34	5.62	47.57
2019	6.88	23.96	1.23	.85	3.34	5.63	41.89
2020	3.05	23.96	.19	.85	3.34	5.62	37.01
2021	3.05	23.96	.19	.85	3.34	5.62	37.01
2022	3.05	23.96	.19	.85	3.34	5.62	37.01
2023	3.05	23.96	1.23	.85	3.34	4.64	37.07
TOTAL	90.36	611.79	11.97	21.21	82.47	144.55	962.35

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 19B. WASTE OPERATIONS COST SUMMARY FOR BWR FUEL
----- IN SALT BEDMILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	9.43	14.49	.64	.38	1.32	4.39	30.64
1999	3.44	8.81	.07	.38	1.32	4.39	18.42
2000	3.44	8.81	.07	.38	1.32	4.39	18.41
2001	3.44	8.81	.07	.38	1.32	4.39	18.41
2002	3.44	8.81	.07	.38	1.32	4.39	18.42
2003	10.77	13.77	.66	.48	1.80	4.58	32.06
2004	4.78	13.77	.10	.48	1.80	4.57	25.50
2005	4.78	13.77	.10	.48	1.80	4.57	25.49
2006	4.78	13.77	.10	.48	1.80	4.56	25.49
2007	4.73	13.77	.66	.48	1.80	4.57	26.06
2008	4.78	13.77	.10	.48	1.80	4.56	25.49
2009	4.78	19.45	.10	.48	1.80	4.56	31.17
2010	10.77	13.77	.10	.48	1.80	4.56	31.47
2011	4.78	13.77	.66	.48	1.80	4.57	26.06
2012	4.78	13.77	.10	.48	1.80	4.56	25.49
2013	4.78	13.77	.10	.48	1.80	4.56	25.49
2014	4.78	13.77	.10	.48	1.80	4.56	25.49
2015	4.78	13.77	.66	.48	1.80	4.57	26.06
2016	4.78	13.77	.10	.48	1.80	4.56	25.49
2017	4.78	13.77	.10	.48	1.80	4.56	25.49
2018	4.73	19.45	.10	.48	1.80	4.56	31.17
2019	10.77	13.77	.66	.48	1.80	4.57	32.04
2020	4.78	13.77	.10	.48	1.80	4.56	25.49
2021	4.78	13.77	.10	.48	1.80	4.56	25.49
2022	4.78	13.77	.10	.48	1.80	4.56	25.49
2023	4.73	13.77	.66	.48	1.80	4.38	25.87
TOTAL	141.51	350.35	6.44	11.88	44.35	117.58	672.10

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 19C. WASTE OPERATIONS COST SUMMARY FOR SF HARDWARE
 ----- IN SALT BED
 MILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	.36	7.98	.44	.26	.92	.38	10.35
1999	.12	4.02	.05	.26	.92	.38	5.76
2000	.12	4.02	.05	.26	.92	.38	5.76
2001	.12	4.02	.05	.26	.92	.38	5.76
2002	.12	4.02	.05	.26	.92	.38	5.76
2003	.41	6.07	.46	.33	1.25	.40	8.92
2004	.17	6.07	.07	.33	1.25	.39	8.29
2005	.17	6.07	.07	.33	1.25	.39	8.29
2006	.17	6.07	.07	.33	1.25	.39	8.29
2007	.17	6.07	.46	.33	1.25	.39	8.68
2008	.17	6.07	.07	.33	1.25	.39	8.29
2009	.17	10.03	.07	.33	1.25	.39	12.24
2010	.41	6.07	.07	.33	1.25	.39	8.52
2011	.17	6.07	.46	.33	1.25	.39	8.68
2012	.17	6.07	.07	.33	1.25	.39	8.29
2013	.17	6.07	.07	.33	1.25	.39	8.29
2014	.17	6.07	.07	.33	1.25	.39	8.29
2015	.17	6.07	.46	.33	1.25	.39	8.68
2016	.17	6.07	.07	.33	1.25	.39	8.29
2017	.17	6.07	.07	.33	1.25	.39	8.29
2018	.17	10.03	.07	.33	1.25	.39	12.24
2019	.41	6.07	.46	.33	1.25	.39	8.92
2020	.17	6.07	.07	.33	1.25	.39	8.29
2021	.17	6.07	.07	.33	1.25	.39	8.29
2022	.17	6.07	.07	.33	1.25	.39	8.29
2023	.17	6.07	.46	.33	1.25	1.50	9.79
TOTAL	5.07	159.52	4.48	9.28	30.89	11.27	219.51

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 19D. WASTE OPERATIONS COST SUMMARY FOR A REPOSITORY IN SALT BED

MILLIONS OF 1982 DOLLARS

YEAR	RECEIVING	PACKAGING	TRANSPORTATION	EMPLACEMENT EXCAVATION	EMPLACEMENT OPERATIONS	OTHER	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00
1998	15.91	48.43	2.27	1.31	4.70	10.25	82.77
1999	5.76	28.23	.27	1.31	4.70	10.28	50.55
2000	5.76	28.23	.27	1.31	4.70	10.25	50.52
2001	5.76	28.23	.27	1.31	4.70	10.25	50.52
2002	5.76	28.23	.27	1.31	4.70	10.27	50.54
2003	19.05	43.80	2.36	1.66	6.39	10.64	82.90
2004	8.00	43.80	.36	1.66	6.39	10.60	70.81
2005	8.00	43.80	.36	1.66	6.39	10.59	70.80
2006	8.00	43.80	.36	1.66	6.39	10.57	70.78
2007	8.00	43.80	2.36	1.66	6.39	10.59	72.80
2008	8.00	43.80	.36	1.66	6.39	10.57	70.78
2009	8.00	64.00	.36	1.66	6.39	10.57	90.98
2010	18.05	43.80	.36	1.66	6.39	10.57	80.83
2011	8.00	43.80	2.36	1.66	6.39	10.59	72.80
2012	8.00	43.80	.36	1.66	6.39	10.57	70.78
2013	8.00	43.80	.36	1.66	6.39	10.57	70.78
2014	8.00	43.80	.36	1.66	6.39	10.57	70.78
2015	9.00	43.80	2.36	1.66	6.39	10.59	72.80
2016	9.00	43.80	.36	1.66	6.39	10.57	70.78
2017	8.00	43.80	.36	1.66	6.39	10.57	70.78
2018	8.00	64.00	.36	1.66	6.39	10.57	90.98
2019	18.05	43.80	2.36	1.66	6.39	10.59	82.85
2020	8.00	43.80	.36	1.66	6.39	10.57	70.78
2021	8.00	43.80	.36	1.66	6.39	10.57	70.78
2022	8.00	43.80	.36	1.66	6.39	10.57	70.78
2023	8.00	43.80	2.36	1.66	6.39	10.52	72.73
TOTAL	236.93	1121.66	22.89	41.37	157.71	273.40	1853.96

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 20 BACKFILLING AND DECOMMISSIONING SUMMARY FOR A REPOSITORY IN SALT BED

YEAR	BACKFILL MATERIALS, THOUSAND TONNES			COSTS IN MILLIONS OF 1982 DOLLARS				
	ROCK	OTHER	TOTAL	BACKFILLING	SEALING	DECOMMISSION	SURVEILLANCE	TOTAL
1992	.00	.00	.00	.00	.00	.00	.00	.00
1993	.00	.00	.00	.00	.00	.00	.00	.00
1994	.00	.00	.00	.00	.00	.00	.00	.00
1995	.00	.00	.00	.00	.00	.00	.00	.00
1996	.00	.00	.00	.00	.00	.00	.00	.00
1997	.00	.00	.00	.00	.00	.00	.00	.00
1998	.00	.00	.00	.00	.00	.00	.00	.00
1999	.00	.00	.00	.00	.00	.00	.00	.00
2000	.00	.00	.00	.00	.00	.00	.00	.00
2001	.00	.00	.00	.00	.00	.00	.00	.00
2002	.00	.00	.00	.00	.00	.00	.00	.00
2003	1252.50	.00	1252.50	5.01	.00	.00	.00	5.01
2004	1252.50	.00	1252.50	5.01	.00	.00	.00	5.01
2005	1252.50	.00	1252.50	5.01	.00	.00	.00	5.01
2006	1252.50	.00	1252.50	5.01	.00	.00	.00	5.01
2007	1018.67	.00	1018.67	4.07	.00	.00	.00	4.07
2008	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2009	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2010	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2011	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2012	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2013	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2014	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2015	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2016	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2017	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2018	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2019	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2020	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2021	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2022	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2023	753.04	.00	753.04	3.01	.00	.00	.00	3.01
2024	201.45	.00	201.45	.81	1.61	24.74	.00	27.15
2025	302.18	.00	302.18	1.21	2.41	37.10	.00	40.73
2026	503.63	.00	503.63	2.01	4.02	61.84	.00	67.88
2027	604.35	.00	604.35	2.42	4.83	74.21	.00	81.45
2028	402.90	.00	402.90	1.61	3.22	49.47	.00	54.30
TOTAL	20091.79	.00	20091.79	80.37	16.10	247.35	.00	343.82

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 21 COST SUMMARY FOR A REPOSITORY IN SALT BED
----- MILLIONS OF 1982 DOLLARS

FROM TABLE	COST CATEGORY	WASTE TYPE			
		PWR FUEL	BWR FUEL	SF HARDWARE	TOTAL
13	CONSTRUCTION AND PREOPERATION				
	LAND	25.46	13.69	1.85	41.00
	LICENSE	.00	.00	.00	.00
	SITE PREPARATION	143.21	77.04	10.41	230.66
	SHAFT	57.86	56.70	9.22	123.78
	SURFACE FACILITIES	700.16	625.63	48.39	1374.18
	UNDERGROUND FACILITIES	15.23	13.42	1.05	29.70
	ARCHITECT ENGINEER	123.67	94.30	9.50	227.47
	STARTUP	.00	.00	.00	.00
	SUBTOTAL	1065.58	880.79	80.42	2026.79
14	MINING AND ROCK REMOVAL OPERATIONS				
	MINING	203.88	109.69	14.81	328.38
	HOISTING	44.00	23.68	3.22	70.90
	SURFACE HANDLE AND STORE	3.86	2.08	.28	6.21
	OFFSITE DISPOSAL	.00	.00	.00	.00
	SUBTOTAL	251.74	135.44	18.32	405.50
19	WASTE OPERATIONS				
	RECEIVING	90.36	141.51	5.07	236.93
	PACKAGING	611.79	350.36	159.52	1121.66
	TRANSPORTATION	11.97	6.44	4.48	22.89
	EMPLACEMENT EXCAVATION	21.21	11.88	8.28	41.37
	EMPLACEMENT OPERATIONS	82.47	44.35	30.89	157.71
	OTHER	144.55	117.58	11.27	273.40
	SUBTOTAL	962.35	672.10	219.51	1853.96
20	BACKFILLING AND DECOMMISSIONING				
	BACKFILLING	49.93	26.85	3.59	80.37
	SEALING	8.38	6.69	1.03	16.10
	DECOMMISSIONING	126.03	112.61	8.71	247.35
	SURVEILLANCE	.00	.00	.00	.00
	SUBTOTAL	184.33	146.16	13.33	343.82
	CONTINGENCY	711.59	507.12	97.75	1316.46
TOTAL		3175.59	2341.61	429.32	5946.52

TABLE 22 CASH FLOW SUMMARY FOR A REPOSITORY IN SALT BED
----- MILLIONS OF 1982 DOLLARS

YEAR	CONSTRUCTION, STARTUP COSTS	OPERATING COSTS				TOTAL
		OPERATIONS MINING	WASTE OPERATIONS	BACKFILLING AND DECOMMISSIONING	CONTINGENCIES	
1992	88.51	1.91	.00	.00	27.13	117.55
1993	265.54	5.73	.00	.00	81.38	352.65
1994	354.06	7.64	.00	.00	108.51	470.20
1995	389.46	9.40	.00	.00	119.36	517.22
1996	407.16	8.78	.00	.00	124.78	540.73
1997	280.18	16.44	.00	.00	88.99	385.60
1998	38.19	10.74	82.77	.00	28.05	159.76
1999	50.92	10.74	50.55	.00	18.39	130.59
2000	56.01	10.74	50.52	.00	18.38	135.65
2001	58.56	10.74	50.52	.00	18.38	138.20
2002	38.19	17.84	50.54	.00	20.52	127.09
2003	.00	12.58	82.90	5.01	30.15	130.63
2004	.00	12.58	70.81	5.01	26.52	114.92
2005	.00	12.58	70.80	5.01	26.52	114.90
2006	.00	12.58	70.78	5.01	26.51	114.88
2007	.00	13.56	72.80	4.07	27.13	117.57
2008	.00	14.68	70.78	3.01	26.54	115.01
2009	.00	14.68	90.98	3.01	32.60	141.27
2010	.00	14.68	80.83	3.01	29.56	128.08
2011	.00	14.68	72.80	3.01	27.15	117.64
2012	.00	14.68	70.78	3.01	26.54	115.01
2013	.00	14.68	70.78	3.01	26.54	115.01
2014	.00	14.68	70.78	3.01	26.54	115.01
2015	.00	14.68	72.80	3.01	27.15	117.64
2016	.00	14.68	70.78	3.01	26.54	115.01
2017	.00	14.68	70.78	3.01	26.54	115.01
2018	.00	14.68	90.98	3.01	32.60	141.27
2019	.00	14.68	82.85	3.01	30.16	130.71
2020	.00	14.68	70.78	3.01	26.54	115.01
2021	.00	14.68	70.78	3.01	26.54	115.01
2022	.00	14.68	70.78	3.01	26.54	115.01
2023	.00	3.20	72.73	3.01	23.68	102.62
2024		.85		27.15	8.40	36.40
2025		1.28		40.73	12.60	54.60
2026		2.13		67.88	21.00	91.00
2027		2.55		81.45	25.20	109.20
2028		1.70		54.30	16.80	72.80

TOTAL	2026.79	405.50	1853.96	343.82	1316.46	5946.52

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 23 UNIT COST SUMMARY FOR A REPOSITORY IN SALT 9ED
----- 1982 DOLLARS PER KILOGRAM HEAVY METAL

FROM TABLE	COST CATEGORY	WASTE TYPE		
		PWR FUEL	BWR FUEL	SF HARDWARE
13	CONSTRUCTION AND PREOPERATION			
	LAND	.59	.49	.00
	LICENSE	.00	.00	.00
	SITE PREPARATION	3.26	2.73	.00
	SHAFT	1.32	2.01	.00
	SURFACE FACILITIES	13.85	17.08	.00
	UNDERGROUND FACILITIES	.23	.19	.00
	ARCHITECT ENGINEER	2.82	3.34	.00
	STARTUP	.00	.00	.00
	SUBTOTAL	22.05	25.84	.00
14	MINING AND ROCK REMOVAL OPERATIONS			
	MINING	4.64	3.89	.00
	HOISTING	1.00	.84	.00
	SURFACE HANDLE AND STORE	.09	.07	.00
	OFFSITE DISPOSAL	.00	.00	.00
	SUBTOTAL	5.73	4.80	.00
19	WASTE OPERATIONS			
	RECEIVING	2.06	5.02	.00
	PACKAGING	13.93	12.42	.00
	TRANSPORTATION	.27	.23	.00
	EMPLACEMENT EXCAVATION	.48	.42	.00
	EMPLACEMENT OPERATIONS	1.88	1.57	.00
	OTHER	3.29	4.17	.00
	SUBTOTAL	21.91	23.83	.00
20	BACKFILLING AND DECOMMISSIONING			
	BACKFILLING	1.14	.95	.00
	SEALING	.19	.24	.00
	DECOMMISSIONING	2.87	3.99	.00
	SURVEILLANCE	.00	.00	.00
	SUBTOTAL	4.20	5.18	.00
	CONTINGENCY	16.20	17.98	.00
TOTAL		79.09	77.64	.00

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 24 UNIT COST SUMMARY FOR A REPOSITORY IN SALT BED
 ----- 1982 DOLLARS PER CUBIC METER OF WASTE

FROM TABLE	COST CATEGORY	WASTE TYPE		
		PWR FUEL	BWR FUEL	SF HARDWARE
13	CONSTRUCTION AND PREOPERATION			
	LAND	1370.15	1147.33	219.09
	LICENSE	.00	.00	.00
	SITE PREPARATION	7708.12	6454.60	1232.56
	SHAFT	3114.58	4750.18	1092.01
	SURFACE FACILITIES	32733.26	40341.06	5051.71
	UNDERGROUND FACILITIES	546.39	457.53	87.37
	ARCHITECT ENGINEER	6656.36	7900.46	1125.18
	STARTUP	.00	.00	.00
	SUBTOTAL	52128.86	61051.16	8807.92
14	MINING AND ROCK REMOVAL OPERATIONS			
	MINING	10973.93	9189.31	1754.78
	HOISTING	2368.32	1983.83	381.93
	SURFACE HANDLE AND STORE	207.53	173.84	33.47
	OFFSITE DISPOSAL	.00	.00	.00
	SUBTOTAL	13549.79	11346.97	2170.22
19	WASTE OPERATIONS			
	RECEIVING	4863.64	11855.11	600.32
	PACKAGING	32929.57	29351.97	18895.19
	TRANSPORTATION	644.14	539.14	530.99
	EMPLACEMENT EXCAVATION	1141.71	995.30	980.27
	EMPLACEMENT OPERATIONS	4439.10	3715.52	3659.35
	OTHER	7780.60	9850.34	1335.01
	SUBTOTAL	51798.75	56307.39	26001.13
20	BACKFILLING AND DECOMMISSIONING			
	BACKFILLING	2687.30	2249.41	425.37
	SEALING	450.83	560.88	121.42
	DECOMMISSIONING	6783.53	9434.53	1031.74
	SURVEILLANCE	.00	.00	.00
	SUBTOTAL	9921.66	12244.83	1578.53
	CONTINGENCY	38301.72	42485.01	11578.60
TOTAL		165700.77	183435.36	50136.40

CASE DESCRIPTION - SPENT FUEL/SALT

TABLE 25 UNIT COST SUMMARY FOR A REPOSITORY IN SALT BED
----- 1982 DOLLARS PER PACKAGE

FROM TABLE	COST CATEGORY	WASTE TYPE		
		PWR FUEL	BWR FUEL	SF HARDWARE
13	CONSTRUCTION AND PREOPERATION			
	LAND	1603.07	1606.26	311.11
	LICENSE	.00	.00	.00
	SITE PREPARATION	9018.50	9036.43	1750.24
	SHAFT	3644.06	6650.26	1550.66
	SURFACE FACILITIES	38297.91	56477.48	7173.42
	UNDERGROUND FACILITIES	639.27	640.55	124.07
	ARCHITECT ENGINEER	7787.94	11060.64	1597.75
	STARTUP	.00	.00	.00
	SUBTOTAL	60990.77	85471.62	12507.25
14	MINING AND ROCK REMOVAL OPERATIONS			
	MINING	12839.50	12865.03	2491.78
	HOISTING	2770.94	2777.36	542.41
	SURFACE HANDLE AND STORE	242.81	243.38	47.53
	OFFSITE DISPOSAL	.00	.00	.00
	SUBTOTAL	15853.25	15885.76	3081.72
19	WASTE OPERATIONS			
	RECEIVING	5690.46	16597.16	852.46
	PACKAGING	38527.60	41092.76	26831.17
	TRANSPORTATION	753.64	754.80	754.01
	EMPLACEMENT EXCAVATION	1335.80	1393.42	1391.98
	EMPLACEMENT OPERATIONS	5193.75	5201.73	5196.28
	OTHER	9103.30	13790.47	1895.71
	SUBTOTAL	60604.53	78830.34	36921.60
20	BACKFILLING AND DECOMMISSIONING			
	BACKFILLING	3144.14	3149.18	604.03
	SEALING	527.47	785.23	172.42
	DECOMMISSIONING	7936.73	13208.34	1465.07
	SURVEILLANCE	.00	.00	.00
	SUBTOTAL	11608.34	17142.75	2241.51
	CONTINGENCY	44813.01	59479.01	16441.61
TOTAL		193869.90	256809.49	71193.69

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