EQUIPMENT REPLACEMENT ANALYSIS FOR PUBLICLY OWNED FLEETS

CENTRE FOR NEWFOUNDLAND STUDIES

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RICHARD CHARLES EDWARD APPLEBY







EQUIPMENT REPLACEMENT ANALYSIS FOR PUBLICLY OWNED FLEETS

BY

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A thesis submitted to the School of Graduate
Studies in partial fulfilment of the
requirements for the degree of
Master of Engineering

Faculty of Engineering and Applied Science Memorial University of Newfoundland

April 1993

St. John's Newfoundland Canada

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ISBN 0-315-86661-6

ABSTRACT

The economic Sife of equipment is the point in time when the sum of all equipment costs are minimum. The factors associated with equipment costs are operating and maintenance costs, ownership costs, obsolescence costs, parts cost, downtime cost and training costs. With today's economy, public sector agencies are finding it more and more difficult to acquire the funding necessary to operate, maintain and replace their equipment fleets. In many cases, equipment is used far beyond its optimum economic life because of this lack of funding. In these cases, the fleet manager requires some method of prioritizing the equipment replacement list.

In order to effectively plan equipment replacement purchases, the fleet manager must have the ability to forecast future costs. In some cases, geographic location has an impact on delivery time of new equipment to the public agency and forecasting future equipment costs can provide the lead time necessary to order the new equipment before the end of its economic life. In other cases, the timing of budget approval for replacement funding can delay the purchase of new equipment.

The criteria used for deciding when equipment should be replaced vary from one agency to the next. There are also some differences in the criteria used depending on whether the agency is public or privately owned.

There are several fleet replacement techniques available to the fleet owner. In general terms, the life cycle cost method, interval life method and nomographs are commonly used. Each method has varying degrees of complexity. The causes of each

method depends on the accuracy of the input information used by the fleet manager.

Commercially prepared software is available to the fleet manager to assist in the equipment replacement decision. These software packages perform different types of fleet management functions. Fleet managers should thoroughly investigate the software being considered to ensure it fulfils wheir needs.

Fleet ieplacement models can be developed in-house or by computer software consultants. The model should be designed so that it is adaptable and easily modified by the fleet owner. It should have the ability to compile cost data in a concise and logical format. It should also have the capability of forecasting future equipment costs and provide the fleet manager with a priority listing of equipment to be replaced.

ACKNOWLEDGEMENTS

I would like to acknowledge the following people who assisted me in the completion of this thesis:

Professor W. J. Campbell, Memorial University of Newfoundland for his guidance throughout my Masters Degree Program.

Appreciation is also given to Professor M. G. Andrews for his advice and assistance during the writing of this thesis.

I would like to thank my wife and family for their encouragement at all times, especially over the last several months.

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LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

Symbols

a

b.

bij

Cn - Downtime cost in a given year

D - Downtime percentage of existing machine H.

- Planned annual usage of existing machine in hours

- Hourly cost in a given year CR

- Obsolescence cost in a given year

- Production loss of existing machine in present

- Standardized operating and Maintenance Cost

- Standard operating units for equipment type - Actual operating units for equipment type

- Actual operating and maintenance costs

MAC - Mean annual cost

P - Purchase price

SR - Salvage value at period R

ΣX, - Sum of periods equipment costs R - Year of replacement

Y,

- Annual equipment cost at time t

- Intercept on Y-axis - Slope of trend line

h X. - Time, t (in years)

- Number of years of data

Estimated linear effect on Y,

- Estimated curvilinear effect on Y. - Logarithm

log M.

- Moving average at time t Mª.

- Double moving average at time t

S' - Single exponential smoothing value

ox - Smoothing constant

- Priority factor C, - Total cost to date

Cui - Forecast equipment cost next year

- Purchase price of replacement vehicle

Sect - Salvage value of equipment next year

Abbreviations

APWA - American Public Works Association

ICMA - International City Management Association

ITC - Investment Tax Credit

Acronyms

FRAPOF - Fleet Replacement Analysis Model for Publicly Owned Fleets

O&M - Operating and Maintenance

Chapter 1

PROBLEM DEFINITION

1.1 INTRODUCTION

The acquisition and maintenance of publicly owned fleets is a major part of any jurisdiction's budget. To ensure the fleet operates in an efficient and cost effective manner, the fleet manager must have the capability to decide when equipment should be replaced using an appropriate equipment replacement model.

Unfortunately, there is no simple formula to determine the optimum replacement or the issues to be considered in setting replacement criteria. The importance of each factor must be determined by the fleet owner.

Fleet managers have the difficult task of planning their equipment replacements over a period of years to fall within their budgeting constraints.[1] Budget requirements for equipment purchase vary greatly from one year to the next, while replacement funds supplied by local governing bodies are only increased a small percentage from year to year. Many times, the "economically optimum" replacement time occurs when insufficient funding is available.

In a government setting it is often necessary to plan equipment replacement purchases as much as a year in advance. Accurate forecasts of equipment future costs are therefore required, if the Fleet Manager is to plan for such replacement purchases. This is especially true in remote areas, including Newfoundland.

1.2 FLEET REPLACEMENT OUESTIONNAIRE

A questionnaire was sent to 22 public agencies in Canada and the U.S.A. to determine: (APPENDIX A)

- 1. What method of fleet replacement analysis is used by the agency?
- 2. What, if any, type of software is used?
- 3. Is the software fulfilling all of the agency's needs?
- 4. Does the agency receive sufficient replacement funds each year?
- How does the agency decide the order in which equipment is to be replaced?
 Seventeen (78%) of the 22 public agencies polled responded to the questionnaire.

Table I show the results of the questionnaire.

1.2.1 Fleet Replacement Criteria Used by Respondent

Four main criteria were used by the respondents. They were:

- Age
- 2. Mileage
- Cost
- 4. Combination of Age/Mileage/Cost

None of the respondents used age only as their replacement criteria. Two (12%) of the respondents used mileage as their only replacement criteria. Seven (40%) of the respondents use cost as their only replacement criteria. The majority of respondents used a combination of age, mileage and cost as their replacement criteria. Eight (48%) of respondents used some combination of these factors as replacement criteria.

Table I

RESPONDENT	REPLACEMENT CRITERIA	SOPTWARE USED	PRIORITY LISTING	FUNDS	REMARKS
City of Los Angeles	Age/Cond./Cost	Fleet Command	No	No	Trained personnel required to operate system.
Ontario Provincial	Age/Mileage	Designed Mainfrance	No	No	Cannot be modified
Police		Model			by user.
City of Bellview, Wash.	Costs	None	No	Yes	
Gov. of Alberta	Mileage	VIMS	No	Yes	Forecasting based on mileage.
Gov. of Manitoba	Costs	AGECON	No	No	No forecasting.
Cay of Helitax	Costs	None	No	Yes	Manual system.
City of Moncton	None	None	No	No	
Hamilton-Westworth Police	Mileage	Fleet Plus	No	No	Forecasting based on mileage.
Etobicoke Hydro	Age/Costs	None	No	No	
City of Fredericton	Age/Mile./Cests	None	No	No	
Province of B.C.	Age/Mileage	None	No	No	
City of Windsor	Costs	None	No	No	Economic worksheet used.
City of St. John's	Costs	AGECON	No	No	True cost adjusted for usage
ity of New Orleans	Mileage/Costs	None	No	No	
Province of Ontario	Costs	Mainframe Model	No	No	No forecasting.
City of Calgary	Costs	None	No	No	Manual APWA mode used.
Tity of Rochester	Age/Mile./Costs	None	No	No	

1.2.2 Software Used by Respondents

Eight (48%) of the respondents used some form of computer software/hardware to assist in their equipment replacement analysis. Four of these eight agencies, used micro-computers and related software, while the remaining four agencies had a mainframe program that was specially designed for their particular circumstances.

The following is a description of the software/programs being used by the respondents:

- FLEET COMMAND[2]

Synopsis: Ten modules for fleet management and support including equipment records, work order processing, mechanic productivity, preventative maintenance scheduling, vendor information, parts inventory, fuel usage and billing. Primarily a mainframe application.

VEHICLE INVENTORY MANAGEMENT SYSTEM (VIMS)[2]

Synopsis: VIMS is a custom designed system written in MICROFUCUS HIGH
PERFORMANCE COBOL. The system can input age and/or mileage
replacement criteria and forecast when vehicles will reach a certain age

or mileage. System lists all equipment to be replaced on a certain date.

AGECON[3]

Synopsis: This software uses economic models to arrive at the optimal time of replacement. AGECON plots operating and maintenance costs against ownership costs to determine the lowest total cost of a particular equipment item.

FLEET PLUS[2]

Synopsis: System records all maintenance costs, parts inventory, fuel costs and provides replacement list based on age/mileage criteria input into computer.

FLEET MANAGEMENT INFORMATION SYSTEM[2]

Synopsis: This is a mainframe program that produces thirteen different reports on various vehicle data and operating costs. One report is used solely for vehicle replacement and projects replacement in order of the date each vehicle is to be replaced. Replacement forecasts are based on mileage.

1.2.3 Problems With Software Being Used by Respondents

The problems associated with these programs can be summarized as follows:

- FLEET COMMAND
 - · Mainframe program difficult for user to modify
 - · Does not perform equipment cost forecasting
 - · Does not provide a replacement priority list
 - · Requires trained personnel to operate
- VEHICLE INVENTORY MANAGEMENT SYSTEM
 - Custom designed system
 - · Provides replacement list based on the date a certain mileage or age reached
 - Does not provide a priority list
- AGECON (APPENDIX B)
 - · Does not provide equipment cost forecasting
 - · Does not provide a priority listing
- FLEET PLUS
 - · Provides a replacement list based on the date a certain mileage or age is reached
 - · Does not provide a priority list
- FLEET MANAGEMENT INFORMATION SYSTEM
 - · Mainframe program cannot be modified by user

- · Does not forecast equipment costs
- · Does not provide a priority list

1.2.4. Funding Required for Fleet Replacement and Setting Fleet Replacement Priority List

Fifteen of the seventeen respondents (80%) indicated that they did not receive sufficient funds to replace all equipment requiring replacement. The question then asked of the respondents, was, "How did they decide the order in which equipment was to be replace?"

In all cases, the answer to this question was subjective and was in the following format:

- Use "worst case scenario", that is, replace the worst or those "most likely" to need extensive work.
- · Replace equipment with the highest mileage.
- Replace equipment based on "occupational necessities", that is, certain types
 of equipment are absolutely necessary while others are not as critical.
- Keep equipment which will "most likely" be the least expensive to operate
 and maintain
- Department head sets "priority".
- "Establish" a priority list.
- Need, use, etc. All tempered by current priorities as determined by government officials (politics).

- · Essential equipment replaced first.
- Implications of not replacing equipment are discussed by management/government.

1.2.5 Special Problems of Respondents

The main complaint expressed by the respondents was that they did not receive sufficient funds to replace all vehicles and equipment which required replacement in a given year. To complicate this malter, these respondents had no quantitative method to determine the order in which this equipment was to be replaced.

Another problem identified by the questionnaire, was related to the forecasting of equipment's future years' costs. This was a problem for the respondent, because of the required time to receive the new equipment after tenders for this equipment were called. In one case, the average delivery time for the new equipment was between 6 to 8 months in duration. This time, coupled with the 2 to 4 month delay in getting funds approved to purchase this equipment, meant the respondent had to maintain the old equipment for a period of 8 to 12 months beyond its economic life. If the respondent had been able to forecast the total equipment costs the year prior to its scheduled replacement, the new equipment would have replaced the old equipment at the end of its economic life.

1.3 TYPES OF EQUIPMENT LIFE

The life of equipment can be described in three categories:[4]

- 1. Service Life
- 2. Technological Life
- 3. Economic Life

The service life[4] of a vehicle refers to the amount of time a vehicle is capable of operating and rendering useful service, provided it receives adequate maintenance and if worn out parts are replaced with new parts.

The technological life[5] of a vehicle associates the relative decline in productivity

of an older model vehicle, to the increased productivity of a new model vehicle. The design of new equipment is usually modified from on year to the next in an attempt to increase productivity, hence increasing the attractiveness of buying the new equipment. One equipment manufacturer has quantified this increase in productivity for some of its equipment by calculating a productivity index for this equipment. The Caterpillar Tractor Company produces a publication entitled "Perspective"[6] for some of the equipment it produces. In this publication, one can track the productivity of a machine, in some cases, as far back as 1947. The technological life of an item of equipment is therefore the amount of time that passes between changes in its productivity index.

The economic life of a machine refers to the time when the total costs for that machine are a minimum.[7] Components that make up the total cost are: operating and maintenance costs, ownership costs, parts inventory cost, obsolescence cost, training costs and salvage value. These will be fully discussed in a following section.

1.3.1 Fleet Replacement Criteria: Public VS Private Fleets

The criteria used to determine a fleet replacement plan, varies, depending on whether or not the fleet being analyzed is publicly owned or privately owned. Table II shows the primary concerns for fleet managers of both types of fleets. The following is a discussion of these concerns.

Table II

PRIMARY CONCERNS FOR SETTING FLEET REPLACEMENT CRITERIA FOR PUBLIC VS. PRIVATE FLEETS

Publicly Owned Fleet	Privately Owned Fleet			
Age Mileage Operating & Maintenance Costs Politics OTHER CONSIDERATIONS: Safety	1. Depreciation 2. Price 3. Replacement Timing 4. Mileage 5. Maintenance & Reliability 6. Vehicle Condition at Resale 7. Taxes 8. OTHER CONSIDERATION: (i) Safety (ii) Image (iii) Employee Morale			

1.3.2 Publicly Owned Fleet Replacement Criteria

Age

Statistically, it is known that failure of some vehicle components is a function of time.[48] This is of particular significance in rubber and plastic parts. In harsh environments, body components are also affected due to age. In a governmental setting. if the purchasing cycle is missed in any given year, the agency may be required to spend unnecessary monies in order to keep the vehicle in operating condition until the next cycle occurs.

The age of equipment is expressed in the number of years worked for light duty vehicles such as cars and trucks. For heavy equipment, the age is usually expressed in the number of hours worked by the equipment.

Mileage

Many public agencies use mileage as their governing fleet replacement criteria. This is based on the fact that, historically, higher mileage will result in higher failure rates for a vehicle. Many public agencies used both age and mileage as their main replacement criteria. This was confirmed by the response to the fleet replacement questionnaire.

Operating and Maintenance Expenses

Equipment in the same equipment class or type, will develop a pattern of normal operating expenses. When this pattern is established, individual units in a particular class can be tracked to determine if units follow the normal pattern of costs. When searching for the optimum economic life of equipment, this criteria is perhaps the greatest in importance, provided that the information is recorded in a form which can be used by the fleet manager.

Politics

In most public agency environments, there is likely to be some form of elected body which is responsible to represent the private and corporate citizens from which most of the revenues needed to operate the agency are derived. Political decisions made by such groups, can have an affect on how equipment replacement decisions are made. These decisions can have the greatest impact on fleet replacement, when monies budgeted for fleet replacement is transferred or re-appropriated for other purposes in the public agency. The fleet manager will then require some method of reassessing the equipment requiring replacement and at the same time be able to inform the elected body of the repercussions of their decisions.

Other Considerations

(i) Safety

In recent years, safety is gaining considerable attention in both public and private agencies. Certain equipment will require replacement based on the fact that serious injury to personnel or damage to property may result due to the condition of that equipment. The costs associated with these injuries or damages, can be greater than the cost of replacing the defective equipment. These costs could be in the form of Workman's Compensation payments, fines levied from the local Occupational Health and Safety Department or legal claims as a result of injury or property damages.

1.3.3 Privately Owned Fleet Replacement Criteria

Depreciation

The difference between the purchase price and the resale value of a vehicle is defined as depreciation.[8] In privately owned fleets, depreciation usually has the greatest financial impact on the replacement decision. The loss in value of a vehicle,

often has a greater impact on fleet costs than does maintenance costs. Knowledgeable fleet managers place great emphasis on the impact of depreciation when determining which vehicles should be replaced.

Price

By acquiring equipment at the lowest possible price, without compromising quality, the fleet manager can reduce the difference between the purchase price and the resale value of the equipment. Private fleet owners can usually negotiate the price of this equipment on a one-on-one basis with the equipment dealer. With publicly owned fleets, the acquisition of equipment is normally done through a tender call, where the acquisition price may not necessarily be the lowest price. In Newfoundland, the provincial preference policy has been a factor in this regard.

Replacement Timing

During certain times of the year, the resale value of equipment will be greater than at other times. Generally, the highest resale value will be achieved during the first few weeks of the new model year; September to mid-November. Resale values drop substantially during the winter months due to decreasing consumer demand. Private fleet managers watch the resale market very closely so that they can get the greatest resale value of their old equipment and at the same time minimize the depreciation on newly acouired equipment.

Mileage

This factor has been discussed under Section 1.3.2.

Maintenance and Reliability

Maintenance and operating costs for private fleets will be the same as those in the
publicly owned fleet provided the labour costs for mechanical repair personnel are
similar. The reliability of the private fleet can have a detrimental effect on the private
fleet organizational profits. If a private firm bids a certain project assuming the use of
a certain vehicle, and that vehicle should break down during the execution of the project,
a replacement vehicle will either have to be purchased or rented. This extra cost will
decrease the overall profit of the private fleet owner.

Vehicle Condition

At resale, vehicles which have received good care earn the highest value. If operators are made accountable for the condition of their vehicles, the private fleet owner can expect to achieve the highest resale value for its equipment.

Taxes

From time to time, Canadian and U.S. governments enact Investment Tax Credit (ITC) laws which encourage the purchase of new equipment. The impact of such laws change with the length of time the equipment is kept in service. Also, some governments tax personal property including vehicles. In most cases, the tax declines as a vehicle ages.

Other Considerations

(i) Safety

This has been discussed in Section 1.3.2.

(ii) Image

Vehicle age or condition may have a substantial effect on the image of a private company. When important clients are transported in company vehicles, the image of that company will be enhanced by the good condition of its vehicles. Likewise, equipment in good condition being used on projects, will give clients the confidence to continue dealing with such companies on future projects where this equipment is required.

(iii) Employee Morale

High employee morale will undoubtedly create increased productivity. Employees working with equipment which has low downtime, will likely be less frustrated with trying to complete their assigned jobs. They will also become more interested in keeping the equipment properly maintained.

1.4 SOFTWARE

1.4.1 Commercially Available Software

A market search, of commercially available fleet management software packages, was performed. Table 3 shows a total of 40 software packages are available for various fleet management functions. Nine (23%) of these software packages have some fleet replacement analysis capabilities. Three of these nine packages, use age/mileage as replacement criterion. The remaining six packages, use equipment costs as replacement criterion.

Table III

COMMERCIALLY AVAILABLE COMPUTER SOFTWARE

SOPTWARE	PROVIDES COST TRACKING	REPLACEMENT CRITERIA USED	PROVIDES FORECASTING	PROVIDES PRIORITY 13ST	USER CAN MODIFY SOFTWARE	REMARKS
Menin	Yes	N/A	No	No	No	Designed for each user
EX-Fleet	Yes	N/A	No	No	No	Special data collection equip.
Vehicle Control	Yes	N/A	No	No	No	Repair tracking system
BUMINEMS	Yes	Age/Mileage	Yes	Yes	No	No longer sold
Equipment Management	Yes	N/A	No	No	No	Data base manager
l-leet Manager	Yes	Costa	No	No	No	
Tremain	Yes	N/A	No	No	No	Equipment inventory system
CFA-VHRS	Yes	N/A	No	No	No	Repair tracking system
MCMS	Yes	N/A	No	No	No	Mainframe application
T1345	Yes	N/A	Yes	No	No	Repair tracking system
VMS	Yor	Usage/Costs	No	No	No	
GEMS	Yes	Age/Mileage	No	No	No	Forecasts by Age/Mileage
Vehicle Cul VMRS	Yes	N/A	No	No	No	Designed for truck fleets
Equipment Maintenance Management	Yes	N/A	No	No	No	Repair tracking system
System Vehicle Cost Analyzer	Yes	Costs	No	No	No	Individual analysis
Fleet Controller	Yes	N/A	No	No	No	Data base manager
Firet Cost Control	Yes	N/A	No	No.	No.	
Fleet Tracket	Yes	N/A	No No	No	No No	Repair tracking system
Mainaver	Yes	N/A N/A	No No	No	No No	Repair tracking system
Maintenance	Yes	N/A	No No	No No		Repair tracking system
Management System	10.	N/A	No	No	No	Repair tracking system
Fleet Muintenance Module	Yes	N/A	No	No	No	Repair tracking system
CHRIS	Yes	N/A	No	No	No	Repair tracking system
l-lect Command	Yes	N/A	No	No	No	Mainframe application
Fleet*Mate	Yes	N/A	No	No	No	Repair tracking system
VEMS	Yes	N/A	No	No	No	Data base manager
Penton	Yes	N/A	No	No	No	Repair tracking system
Maintenance						
EMS/IX*	Yes	N/A	No	No	No	Repair tracking system
anta l'auta	No	N/A	No	No	No	Parts inventory only
Inventory	*****		440	1000		
	Yes	N/A	No	No	No	Data base manager
Fleet Maintenance System	Yes	N/A	No	No	No	Data base manager
laskince	Yes	N/A	P.M. Only	No	No	Repair tracking system
Vehicle (*TRL	Yes	Costs	No	No	No	Repair tracking system
Dataforce	Yes	Costs	No	No	No	
Parts Porce	No	N/A	No	No	No	Parts inventory only
MMS-II	Yes	N/A	No	No	No	Repair tracking system
Maintenance	Yes	N/A	No	No	No	Repair tracking system
MS: Fleet	Yes	N/A	No	No	No	Repair tracking system
Management		a tree!	140	1.0	110	repair unexing system
Program						
1MS	Yes	N/A	No	No	No	Repair tracking system
MILCON	Yes	Costs	No	No	No	THE PART OF THE PA
Peet Plus	Yes	Age/Mileage	Yes	No	No	

Three software packages (7%) do perform forecasting functions, and is done on the basis of determining when a vehicle will reach a certain age or mileage.

One of the software packages (3%) has the capability of providing a listing of vehicles which require replacement. Vehicles are selected for replacement if they meet the software replacement criteria. In this particular case, vehicles which have reached a certain ase/milease are selected for replacement.

It has been found that most computerized fleet management packages are not appropriate for municipal applications.[9] Despite the variety of programs and systems available, many facts and fantasics arise after these systems are implemented.[10]

None of the software packages listed in Table III can be modified by the user. The only flexibility the user has with some of these packages is in the input of replacement criteria. Some of these programs will give the user a choice of replacement criteria permitted to be used with the system.

Appendix B gives a detailed listing of software packages shown in Table 3 which provides; vendor information, hardware requirements, and a synopsis of each software package.

1.5 PURPOSE OF THE RESEARCH

The purpose of the research is as follows:

To develop an equipment replacement model for publicly owned fleets which will incorporate the following capabilities:

(a) Forecast future equipment costs.

- (b) The model will provide the fleet owner with the optimum equipment replacement time.
- (c) The model will provide the fleet owner with a priority listing giving the order in which the equipment is to be replaced.
- (d) The model will be user friendly and not require computer programming by the fleet owner.
- (e) The model will be flexible so that it can be modified by the owner as required.

1.6 METHODOLOGY

The research presented in this thesis was developed based on the following methodology:

- Publicly owned agencies were polled to determine how equipment replacement analysis was performed on their fleet.
- A literature review, in the area of fleet management, was performed to identify sources of information in this area. The types of equipment life and the criteria used for both public and private fleets were researched.
- 3. Available software packages in this field were researched and analyzed.
- 4. The various costs associated with total equipment costs as discussed.
- All types of equipment replacement analysis techniques are reviewed.
- Forecasting techniques for equipment costs in a time series are analyzed.

- A method of equipment replacement analysis is recommended which incorporates equipment costs, forecasting and a priority listing of equipment to be replaced.
- The recommended fleet replacement analysis model is implemented with an existing publicly owned fleet.

Chapter 2

FLEET REPLACEMENT ANALYSIS TECHNIQUES

2.1 INTRODUCTION

There are several fleet replacement analysis techniques available to the fleet manager. The complexity of these techniques is varied. Therefore, the type of fleet replacement analysis technique chosen, should fit the operational needs of the fleet owner.

In most cases, the fleet replacement process will exhibit several common traits. These characteristics can be summarized by Figure 2.1. This figure shows a typical fleet replacement process.

With the fleet replacement process in place, the fleet manager requires cost data on the equipment being analyzed. Several cost factors should be considered in the total equipment costs. These costs can be summarized as follows:

- Ownership Costs
- 2. Operating and Maintenance Costs
- 3. Downtime Costs
- 4. Parts Inventory Costs
- 5. Training Costs
- 6. Obsolescence Costs

These cost factors, as well as the various types of equipment replacement analysis techniques will be discussed in this section.

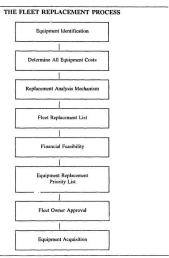


Figure 2.1

2.2 EQUIPMENT COSTS

2.2.1 Ownership Costs

Annual equipment ownership costs, as the name implies, refers to the annual costs incurred by an agency to own equipment.[11] Several factors can be considered in the determination of these costs as follows:

- 1. Depreciation
- Investment Cost, Taxes, Insurance, Storage and Miscellaneous
 The following sections shall briefly discuss each of these factors.

2.2.1.1 Depreciation

Depreciation is defined as the annual decrease in equipment value through wear, deterioration or obsolescence. The profitable fleet owner must recover the loss in value of equipment during its useful life.

The general term depreciation should not be confused with the specific term depreciation accounting. [12] Depreciation accounting is the systematic allocation of the costs of a capital investment over a specific number of years. There are three reasons for calculating the depreciation accounting value of equipment. They are:

 To provide the owner with an easily calculated estimate of the current market value of the equipment.

- To provide a systematic method for allocating the depreciation portion of equipment ownership costs over a specific time period.
- To allocate the depreciation portion of ownership costs in such a manner to accrue the greatest tax benefits.

To determine the depreciation of any type of equipment, the following information is required:

- The original purchase price of the equipment.
- 2. The approximate economic life of the equipment. (Term)
- 3. The estimated resale value of the equipment. (Salvage)

With this information, depreciation can be calculated using several methods.

Three of the most common methods are:[12]

1. Straight Line Method

- 2. Sum of Year Digits Method
- 3. Decling Balance Method

A description of these methods is available in any economics reference book.

2.2.1.2 Investment Cost, Taxes, Insurance, Storage and Miscellaneous

Investment costs are costs associated with interest payments on money borrowed to purchase new equipment. Many owners charge interest as part of hourly ownership and operating costs while others consider it as general overhead in the overall operation, [13] Interest is usually based on the owners average annual investment in the unit and it should be considered whether or not the machine is purchased outright or

All taxes and insurance which are assessed against each machine should be included in ownership costs. The Canadian and U.S. Governments sometimes enact tax laws which can have positive or negative effects on ownership costs. In some cases, tax credits are provided to encourage equipment purchases. In other cases, taxes are levied against vehicles based on the vehicles value at any given time. In the United States, some states tax personal property, including vehicles. In most situations, the tax declines as a vehicle ages.

Other factors which could be associated with ownership costs, would be storage fees such as rent or maintenance costs of equipment storage yards and buildings. Miscellaneous ownership costs[14] such as wages for security guards, for protection of the equipment fleet, expenses for handling equipment in and out of storage may also be considered as ownership costs. An example of this cost could be float charges for dozers and track excavators.

2.2.2 Operating and Maintenance Costs

The most significant factor affecting the total equipment cost is the operating and maintenance (O&M) costs. The operating costs would include all costs associated with the equipment's operation such as fuel, oil, fluids, and all other items required for the efficient operation of a particular equipment item.

The maintenance costs would include all costs associated with the repair of the equipment item for both preventative and demand maintenance. These costs would include all labour, parts, and equipment costs required for such maintenance. Preventative maintenance would involve scheduled service checks on the equipment which, in theory, should reduce some of the demand maintenance requirements. Demand maintenance would involve the repair of equipment due to damage to or the malfunction of the equipment item.

2.2.3 Downtime Cost Factor

Consideration in the determination of this cost factor are the internal and external equipment rental rates, operators wages, overtime rates, and any costs incurred due to the delay of work.

Annual downtime hours can be obtained from the fleet cost tracking mechanism being used by the agency.

The internal and external rates of all equipment must be known. If an agency has to rent "outside" equipment to replace one of its equipment items, this is an extra cost which must be borne by the agency.

The wages paid to the operator, of a machine that is down for repairs, must also be considered in the total downtime cost of the machine. For some public agencies, this cost will vary depending on how it can deal with the idle operator. Where collective agreements are in place, there may be restrictions placed on how the operator can be used once the machine he/she is assigned to is down for repairs. If the operator is not

permitted to operate another type of equipment, or does not possess the knowledge and experience to operate another type of equipment, the wages of that operator will be another cost consideration in the downtime cost factor.

One method of determining downtime cost is by using the following formula:

$$C_D = D \times H_P \times C_R$$
 Equation 2-1

Where

C_D = Downtime cost in a given year

D = Downtime percentage of existing machine

H_P = Planned annual usage of existing machine in hours

CR = Hourly cost of replacement machine

2.2.4 Parts Inventory Cost

Another cost that must be considered in the total equipment cost, is the cost of parts inventory and the carrying costs associated with stocking those parts.

The cost of parts inventory can be obtained from the agencies inventory records.

Ideally, parts should be categorized by equipment make. The cost of the same type of
parts items, may be different for machines in the same class of equipment, due to
differences in design of each particular make of machine.

The carrying charges incurred by the agency are also an important consideration in the determination of the parts inventory cost. The method which this cost could be determined, would be to a 'ply the appropriate inflation factor as a function of time, to the particular parts item.

2.2.5 Training Costs

The cost to train operators in the safe operation of the various equipment types is also an important cost consideration in the total equipment cost. This cost will vary depending on the type of equipment involved.

Training can be done either in-house or provides by professional equipment operator training schools. For large agencies, the in-house approach may be the best alternative for the training for personnel. Using this method the operator could be trained on the equipment item he/she may be required to operate once the training is completed.

For smaller agencies, the professional equipment operator training school may best suit their needs. These agencies will have less equipment to call on for in-house training and will not have a great need to employ its own equipment operator training personnel.

2.2.6 Obsolescence Cost

As an equipment item ages, there may be a cost associated with the obsolescence of that particular type of machine.

As advances are made in the technology of certain equipment items design, older machines become less efficient than similar new machines. An additional cost is incurred on the agency due to a decrease in the efficiency of the older equipment item. The older machine may have to work longer to produce the same result of that of a new similar machine.

Improvements in the quality of equipment components, such as stronger materials and the accessibility of replacement parts will also have an affect on the obsolescence cost of a narticular equipment item.

Provided the appropriate information is available, the obsolescence cost can be calculated from the following formula:

$$C_0 = P_1 \times H_P \times C_R$$
 Equation 2-2

Where

Co = Obsolescence cost in a given year

Pr = Production loss of existing machine in percent

Hp = Planned annual usage of existing machine in hours

CR = Hourly cost of the replacement machine

2.2.7 Standardized Usage

When comparing the total equipment costs for the various equipment types, consideration must be given to the amount of usage each item of equipment receives. To illustrate this, two similar equipment items are compared. An older machine may have less total operating and maintenance costs than a new machine. If an equipment replacement analysis is done based only on these costs, the new machine would be scheduled for replacement before the older machine. If, however, the usage of each machine is incorporated into these costs, the results would be the opposite. This can be represented by the following expression:

$$C_8 = T_8 \times C_A$$
 Equation 2-3

Where

Cs = Standardized Operating and Maintenance Costs

 T_s = Standard Operating Units for Equipment Type

TA = Actual Operating Units for Equipment Type

C. = Actual Operating and Maintenance Costs for Equipment Type

Figure 2.2 shows how usage of equipment can affect equipment costs. It also shows how these costs can be standardized for the purposes of equipment replacement analysis.

COST COMBADISON OF FOURMENT BASED ON DIFFERENT USACE

Standardized Annual Usage (hours):	1800 hours per year						
	Year I	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Annual Equip. Cost, C							
- Machine "A"	33,165	12,507	27,402	34,501	40,836	37,724	186,135
Annual Equip. Cost, CA							
- Machine "B"	21,079	40,021	46,905	59,531	40,035	39,092	246,663
Annual Equip. Usage (hrs), TA							
- Machine "A"	1,750	920	1,200	1,400	1,530	1,500	8,300
Annual Equip. Usage (hrs), TA							
- Machine "B"	1,660	2,200	1,900	1,950	1,600	1,920	11,230
Standarized Equip. Cost, C ₃							
- Machine "A"	34,113	24,470	41,103	44,358	48,042	45,269	237,355
Standarized Equip. Cost, Cs							
- Machine "B"	22,857	32,744	44,436	54,952	45,039	36,649	236,677

Example $C_s = 1.800 \times $40.035 = 45.039

Figure 2.2

2.3 ANALYSIS TECHNIQUES

Three types of equipment replacement analysis techniques will be discussed in this section. They are:

- 1. Life Cycle Cost Method
 - 2. Interval Life Method
 - 3. Nomographs

2.3.1 Life Cycle Cost Method

The life cycle cost method of equipment replacement analysis refers to the analysis of the various equipment cost factors previously discussed in Section 2.2.

Figure 2.3 shows a typical life cycle cost method for equipment replacement analysis.

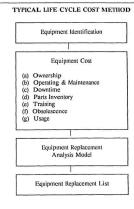


Figure 2.3

This method calculates the total annual equipment costs. These costs are then plotted against time. The optimum time to replace the equipment being analyzed, would be when these costs are a minimum. Figure 2.4 shows the typical relationship between these costs.

RELATIONSHIP OF LIFE CYCLE COSTS

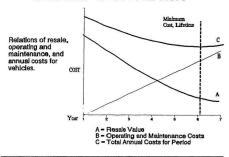


Figure 2.4

A slight variation to this method is with the use of "average" annual equipment costs.[4] In this method, the optimum replacement time is when average annual equipment costs are a minimum. Figure 2.5 illustrates the relationship of these costs.

The average annual costs[4] can be calculated from the following formula:

$$MAC_{R} = \frac{P - S_{R} + \sum_{t=1}^{R} X_{t}}{R}$$
 Equation 2-4

Where

$$MAC_R$$
 = Mean Annual Cost at Period R

S_R = Salvage Value at Period R

ΣX, = Sum of Periods Equipment Costs

R = Year of Replacement

The time value of money must be included in all equipment cost factor amounts.

Appendix C shows a typical example of equipment replacement analysis using average annual equipment costs.

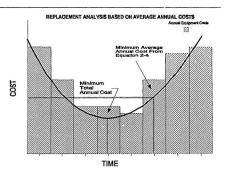


Figure 2.5

2.3.2 Interval Life Method

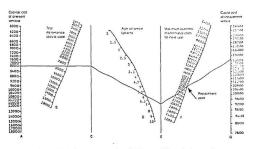
This method is used where the fleet owner uses age and/or mileage as fleet replacement criteria. In this method the fleet owner replaces equipment that has reached its replacement age or mileage criteria. This method is very simple and requires little analysis. The data required for this method of analysis would be the age and/or mileage of the equipment. If the owner's mileage replacement criteria was 100,000 km, all vehicles with oedometer readings greater than 100,000 km would be replaced. Similarly, if the age replacement criteria was five years for a certain type of equipment, all vehicles older than five years of age would be replaced.

2.3.3 Nomographs

Commercially prepared nomographs[14] are available for equipment replacement analysis. They are a graphical representation of the life cycle costing method previously discussed. They are inexpensive, straightforward and easy to use. These nomographs can be used without any special mathematical or statistical skills. The information required to use these nomographs are:

- 1. Purchase price of the equipment
- 2. Total maintenance cost to date
- 3. The age of the equipment
- 4. The purchase price of a new machine

NOMOGRAM FOR VEHICLE REPLACEMENT



Initial cost: \$8,000. Total maintenance cost to date: \$7,200. Age: 6 Years. Replacement Cost: \$14,000. Replace the vehicle when the maintenance cost for the next year is projected at \$3,300 or greater. [14]

Figure 2.6

The projected cost of repairs for the next year will determine whether equipment replacement is necessary. Figure 2.6 shows a typical nomograph used for equipment replacement analysis. This nomograph calculates the maximum permissible "economic" maintenance costs for the next year. If the actual maintenance costs in the next year exceeds this amount, the equipment should be replaced.

2.4 ECONOMIC LIFE OF EQUIPMENT USING PERFORMANCE FACTORS

Equipment owners should be interested in obtaining the lowest possible cost per unit of production.[12] In order to determine the most economical time to replace equipment, accurate records of the various equipment costs associated with each machine must be kept. Similarly, accurate records of the equipment performance indicators must be maintained

Typical performance indicators can be hours of use or, volume of material excavated. The fleet owner can then calculate a yearly production cost per machine in terms of cost per hour of usage or cost per volume of material excavated.

The fleet owner would consider replacing a machine, when the annual production cost of the machine begins to increase. This method of analysis could be incorporated into the life cycle cost method of equipment replacement analysis discussed in Section 2.3.1.

Chapter 3

FORECASTING TECHNIQUES

3.1 INTRODUCTION

Decisions in the private and public sector[15] depend on the perceptions of future outcomes that will affect the benefits and costs of possible alternative courses of action. Since these alternatives take place in the future, they must be forecast.

Accurate forecasts of future equipment costs will help the fleet owner make the equipment replacement decision prior to the end of the equipment's economic life. This will enable the fleet owner to avoid spending excessive amounts of monies on certain types of repairs, and also provide the lead time required in some areas, to order the new replacement vehicle.

An extremely useful form of forecasting procedure is time series analysis. A time series is a set of statistical observations arranged in chronological order. In the case of fleet replacement analysis, these observations would be the annual total costs for a piece of equipment.

The prediction of any time series in fleet replacement analysis involves the examination of past equipment costs. Methods of time series analysis are descriptive in nature and do not provide for probability statements concerning future events. It is important to note that these methods must be always supplemented by sound subjective judgement. Figure 3.1 shows a typical forecasting process, [16]

THE FORECASTING PROCESS

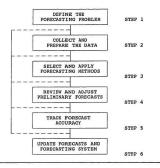


Figure 3.1

3.2 METHODS OF FORECASTING FUTURE YEARS'

COSTS

The following types of forecasting methods shall be investigated:

- 1. The Method of Least Squares
- 2. Second Degree Polynomial Function
- 3. Logarithmic Trend Line
- 4. Moving Average Method

- Exponential Smoothing
- 6. Box-Jenkins Method

3.2.1 Method of Least Squares

The method of least squares is used to fit trend lines because of its simplicity. It should be recognized that while using this method for times series analysis, the usual probabilistic assumptions made in regression analysis are not met. This is because in time series analysis, time is the independent variable, "X" and equipment costs the dependent variable "Y". It is not reasonable to think of the deviation of actual equipment costs in a given yeer from the computed trend value as a random error. Also, the assumption of independence in regression analysis is not met in the case of time series analysis. Equipment costs in a given year surely are not independent of what they were in the preceding year.

The method of least squares produces a straight line in the form of the following equation:

$$Y_t = a + bX_t$$
 Equation 3-1

Where

 Y_t = Equipment Cost at Time T

a = Intercept on Y-axis

b = Slope of the Trend Line

X_t = Time, t (in years)

The slope, b, of the tread line is calculated from the following formula:

$$b \ = \ \frac{\sum\limits_{i=1}^n X_i Y_i}{\sum\limits_{i=1}^n X_i^2} \ - \ \frac{\left(\sum\limits_{i=1}^n X_i\right) \ \left(\sum\limits_{i=1}^n Y_i\right)}{N} \ \ Equation \ 3\cdot 2}$$

Where

n = Number of Years of Data

The intercept of the trend line is calculated from:

$$a = \bar{y} - b \bar{x}$$
 Equation 3-3

Where

v = Mean of All Equipment Cost Data

 \bar{x} = Mean of the x_t Values

3.2.2 Forecasting a Second Degree Polynomial Function with the

Method of Least Squares

The second degree polynomial trend line can be fitted[17] in the form of the following equation:

$$Y_t = a$$
 $b_t X_t + B_t X_t^2$ Equation 3-4

Where

a = Y-axis Intercept

 b_t = Estimated Linear Effect on Y_t

 B_{tt} = Estimated Curvilinear Effect on Y_{tt}

The trend equation co-efficients are determined by solving the following three equations simultaneously:

I.
$$\sum_{i=1}^{n} Y_i = na + b_i \sum_{i=1}^{n} X_i + b_{ii} \sum_{i=1}^{n} X_i^2$$
 Equation 3-5

II.
$$\sum_{i=1}^{n} X_{i} Y_{i} = a \sum_{i=1}^{n} X_{i} + b_{i} \sum_{i=1}^{n} X_{i}^{2} + b_{ii} \sum_{i=1}^{n} X_{i}^{3}$$
 Equation 3-6

III.
$$\sum_{i=1}^{n} X_{i}^{2} Y_{i} = a \sum_{i=1}^{n} X_{i}^{2} + b_{1} \sum_{i=1}^{n} X_{i}^{3} + b_{11} \sum_{i=1}^{n} X_{i}^{4}$$
 Equation 3-7

3.2.3 Forecasting Using a Logarithmic Trend Line

The equation of the logarithmic line that would describe the trend of a time series is as follows:

Log
$$Y_1 = a + bx$$
 Equation 3-8

The constant, A, and slope, B, of this equation are computed as follows:

$$a = \frac{\sum_{t=1}^{n} log \ Y_t}{n}$$
 Equation 3-9

and

$$b = \frac{\sum_{t=1}^{n} X_{t} \log Y_{t}}{\sum_{t=1}^{n} X_{t}^{2}}$$
Equation 3-10

After "a" and "b" are calculated, Y_T can be calculated by substituting values of X (time) into the trend equation.

Logarithmic second-degree curves can also be fitted to time series in which the trend is increasing at an increasing or decreasing percentage rate. For polynomials greater than the third degree, this method of forecasting is not recommended as curves computed by such polynomials permit many changes in direction. These curves do not have the smooth, continuous movement characteristic of a time series.

3.2.4 Moving Average Method of Forecasting

The moving average method of forecasting is one of the simplest time series to use,[18] This technique assumes that the pattern exhibited by the historical data can be represented by the arithmetic means of past data. The simplest moving average model is in the following form:

$$M_i = Y_{i+1} = \frac{Y_i + Y_{i+1} Y_{i+2} \dots Y_{i+n+1}}{N}$$
 Equation 3-11

Where

M_t = Moving Average at Time T

Y. = Actual Value of the Data at Time T

N = Number of periods included in the Moving Average

Y₁₁₁ = Estimate Value of Data at Time, T+1

Equipmen' cost data usually exhibits some form of increasing trend as a function of time. The simple moving average method described above may be inappropriate in these cases. If a trend is present in the cost data, the simple moving average values will lag behind the actual data. To correct for this problem, a double moving average M_T

should be calculated. To calculate M_T , each value of M_T is treated as one data point and a second moving average is calculated based on M_T observations. This can be expressed by the following formula:

$$M_{t}^{d} = \frac{M_{t} + M_{t2} +M_{t+1}}{n}$$
 Equation 3-12

The double moving aver ge forecast is based on the following formula:

$$\hat{M}_{AT}^{d} = a_t + b_t T$$
 Equation 3-13

denotes forecast value

The constant, "a,", and slope, "b", of the formula can be calculated as follows:

and

$$b = \frac{2}{n-1} (M_t - M^d)$$
 Equation 3-15

In using equation 3-13 to develop the next year's equipment cost, t has a value of I.

As each new data observation becomes available, new values for "a," and "b" in equations 3-14 and 3-15 respectively, can be calculated. A new next year forecast can then be determined.

3.2.5 Exponential Smoothing

Exponential smoothing is a widely used time-series forecasting model. New forecasts are derived by adjusting the prior forecast to reflect its forecast error. In this way, the forecasts are continually being revised based on past experience.

Exponential smoothing offers several advantages over other forecasting techniques as follows:

- 1. Exponential smoothing models mesh very easily with computer systems.
- Data storage requirements are minimal compared to other forecasting techniques.
- Exponential smoothing models react more quickly to changes in economic conditions than do moving average models.

In single exponential smoothing, the forecast for the next year and all subsequent years, is determined by adjusting the current year forecast by a portion of the difference between the forecast and actual value.

The basic formula for single exponential smoothing is as follows:

$$S_i^i = \alpha Y_i + (1 - \alpha) S_{i,i}^i$$
 Equation 3-16

Where

Si = Single Exponential Smoothing Value

Y, = Actual Value in Time Period t

 α = the Smoothing Constant ($0 \le \alpha \le 1$)

It can be shown that ∞ is related approximately to the number of periods in a simple moving average by the following formula:

$$\alpha = \frac{2}{n+1}$$
 Equation 3-17

Another method of selecting an appropriate value for ∞ is by investigating a graph of the data over time. If the plot shows little variation in the data, a small value of α should be chosen. If the plot shows great variations in the data, a corresponding greater value of α should be selected by the user.

Other methods of exponential smoothing which can be used are: (APPENDIX D)

- 1. Double Exponential Smoothing
- 2. Winter's Method (Seasonal)
- 3. Brown's Linear Exponential Smoothing
- 4. Triple Exponential Smoothing
- 5. Adaptive Response Rate Exponential Smoothing
- 6. Holts Exponential Smoothing

3.2.6 Box-Jenkins Forecasting Method

The Box-lenkins Method of forecasting is a self-projecting time scries model.

This method of forecasting is based on statistical concepts and principles. The BoxJenkins method of forecasting can be used if the following requirements are met:

- Data representing the historical behaviour of what you want to forecast is available.
- 2. This data is sufficient in quantity to establish a track record.
- 3. The forecasting required is short to medium term.

The computations involved in the Box-Jenkins method are much too labourious and time consuming to perform by hand. A computer is an absolute must if the user is to successfully utilize this forecasting method. Many commercially available Box-Jenkins programs are available through commercial software distributions. Appendix E gives a listing and synopsis of those software packages available.

Chapter 4

FLEET REPLACEMENT MODEL FOR PUBLICLY OWNED FLEETS

4.1 MODEL STRATEGY

The development of a fleet replacement analysis model for publicly owned fleets (FRAPOF MODEL), requires the determination of a model strategy. The strategy being proposed in this model is as follows:

- The model must be adaptable and easily modified to meet the users specific needs.
- It must have the ability to compile equipment data in a concise and logical manner.
- 3. It must have the ability to forecast future costs.
- 4. It must provide the user with an equipment replacement priority list.

The model will consist of five modules as shown in Figure 4.1.

4.1.1 Adapting and Modifying the Model

The FRAPOF Model developed will be adaptable to most spreadsheet computer software packages. The intent of the model, is to provide the user with a spreadsheet which will perform several mathematic functions using spreadsheet packages such as Lotus 1-2-3.[19]

Using the existing software packages will serve two purposes:

THE FLEET REPLACEMENT MODEL (FRAPOF)

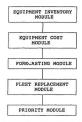


Figure 4.1

- 1. Eliminate the need for complex computer programming by the user.
- The model can be adapted and modified by users who are comfortable working with their chosen spreadsheet software packages.

4.1.2 Compiling Equipment Data

The FRAPOF Model developed, will compile various types of information about the equipment being analyzed. This information will include the following parameters:

- 1. Equipment Identification
 - (a) Unit Number
 - (b) Equipment Class
 - (c) Model Year

2. Equipment Costs

4.1.3 Forecasting Future Equipment Costs

The FRAPOF Model can perform time series forecasting by any of the techniques described in this thesis. The model will calculate the equipment costs for one year into the future. The method of forecasting chosen will be at the discretion of the user.

4.1.4 Replacement Priority List

The modes will determine the optimum time to replace equipment and will provide the user with a priority listing of this equipment. The priority list will be based on a cost-benefit relationship as well as allow the user to assign an equipment importance factor to each vehicle. This will show the relative importance of each vehicle to the fleet.

4.2 EQUIPMENT INVENTORY MODULE

The equipment inventory module consists of a file containing information about each equipment item in the fleet. Figure 4.2 shows the type of information to be compiled.

The identification number can be determined in any form by the user. The only requirement in selecting these numbers, is that they be unique to each vehicle.

EQUIPMENT INVENTORY MODULE

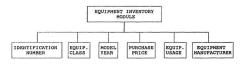


Figure 4.2

The equipment class is a description of the type of equipment being studied.

Appendix F gives a listing of most types of equipment used by public agencies.

The model year indicates when the vehicle was manufactured.

The purchase price is the original price paid by the public agency for the equipment. This will be used in the priority module.

The equipment usage is the annual number of hours the machine worked in a given year.

The equipment manufacturer is the producer of the equipment.

4.3 EQUIPMENT COST MODULE

The equipment cost module, is a record of annual equipment costs. Each of the equipment cost factors discussed in Section 2.0 will be incorporated into this module. This module consists of separate files which record the annual costs for each factor. They are then integrated into one file, where the total annual costs are compiled for use in the forecasting and replacement modules.

EQUIPMENT COST MODULE

OMNERSHIP COSTS OPERATING AND MAINTENANCE COSTS DOMNTIME COSTS TOTAL COSTS PARTS INVENTORY COSTS OBSOLESCENCE COSTS TRAINING COSTS TRAINING COSTS

Figure 4.3

The accuracy of the recorded data in this module is an important factor in the validity of the results obtained in the forecasting, replacement and priority modules.

4.4 FORECASTING MODULE

The forecasting module is the mechanism where equipment's future costs are predicted. Any of the forecasting techniques discussed in Section 3.1, can be used in this module. The primary objective of this module is to determine the predicted next year cost for use in the replacement and priority modules.

4.5 REPLACEMENT MODULE

This module utilizes data from the equipment cost module and forecasting modules discussed in Sections 4.3 and 4.4, respectively. The purpose of this module is to determine when equipment costs are minimum. Using data base functions, the module will provide the user with a listing of equipment replacement candidates. The candidates will then be used in the priority module.

4.6 PRIORITY MODULE

This is the final stage of the FRAPOF Model process. This module uses information from the equipment inventory, cost, forecasting and replacement modules, to provide the user with a priority listing of equipment to be replaced. The module calculates a replacement priority factor for each equipment replacement candidate. This factor is based on the following formula:

$$F_p = \frac{C_t + C_{t+1} - S_{t+1}}{P_t}$$
 Equation 4-1

Where

F_p = Priority Factor

C_i = Total Cost to Date Including Ownership Costs

C₁₊₁ = Forecasted Equipment Cost Next Year

- S_{t+1} = Salvage Value of Equipment Next Year
- P, = Purchase Price of a New Replacement Vehicle

This is the ratio of total equipment cost including the predicted next year cost to the purchase price of the new replacement vehicle.

Chapter 5

IMPLEMENTING THE FRAPOF MODEL

WITH AN EXISTING FLEET

5.1 INTRODUCTION

The FRAPOF Model described in Chapter 4, has been implemented with a publicly owned fleet consisting of 252 vehicles. The total value of this fleet has been estimated to be approximately \$15,500,000. This agency budgets \$1,500,000 annually for equipment replacement, but, this amount has been reduced in some years by as much as \$500,000 due to budgetary restraints.

The agency does use a fleet management model which was prepared by a consulting firm. The model did not perform up to the expectations of the agency. The model was modified by the agency's own staff to produce a fleet replacement priority list that was eventually acceptable to the agency.

This model continues to be used by the agency although it is uncertain if the model produces a true economic life cycle replacement program.

Annual capital budgets for the agency are approved during the months of April or May each year. Typically, once approval is given, tenders are called and equipment if finally received, a period of 6 months has passed. No method of forecasting is used by the agency that would allow for this delay in receiving the new equipment.

5.2 FRAPOF EQUIPMENT INVENTORY MODULE

The following section deals with the implementation of the equipment inventory module with the public agency. This module follows the format outlined in Section 4.2.

Appendix G shows the equipment inventory spreadsheet for this fleet.

5.2.1 Equipment Unit Numbers

The unit numbers chosen by the public agency were developed to provide the following information:

- Manufacturer
- 2. Classification of Equipment
- 3. Model Year
- 4. Identification Number

Figure 5.1 illustrates how the equipment unit numbers were developed by the agency.

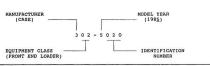


Figure 5.1

5.2.2 Equipment Classification, Model, Manufacturer, and Purchase

Price

This data is in the equipment inventory module for the purpose of quick reference for personnel not familiar with the unit number coding. By simply looking at each unit number, the user can get a description of the particular continuent item.

The purchase price of the equipment item is provided for two reasons:

- 1. It provides the user with a record of the equipment item cost.
- This data is used in the replacement module to determine the annual ownership cost of the particular unit. The ownership cost in this case is the annual depreciation of the equipment item.

5.2.3 Annual Usage Hours

The annual usage hours are included in this module for two purposes:

- It gives the user a record of annual usage on particular equipment items.
 These hours can be used by the fleet manager for the purpose of standardizing.
- the equipment cost of machines that have relatively low usage compared to other vehicles in the same classification. This is discussed in Section 2.2.7.

The annual usage hours for this agency's fleet were incomplete and, therefore, not used for analysis purposes in this model.

Figure 5.2 shows the first sheet of the equipment inventory module for this fleet.

			EQUIPM	EQUIPMENT INVENTORY MODULE	MODULE				PRESEN	PRESENT YEAR:		1991		
								<i>a</i> 1	ASTUR	LAST UPDATE:	_	NOV.15/91	=	
					ORIGINAL									
		EQUIPMENT			PURCHASE		- 2	ANNUA	USAGE	ANNUAL USAGE (HOURS)	(8)			
UNIT #	į	CLASS	MODEL	MANUFACTURER	PRICE	1963	1984	1984 1985	1986	1987	1968	1989	96	1981
ø	9013	Portable Compressor	1989	INGERSOL RAND	\$15,000									
9	9021	Portable Compressor	1989	INGERSOL RAND	\$15,000									
9	6806	Portable Compressor	1989	INGERSOL RAND	\$15,000									
ø	1101	Portable Compressor	1981	INGERSOL RAND	\$8,000									
8	109	Sidewalk Plows	1981	BOMBARDIER	\$35,000									
8	117	Sidewalk Plows	1961	BOMBARDIER	\$35,000									
8	125	Sidewalk Plows	1981	BOMBARDIER	\$35,000									
3	9290	Sidewalk Plows	1989	BOMBARDIER	\$55,000									
74	8194	Sidewalk Plows	1988	TRACKLESS	: 2,000									
7	6156	Sidewalk Plows	1986	TRACKLESS	3.3000									
7.	6222	Sidewalk Plows	1986	TRACKLESS	\$48,000									
74	7220	Sidewalk Plows	1987	TRACKLESS	\$50,000									
74	8202	Sidewalk Plows	1988	TRACKLESS	\$52,000									
4	9184	Sidewallk Plows	1989	TRACKLESS	\$55,000									
7	9168	Sidewalk Plows	1989	TRACKLESS	\$55,000									
102	7598	Londer	1987	MICHIGAN	\$118,000									
305	3512	Loader	1973	CASE	\$51.000									
102	7606	Loader	1987	MICHIGAN	\$118,000									
305	5608	Loader	1975	CASE	\$55,000									
202	0370													

Figure 5.2

5.3 FRAPOF EQUIPMENT COST MODULE

The following section discusses the implementation of the equipment cost module of the FRAPOF Model as described in Section 4.3.

5.3.1 Ownership Costs

The only ownership cost used by this agency was depreciation. This was calculated based on straight line depreciation as described in Section 2.2.1.1 using a Lotus 1-2-3 spreadsheet. Appendix H shows a typical ownership cost spreadsheet for this fleet, Figure 5.3.1 shows the first sheet of the ownership cost module for this fleet,

5.3.2 Operating and Maintenance Costs

Operating and maintenance costs (O&M) for the fleet were obtained from the agency's fleet cost data records. This data has been compiled by the agency since 1983. Information on equipment data prior to this date was not available. Figure 5.3.2 shows the first sheet of the O&M Cost Module for this fleet.

The O&M spreadsheet for this fleet is shown in Appendix I.

5.3.3 Downtime, Parts, Obsolescence, and Training Costs

The agency did not have cost data for any of these cost factors that was in a useful form. Any information available was either incomplete or inaccurate.

								_	LAST UPDATE:		NOV.15/91			
	E Cardination		ORIGNAL	į				i i		100				NEXT
WIT *	CLASS	MODEL	PRICE	EXPECT	1983	1981	1985	1986	1987	1988	1989	986	26	1982
6 9013	Portable Compressor	1989	\$15,000	7	0	0	0	0	0	0	2,143	2,143	2.143	2,143
6 9021	Portable Compressor	1989	\$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143
6 9039		1989	\$15,000	7	0	0	0	0	0	0	2,143	2,143	2,143	2,143
6 1101	Portable Compressor	1981	\$8,000	4	1.143	1.143	1.143	1.143	54.	1,143	0	0	0	0
6010 109	Sidewalk Plows	1981	\$35,000	9	5.833	5,833	5,833	5,833	5,833	0	0	0	0	
604 0117	Sidewalk Plows	1961	\$35,000	9	5,833	5,833	5,833	5.833	5.833	0	0	0	٥	
604 0125	Sidewalk Plows	1981	\$35,000	9	5,833	5,833	5,833	5,833	5,833	0	0	0	0	0
604 9290	Sidewalk Plows	1989	\$55,000	9	0	0	0	0	0	0	9,167	9,167	9,167	9,167
74 8194	Sidewalk Plows	1988	\$52,000	90	0	0	0	0	0	8,667	8,567	8,667	8,667	8,667
74 6156	Sidewalk Plows	1986	\$48,000	9	0	0	0	8,000	8.000	8.000	8.000	8.000	8,000	8,000
74 6222	Sidewalk Plows	1986	\$48,000	ø	0	0	0	8.000	8,000	8.000	8,000	8,000	8,000	8,000
74 7230	Sidewalk Plows	1987	\$50,000	9	0	0	D	0	8.333	8,333	8,333	8,333	8,333	8,333
74 8202	Sidewalk Plows	1988	\$52,000	90	0	0	0	0	0	8.667	8.667	8,667	8,667	8,667
74 9184	Sidewalk Plows	1989	\$55,000	9	0	0	0	0	0	0	9,167	9,167	9,167	9,167
74 9168	Sidewalk Plows	1989	\$55,000	φ	0	0	o	0	0	0	9,167	9,167	9,167	9,167
102 7598	Londer	1987	\$118,000	12	0	0	0	0	9,833	9,833	9.833	9,833	9,833	9,833
302 3512	Loader	1973	\$51,000	12	4,250	4.250	4.250	0	0	0	0	0	0	٥
102 7606	Londer	1987	\$118,000	12	0	0	0	0	9,833	9,833	9,833	9,833	9,833	9,833

ure 5.3.1

O & M COST MODULE

PRESENT YEAR: 1991 LAST UPDATE. NOV.15/91 YEAR

			•	ANNUAL EQUIPMENT O & M COSTS	OUIPMBY	TORMO	OSTS					TO-DATE
UNT.	EQUIPMENT CLASS	MODEL	1983	1984	1985	1986	1987	1988	1969	1980	198	COSTS
9013	Portable Compressor	1969						503	909	2,500	1.524	\$5,132
6 9021	Portable Compressor	1989							1,180	2,667	2.670	\$6.517
6 9039	Portable Compressor	1989							840	825	1,620	\$3,285
1011 9	Portable Compressor	1981	825	1.984	2,988	2,964	1,679	2,305	2,470	2,400	2,100	\$19,715
504 109	Sidewalk Plows	1981	6,012	5,867	16,588	14,169	14,479	15,140	15,060	22,120	12,430	\$121,865
504 117	Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,486	\$97,674
304 125	Sidewalk Plows	1981	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,656	15,520	\$103,514
304 9290	Sidewalk Plows	1989							7,305	6,811	18,845	\$32,961
74 8194	Sidewalk Plows	1988						18,964	19,950	47,450	42,354	\$128,718
74 6156	Sidewalk Plows	1986					17,343	19,393	25,150	26,235	14,400	\$102,521
74 6222	Sidewalk Plows	1986				5,747	24,819	25,002	22,430	28,233	20,469	\$126,700
74 7220	Sidewalk Plows	1987					10,716	22,144	22,013	10,715	15,200	\$80,788
74 8202	Cdewalk Plows	1988						16,990	16,032	23,280	16,200	\$72,502
74 9184	Sidewalk Plows	1989							8,070	47,435	4,644	\$60,149
74 9168	Sidewalk Plaws	1989							15,900	11,470	720,02	\$47.447
102 7598	Loader	1987						16,715	19,121	20,120	21,730	\$77,686
302 3512	Loader	1973	31,382	29,006	35,872	32,331	46,115	22,750	22,364	22,370	22,467	\$224,657
102 7606	Loader	1987						18,014	18,129	19,034	22,188	\$77,365
302 5608	Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,619	60,123	\$297,739
402 9369	Londer	1989							7,507	15,390	23.830	\$46,727

Figure 5.3.2

5.4 FRAPOF FORECASTING MODULE

The forecasting module used for this fleet, utilizes all cost data available in the equipment cost modules discussed in Section 5.3. The total equipment cost for each equipment item is compiled in this module. A forecasting model, using the method of least squares, calculates the total equipment cost for the "next year". Figure 5.4 shows the first sheet of the Forecasting Module for this fleet. Appendix J shows a typical module spreadsheet for this fleet.

5.5 FRAPOF REPLACEMENT MODULE

The FRAPOF replacement module uses data from the cost and forecasting modules, previously discussed, to determine if an equipment item requires replacement. From Figure 2.3, it can be seen that equipment costs are minimum when the difference in the equipment item's annual ownership cost and total equipment cost is minimum. The FRAPOF replacement module uses this theory to determine if equipment replacement is required. Figure 5.5 shows the first sheet of the Equipment Replacement Module for this fleet.

Appendix K shows a typical FRAPOF replacement spreadsheet for this fleet.

	PRESENTYEAR	1991								FORE	CASTI	NG	NO	DUL	ER	OR'	YE	R		1992							COST	EQUP.
					OLV	COSTS	RORTH	EYEAR												9.14	SUM		SW	S,M			TGN	COST
UNITE	EOUP. CLASS					14.00					-		-										m	-	COEFF.	CONST	YEAR	NEW
				-		,,,,,,,,							-	_	_	_												
6 9013	Parable Compresso	1989						503	65	2,500	1,524	0	0	0	0	0	1	3	4	9132	10	4	15309	30	468	405	252	100
6.908	Peribble Compressor	1989							1,180	2,567	2,670	0	0	0	0	0 0	1	1 2	3	6517	6	3	1637	14	150	5823	23,922	Dia
6 9039	Particle Compressor	1989							84	825	1,620	0	0	0	0	0 0) 1	1	3	1365	6	3	7350	14	300	3150	\$1,575	\$31,500
6 1101	Retable Compressor	1981	825	1,58	2986	23%	1,575	2305	2,00	2,400	2,100	1	2	3	4 :	5 6	1		9	15715	45	9	10022	25	TIS	13025	1259	\$20,500
504 109	Sdovak Pows	1981	6012	5,80	1558	14,18	14,65	15,140	15,550	22,120	12,430	1	2	3	4	5 6	1		9	1296	45	9	981E71	25	1258	75117	\$1550	12,00
SS4 117	Science Pores	1981	2,74	5,15	11,154	8,175	15,300	15,735	1578	13,065	146	1	2	1	4 :	5 5	1		9	994	45	9	55812	35	11427	5462	14.56	\$2,400
SM 125	Spievelk Ploves	1981	2/25	(72)	13573	530	20,045	14710	14.55	12,658	1550	1	2	3	4 !	5 8	1	8	9	1054	45	3	50525	25	1432	41E7	12,67	92,400
SN 1250	Scientik Flows	1985							7,355	6,811	18,845	0	1	0	0	0 0	1	2	3	236	- 6	1	77402	14	5700	-951	\$22,527	\$2,400
14 894	Simal Fore	1968						11,364	1930	9,480	Q384	0	0	0	0 (0 1	1	5	4	12718	10	4	STREET	30	9523	77923	98,90	92,400
74 635	Stovek Plovs	1986					17,343	19,253	Z	25,225	14,400	0	0	0	0	1 2	1	4	5	1000	15	5	30519	55	956	2007.4	\$20,791	\$2,400
74 6222	Sidnesh Poves	1966				5747	24,819	25,002	240	25,232	2,48	0	t	0	1 :	2 2	1	5	8	1370	21	6	400	8	2023	12000.7	\$3,26	\$2,400
74 7723	Sowak Pows	1987					10,716	214	22,013	10,715	15,200	0	0	0	0	1 1	1	4	5	576	15	5	200903	55	-361	19863	\$15,415	\$22,400
74 8222	Sdevalk Flows	1988						16,390	16,000	23,290	14,210	0	0	0	0 (0 1	1	3	4	71512	10	4	183614	20	Ø1	159060	\$19,345	\$22,400
74 9184	Scientik Plans	1989							8,070	47,435	454	0	1	0	0 1	0 0	1	2	3	60149	6	1	115872	14	-1701	234757	\$15,526	\$12,400
74 5168	Sdovalk Plans	1989							15,900	11,470	20,077	0	0	0	0 1	0 0	1 1	2	3	1740	6	1	99071	14	200.5	116387	\$13,995	\$2,400
102 7588	Lactor	1987						16,715	19,121	20,120	21,730	0	0	0	0 1	0 1	1	3	4	THE	10	4	202237	30	1534.4	15410.5	\$23,433	\$150,000
302 3512	Lorder	1973	21,382	25,006	3,972	u	48,115	22,750	22,354	2,570	240	1	2	3	4 !	5 6	1	8	9	MEST	45	9	891120	25	-38EA	443390	\$5,615	\$150,000
102 7656	Lasda	1967						16014	18,125	19,034	218	0	0	0	0 0	1	1	1	4	77305	10	4	20125	30	1307	15945	\$22,696	\$150,000
302 558	Lastier	1975	11/15	12,507	7,42	U.S.	43,00	5,724	38,802	12,619	90,123	1	2	3	4 !	5 6	1	1	9	273	45	9	1623006	洒	2785	218895	\$4,275	\$160,000
CC 553	Lorder	1969							7,507	15,290	23,500	0	0	0		1	1	2	3	477	6	1	109777	14	88.5	-703	57,69	\$160,000
42 537	Lorder	1989							875	14,535	71,799	0	0	0	0 0	0 0	1	2	3	453	6	1	1DES	14	787.0	967	200,004	\$150,000
102 802	Lorder	1986					225	323	35,40	31,155	R10	0	1	0	0 1	1 2	1	4	5	1500	15	5	5006	15	11965	2015	DE.EU	\$150,000
102 600	Lorder	1986					24,220	4,011	405	2,66	2,70	0	0	0	0 1	1 2	1	4	5	15336	15	5	4050	55	-205	333427	21,579	\$150,000

Figure 5.4

			1801		TISK	463	7										JUE.	MCC	EWEV	EPUC	MENTE	EQUIP	1		
		t	OU5	,	DATE:	ASTR																			
PUC																									
EQUP?																									
16:1	OST	ROR			55	DI CO	900	EUR	NEX.	ST A	HED				COSTS	UPIG	ASHPE	ONE	NX.	- 7	COST		EQUIPMENT		
10-0	×	181	1990	196	92	Œ	98	185	98	20	12	9	×	25	1988	1967	136	95	1984	192	181	NODEL	CUES	_	NT #
	100	154	250								101	174	107	sm						,	700	-	Portuite Compressor	gent.	
	_	_	250		-							_									-		Portació Carronecco		
			ES.																				Portalis Compressor	-	
			_	-	235	1,55	184	198	13%	55													Portable Compressor		
	136	2,400	22,120	15,060	15,140	1469	K/IS	1,58	5,907	572	٥	0	٥	0	0		5,832	1,007	7,500	22,223	ga	1581	Sidewall Plevs	135	554
	11.55	1,48	12,065	15,760	15,735	1EE	8/75	1,54	5/3	178	0	0	0	0	0		5,82	1,007	7,500	22,20	200	1881	Sidewall Plans	117	924
,	11,55	100	12,550	14,556	14710	2006	530	un	ÇE	228	0	0	0	0	0	0	5,52	UE	2,500	22,30	200	1981	Science Port	125	954
	D.EC	235	san:	7,35							1500	KE.	600	5,00	0	0		0	0		200	1989	Sdewall Plans	930	104
	KS	Q.SH	0,60	13,73	136						033	B.B	35	em	200			0	0		240	188	Science Pows	BISK	78
	279	14.40	200	z,s	133	930					0	tim.	120	3,00	2,000	4000	4,00	0	0		5/0	986	Science Pows	619	'n
5	320	15	225	ZŒ	52	3435	99				0	ŲM.	Œ	3,00	2,000	4,00	4周	0	0		2,00	1986	Science Pows	822	74
9	541	520	1075	ZO	214	1276					(A)	15,00	230	1,333	4,50	5,00			0		50	907	Science Pows	725	×
6	SX	15,22	220	1500	15,000						7,22	2,2	100	qm	2,000	0		0	0		ga.	1988	Science Pows	22	N
4	12	454	9,65	UN							252	Æ	600	5100	0				0		20	199	Sidewall Plans	994	74
0	138	zm	11,00	15,00							232	U.E	6 III	5,00	0	0		0	0		5,00	1986	Sidewall Plans	912	74
13	23,03	21,780	23,33	19,721	12715						2/3	71.55	H300	2.33	E/E	118,000	0	0	0	0	15,000	1987	Loader	758	2
15	5,61	2,40	2,51	236	279	400	Ų	SER	B),BB	IJ	0	0	0	0	0	0		0	4,250	8,50	15,00	1573	Loader	3512	W
18	72,55	2,98	19,004	13,73	1824						E,III	TUE	0,52	2,33	2,67	118,000		0	0		15,00	1987	Lade	7506	Œ
15	4,3	E, C	12,812	X,E	270	40	3,32	I,E	12,50	1,15			0	0	0		432	1/5	13.750	18,22	15:30	1975	Loader	500	Z
	2,5	73,53	15,38	7,50							EST	9,5	TE DE	1200					0	1	EM	1989	Leader	\$35	æ

Figure 5.5

5.6 FRAPOF PRIORITY MODULE

The order in which equipment, identified for replacement in the previous section, is to be replaced is determined in the FRAPOF priority module. This module determines a priority factor for each equipment item based on the ratio of the sum of the total equipment costs to date, to the cost to purchase a similar new equipment item. This is shown in Equation 4-1. This module also provides the user with a cumulative purchase price column, where any budgetary cut-off line can be drawn. Figure 5.6 shows the first sheet of the Equipment Replacement Priority Module for this fleet. Appendix L shows a typical priority module spreadsheet for this fleet.

5.7 DISCUSSION OF FRAPOF RESULTS FOR THIS FLEET

If all equipment listed on the priority module spreadsheet were to be replaced, the total monies required would be \$10,160,000. The annual equipment budget for this agency is \$1,500,000. It is obvious that this agency will have to increase its annual equipment budget, if it is to take advantage of the benefits of the economic life of its equipment. Mechanical repair costs for this fleet are likely to increase if equipment replacement is performed at its present rate. It is incressing to note that the total monies required for mechanical repairs to equipment in this fleet is approximately \$4,900,000 per year (1991 dollars).

		OUP	ENTRE	PUCE	VEN	PRO	RTY	000	E										RES	NT SE		8		
																			Б.	PARE		NOV SE	4	
							100	SU	GW	ue.			ROFE-			RNA	LEDIR	veri	DENC	22		RIE-		Dies
			222										OST									DET	ROSTY	UNE
	EQUIPMENT CLASS IN			192	198	1965	95	1967	22	195	1990	21	Œ	123	8 2	125	æ	138	25	×	30	æ	ROTOR	18/00
	1/2 Ter Pokup				1	1,510	1,15	475	135					_	239	474	DIE	15,005	52	955	229	19304	610	143
11 528	One Iss Tuck	1985	125,400			1,200	980	6,500	130						1,50	5284	LE:	238	1556	11.53	21,279	22.00	(23)	25.5
10 6152	1/2 To: Polup	1985	\$14,700			0	10,000	7,500	5,000	2,500	0					1,239	526	6,300	170	1420	15,300	\$1725	4571	143
12 524	VAV	1985	\$17,500			2,400	130	6,200	1/00						5,05	105	584	1124	1255	1156	236	2112	456	E
TO THE	1/2 Tan Pokup	1987	\$14,700		1	0		12200	1,900	5,520	1.0	1					220	1350	1350	889	11,400	110	4333	22
11 5294	One for Took	1985	125,400			1200	130	6,500	3,530		0				3,175	7,500	7,750	5,03	1450	12,300	11,010	2557	4296	\$12
11 846	One for Took	1988	12,400	0					14,500	11,120	7,400	1700						8,75	1314	230	2,53	22(4)	4215	122
10 621	1/2 Ton Rokup	1985	\$14,700	0	1	0	10,000	7.500	5000	2,50	0						(8)	14,23	1254	1274	9,190	\$1,15	4,173	13.
10 624	1/2 To: Pokup	1986	\$14,700				10,000	7,500	5,000	2,500	0					3271	270	9,40	104	1225	155	2,85	419	12
11 852	One fur Truck	1988	125,400						14,500	11,100	7,400	170						13,00	20,03	19,59	11,412	SILE	422	\$172
100 620	1/2 Ton Rokup	1986	21/700		1		1000	7,500	5000	2,50							434	11,00	11,72	825	11,150	\$12.23	430	\$50
10 5281	1/2 Tot Rokup	1985	24,700			1,500	7,05	4750	255						2,04	122	13	8,55	1,9	178	11,000	\$13,15	1352	12
227 5128	Compact Cars	1985	24,000		:	1,00	126	540	350	1,50	:						138	5,12	130	124	ne	\$150	15	135
Q8 62H	Wate lake	1986	12,000		1	0	QH	Z	M	21,50	14,332	15	9			1,75	12,28	3,33	XX	200	200	\$120	354	22
111 536	One for fluck	196	14,00				12,50	9,375	123	1,15							121	7,60	7,59	12/2	1580	\$1750	138	15
210 710	1/2 Ton Rokup	1967	24700		0	0		220	u	655	1,300		- 6				181	1,70	119	178	148	125	127	578
27 516	Compact Cars	1965	24,000			1,00	120	540	35	1,50							138	12	i Lit	7,18	155	1831	132	215
10 7118	1,2 Tor Possp	1967	24700	1	-			12,200	SEE	550	130		1				286	50	1 55	1,00	1257	200	120	10
18 Stric	Congresor - Mouri	1965	25,000			1,00	1274	11,63	84	SE	451	125			143	157	148	122	128	11,55	12/9	158	130	\$5
ne 515	5 Ten Gump Truck	1965	15,000	1	. 0	2,50	22	FE	SM	12,50						I,E	EE	2,5	9,21	9,2	R.D	ME	110	12
11 848	One for floor	1988	2200						14,00	11,10	7,400	UE						U	14	12	152	1137	12	12
Ø 25	15 Youledonals	192	2300	400	QH	EM	2E	2,00	1400	7,38				E	2,0 3,3	12,55	3/2	5,0	9,0	200	954	HE	12	170
211 850	One for flock	1988	12.00		-				100	11.10	7.42	170						749	15	11.25	5 1834	3 21250	1 1979	172

Figure 5.6

As one would expect, the equipment replacement priority list in Figure 5.6 shows most of the older machines as those with the highest priority to be replaced. This is because the saivage value of these vehicles is minimal and total maintenance costs are high. In cases where, a younger machine has a high replacement priority, the maintenance costs for these vehicles have been extremely high compared to vehicles of the same age in the same classification. The fleet owner may then be required to have a closer look at the machines and use good judgement before replacing such vehicles.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

There are many challenges facing fleet managers in the 1990's,[20] Equipment is becoming more and more expensive to buy as well as maintain. To ensure monies allocated for fleet replacement are spent in a cost effective manner, the fleet manager must use an appropriate equipment replacement model.

A 1992 survey of public agencies indicated that most agencies do not receive the funding required to replace all equipment scheduled for replacement. In all cases, the respondents did not have a quantitative method of determining the priority of such replacements. Forecasting of future equipment costs was also an area not considered by these agencies.

The criteria used to determine a fleet replacement plan vary depending on whether the fleet being analyzed is publicly owned or privately owned. For publicly owned fleets, age, mileage, operating and maintenance costs, politics and safety are important. For privately owned fleets, depreciation, price, replacement timing, mileage, operating and maintenance costs, taxes, safety and company image are of primary importance. The respondents of the 1992 survey indicated that the criteria used by them were age, mileage, equipment costs or some combination of these factors.

Many fleet management software packages are available to the fleet manager from software vendors. The flexibility of these packages was found to be a problem for some agencies. It has been stated that most computerized fleet management packages are not appropriate for municipal applications. Despite the variety of programs and systems available, many facts and fantasies arise after these systems are implemented.

Three types of analysis techniques are available to the fleet manager. They are the life cycle cost method, the interval life method and commercially prepared nomographs. Each of these methods involve varying levels of complexity. The type of method used by the fleet manager depends on the requirements of the public agency. Each method requires accurate equipment data. The validity of the fleet replacement plan produced, is denendent on the accuracy of this equipment data.

Forecasting of future equipment costs will help the fleet manager decide when equipment should be replaced before the end of its economic life. This will give the fleet manager the lead time necessary to order the new equipment and avoid any unnecessary expenditure on old equipment selected for replacement in the near future. Several forecasting techniques are available. Some of these include; the method of least squares, second degree polynomial curve fitting, logarithmic trend lines, moving averages, exponential smoothing and Box-Jenkins methods.

Fleet replacement analysis for publicly owned fleet (FRAPOF) should have the following characteristics:

- 1. It should be adaptable and easily modified by the user.
- 2. It must compile equipment data in a logical and concise manner.
- 3. It must have for casting capabilities.
- 4. It must provide the user with a replacement priority list.

A fleet replacement model for publicly owned fleets (FRAPOF) proposed in this thesis, consists of five modules. These modules are:

- 1. The Equipment Inventory Module
- 2. The Equipment Cost Module
- 3. The Forecasting Module
- 4. The Fleet Replacement Module
- 5. The Priority Module

This model was used with an existing fleet of approximately 252 vehicles. The results of the equipment replacement analysis indicates that increased funding should be allocated to this agency's equipment budget.

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APPENDIX A

THE FLEET REPLACEMENT QUESTIONNAIRE

QUESTIONNAIRE

1.	What method of Fleet Replacement Analysis does your organization use?
2.	Does your organization use computer software for Fleet Replacement Analysis? (Please specify.)
3.	Does this software do everything you would like it to do with respect to Fixed Replacement Analysis? (Please specify.)
4.	Does your organization receive sufficient funds each year to replace all equipment which should be replaced, according to your Fleet Replacement Analysis?
5.	If the answer to 4 above is $\underline{N\Omega},$ how do you decide the order in which equipment is to be replaced?
6.	Who is responsible for Fleet Management in your organization? NAME: ADDRESS: PHONE: FAX:

APPENDIX B

COMMERCIALLY AVAILABLE FLEET MANAGEMENT SOFTWARE

Analysis of Software

The following appendix provides information on software packages presently available for fleet management purposes. The software listed shows the program name, vendor, memory required, hardware requirements and a synopsis of the software.

Program name: AGECON

Vendor: Oliver Marketing Inc.

Suite 704

3455 Drummond Street

Montreal, Quebec

H3G 2R6

Memory required: 256K

Hardware: IBM-PC and iBM Compatible

Synopsis: Fleet replacement program which provides the user with information on when the economic replacement time occurs for specific equipment items. User required to input the purchase price of new similar equipment, operating and maintenance costs, and approximate resale value of existing equipment. Inquire for price. Program name: MESIS

Vendor: ACT Computer Services Ltd.

1735-170 Street

Edmonton, Alberta

Canada T5M 3W7

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: Six modules for fleet management including fleet information and control; servicing and repairs, fuelling and preventative maintenance fleet safety, revenue

accounting and fleet support. System design and application determines price, so inquire

vendor.

Program name: EZ-FLEET

Vendor: ATE Management & Service

Technical Products Division 617 Vine Street / Stc.800

Cininatti, OH 45202

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Tandy 1000, 1200, 2000

Synopsis: Hand-held data collector inputs vehicle check to personal computer. Reports

service flow by station, daily servicing statistics, exception report (vehicles not serviced),

pm schedule, fluids usage exception report.

Program name: VEHICLE CONTROL PLUS

Vendor: Burke & Associates

14291 east Fourth Avenue

Suite 270

Aurora, Co 80011

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT, recommended 10 MEG Hard Disk

Synopsis: Interactive fleet management system. Processes single or multiple work orders. Allows reporting of history, repair order logs, fuel/oil purchase logs, PM schedu-ing with other sort capabilities. APWA, ATA or user defined classifying codes.

Program name: BTML/EMS

Vendor: Byrd, Tallamy, MacDonald and Lewis

2921 Telestar Court

Falls Church, VA 22402

Memory required: 56K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Inventory, pm scheduling and work orders, maintenance and repair tracking (by unit), shop management analysis (productivity and resource use), total user costs (by equipment class: operating expenses; overhead, depreciation, and replacement costs. Program name: EQUIPMENT MANAGEMENT

Vendor: Carter Associates Inc.

2835 Camino Del Rio South

San Diego, CA 92108

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Data base manager. Includes fleet inventory, fuel and repair tracking, performance analysis, pm scheduling. Inquire vendor for price.

Program name: FLEET MANAGER

Vendor: Chesapeake Computer Group

600 Court Street

Portsmoth, VA 23704

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT; Apple II; requires hard disk.

Synopsis: Sepa:ate dbase modules include (1) accounting-billing, purchase history by part, life cycle costs for equipment-units and classes (2) parts inventory; monitors stock;

(3) fuel/oil consumption; (4) cost analysis; (5) pm scheduling, and (6) repair analysis.

Program name: TREMAIN

Vendor: Cochrane Associates Inc.

Consulting Engineers

236 Huntington Avenue

Boston, MA 02115

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Apple

Synopsis: An equipment information, preventative maintenance scheduling and inventory management program. Price is for a lease/purchase plan. \$500 to \$800/month.

Program name: CFA-VHRS

Vendor: Computerized Fleet Analysis Inc.

205 West Worth Avenue

Villa Park IL 60181

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Tracks equipment maintenance and operating costs, analyzes repair detail, controls part inventory costs and analyzes part usage. Four modules: cost listing;

maintenance reporting; detailed inventory listing; part usage tracking.

Program name: CON-TRONIX III

Vendor: Con-tronix

3663 East Garden Place

Oak Creek, WI 53154

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Covers equipment records and reports, parts inventory, generation of work orders. Created for wastewater treatment plant maintenance management.

Program name: MCMS

Vendor: Control Software Inc.

993 Old Eagleschool Rd.

Wayne, PA 19087

Memory required: 640K

Hardware: IBM 43XX, 30XX, OR 9370

Synopsis: Six mainframe modules for fleet equipment maintenance and support. Includes parts purchasing, warranty management, fluids, labour, tire control. Can handle

from 50 to 10,000 pieces. Some applications for personal computer. Inquire vendor.

Program name: TIMS

Vendor: Coverdale, Gary

Bispac Systems

9256 Madison Avenue

Orangevale, CA 95662

Memory required: 256K

miles.

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Vehicle maintenance reporting system which is work order driven. Maintains inventory levels and costs, computes costs per operating mile for each vehicle, broken down by parts, labour and fuel loads. Can establish PM alerts based on calendar or

Program name: VMS

Vendor: Creighton, Rogerand Assoc.

274 Deleware Avenue

Delmar, NY 12054

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT

Symopsis: Provides vehicle data, including historical usage, fuel consumption, Y-T-D maintenance costs by vehicle component, tire mileage, key performance indicators and pm warnings; also fleet analysis on usage, fuel, maintenance costs. Also tire inventory report. Program name: School Bus Management System

Vendor: Creighton, Roger Assoc.

Memory required: 128K

Hardware: IPM-PC, PC/XT, PC/AT

Synopsis: provides vehicle data, including historical usage, fuel consumption, Y-T-D maintenance costs by vehicle component, 'ire mileage, key performance indicators and pm warnings; also fleet analysis on usage, fuel, maintenance costs. Also tire inventory report.

Program name: GEMS

Vendor: Diagonal Data

9700 Newton Avenue

Bloomington, Mn 55431

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Six modules which integrate for management of fleet maintenance. Includes parts, fuel, equipment inventories. Tracks work orders, job costing. Provides exception reporting, equipment status, vehicle specification., equipment replacement. Inquire price. Program name: VEHICLE CTRL, VMRS

Vendor: Display Data Corporation

Executive Plaza IV

Hunt Valley, MD 21301

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Apple II+, Apple IIe

Synopsis: For 130 to 3500 units; analysis by unit of fuel/oil consumption, running and renair costs and repair order analysis; designed for truck fleets.

Program name: Equipment Maintenance Management System

Vendor: Elke Corporation

998 Zane Ave., N.

Golden Valley, MN 55422

Memory required: 256K

Hardware: IBM-PC, PC-XT, PC-AT

Synopsis: Functions include machine specification tracking, preventative and predictive maintenance scheduling, component repair/cost history tracking. May be used in

manufacturing, processing, mining, construction, municipalities and transportation fields.

Program name: Vehicle Cost Analyzer

Vendor: Ernst & Whinney

1225 Connecticut Ave., N.W.

Washington D.C. 20036

Memory required: 128K

Hardware: IBM-PC, PC-XT, PC, AT; requires fixed disk.

Synopsis: Computes life cycle costs. Compares vehicles cost under alternative purchase decisions; maintenance policies; and replacement decisions. Facilitates sensitivity analysis of critical assumptions regarding inflation, capital costs, etc. Inquire price.

Program name: Fleet Controller

Vendor: Fleet Computing International inc.

P.O. Box 14698

Albuquerque, NM, 87191

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT; required hard disk

Synopsis: Uses MDBS, specialized database system to track systems, fluid usage (diesel fuel, engine oil, automatic transmission fluid) schedule pm, provide vehicle inventories, mechanic seniority lists, etc. Inquire vendor for price. Program name: FLEET COST CONTROL

Vendor: Fleet Distribution Inc.

P.O. Box 98704

Atlanta, CA 30329

Memory required: 64K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Fleets from 10 to 1000 units. Output from daily fuel and repair data: (1) mileage and fuelling history; (2) fuel costing and disbursement, (3) unit repair history, and (4) analysis of shop outside vendor costs, mechanic hours.

Program name: Fleet Tracker/PC

Vendor: GTE Data Services

First Florida Tower

P.O. Box 1548

Tampa, FL 33601

Memory required: 640K

Hardware: IBM-PC, PC/XT; 20 MB hard disk

Synopsis: Tracks fleet maintenance operations: pm, repairs, parts inventory, mechanics, vendors, labour, parts location. Multi-user version can produce 80 reports. Inquire price from vend.r.

Program name: MAINSAVER

Vendor: J. B. Systems, Inc.

21600 Oxnard St./#640

Woodland Hills, CA 91367

Memory required: 256K

Hardware: IBM-PC, HP-PC, Microdata PC, Wang PC, A T & T PC

Synopsis: Can generate corrective and pm work orders, tracks inventory and labour by equipment or facilities, maintenance history reports and cost reports. Vendor information management and automatic parts re-ordering optional. Inquire for price.

Program name: MAINTENANCE MANAGEMENT SYSTEM

Vendor: Jentech Controls, Inc.

Route 1, Box 93

Gresham, WI 54128

Memory required: 128K

Hardware: IBM-PC, XT, and IBM compatibles; Apple IIe

Synopsis: For up to 500 pieces of equipment; Five functions: (1) Manufactures information; (2) PM: scheduling by date or run hours; (3) Equipment run hours; (4)

Work history; (5) Parts inventory; by part number, location, reorder report.

Program name: FLEET MAINTENANCE MODULE

Vendor: LWFW Group - GTE Intech

12700 Park Central /#1805

Dallas TX 75251

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Compiles vehicle/equipment data; tracks preventative/predictive programs; analyzes proposed capital investments; relates resources to accomplished work; tracks

employee performance; schedules work, analyzes services levels.

Program name: CHRIS

Vendor: MCS Group, Inc.

2465 West Chicago

Rapid City, SD 57702

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Tracks equipment usage and coats. Equipment make, model, serial number, plus maintenance scheduling, depreciation, MTD, YTD, accumulated direct cost breakdowns, repair & fuel costs per mile/hour. Cash flow budgeted expenses, etc. vs.

actuals. Inquire price.

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Program name: FLEET COMMAND

Vendor: Mainstem Corporation

130 Sewaren Avenue

Sewaren, NJ 07077-1299

Memory required: 640K

Hardware: Unisys B25

Synopsis: Ten modules for fleet management and support including equipment records, work order processing, mechanic productivity, pm scheduling, vendor info, parts inventory, fuel usage, billing. Primarily mainframe, but some p.c. applications.

Inquire.

Program name: FLEET*MATE

Vendor: Multisystems, Inc.

1050 Massuchusetts Avc.

Cambridge, MA 02138

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required

Synopsis: Processes work orders, tracks daily mileages, fuelling, inspections repairs, vehicle histories. Maintains parts inventory; prompts user to reorder; posts costs and quantity adjustments; reports servicing, lists work orders. Inquire vendor for price.

Program name: VEMS

Vendor: National Business Control Systems

12703 A Research Blvd.

Austin, TX 78759

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Uses standard data codes developed by American Trucking Association. Features unit maintenance history, unit costs, cost per mile, hour or day, tracks life warranties and normal service expectations.

Program name: Penton/Maintenance series

Vendor: Penton Software Inc.

420 Lexington Ave.

Suite 2846

New York, NY 10017

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Four modules. I: scheduling, systems management; II: equipment history, purchase order tracking, spare parts; III: fixed asset system, warranty forms design; IV: voice recognition and maintenance capabilities. Inquire vendor for price.

9:

Program name: EMS/PC

Vendor: Prototype Incorporated

S R Box 170 MKB

Kamuela, Hawaii 96743

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Fleet management program adapted for PC. Tracks parts and fuel, maintains dbase of work and purchase orders, keeps pm and repair histories, analyses labour, costs

for repair and pm. Reports fuel and oil consumption.

Program name: LANTA PARTS INVENTORY PACKAGE

Vendor: TIME Support Center

Vanderbuilt University

P.O. Box 1563, Station B

Nashville, TN 37235

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk recommended.

Synopsis: Uses dbase II, version 2.4. Parts inventory and analysis. Allows maintenance manager to track parts, quantities, locations. Best for small/medium sized transit agencies. Monitors incoming-outgoing parts, vendor info., value of current

transit agencies. Monitors incoming-outgoing parts, vendor into., value of curr

inventory.

Program name: UTILFLEET

Vendor: Tecnomics Micro Software

100 Ardmore Street

Blacksburg, VA 24060

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT, Radio Shack TRS-80

Synopsis: Monitors fuel, scheduled maintenance, repairs, insurance, licences, depreciation, and two other costs the user specifies. Computes and prints an individual report for each vehicle that shows itemized and total costs; produces cost comparison charts.

Program name: FLEET MAINTENANCE SYSTEM

Vendor: Turley, Ron and Associates

1642 West Sequoia

Phoenix, AZ 85027

Memory required: 128K

Hardware: IBM-PC, PC/XT, PC/AT; Novell Netware

Symopsis: Tracks vehicle costs, aids preventative maintenance scheduling; provides repair history. Also includes repair order system, fuel inventory and control, parts inventory. Optional: tire inventory and control; fuel state tax reporting. Price varies.

Program name: TASKFORCE

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1299

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: One of four modules for fleet equipment maintenance management. Processes work orders; reports on exception; forecasts future pm; controls shop work; organizes

backlog by priority & estimated labour. Inquire price from vendor.

Program name: VehicleCTRL

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1299

Princeton, NJ 08542

Memory required: 640K

Hardware: Apple (130 units); IBM-PC (600 units); IBM-PC/XT (3500 units)

Synopsis: Automatically updates repair orders, fuel/oil purchases, and pm entries to

appropriate unit record. Schedules pm up to one year. Reports vehicle histories, repair

order logs, etc. Analyses total running costs for each vehicle. Inquire price.

Program name: DATAFORCE

Vendor: Uniforce Corporation

P.O. Box 1229

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM- PC, PC/XT, PC/AT

Synopsis: One of four modules for fleet equipment maintenance management. Equipment data base including mechanic skills and personnel data. Also labour performance & analysis, parts, labour, fuel audits; budget allocation, replacement analysis.

Program name: PARTSFORCE

Vendor: Uniforce Corporation

Fleet Management Systems

P.O. Box 1229

Princeton, NJ 08542

Memory required: 640K

Hardware: IBM-PC, PC/XT, PC/AT; hard disk required.

Synopsis: One of four modules for fleet equipment maintenance management. Uses

VandeMark Methods for inventory control and forecasting; calculates EOQ, order points,

safety stock; tracks purchase orders; parts issues and transfers. Inquire vendor for

prices.

Program name: MMS-II

Vendor: Unik Associates

12545 W. Burleigh

Brookfield, WI 53005

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Integrated system which produces pm schedules, work orders, parts and labour costs, equipment history, repair cost summary, downtime summary, parts

inventory on hand, reorder points, and usage history.

Program name: MAINTENANCE MANAGEMENT

Vendor: Unik Associates

12545 W. Burleigh

Brookfield, WI 53005

Memory required: 128K

Hardware: IBM-PC, Apple IIe

Synopsis: Allows you to maintain records and generate reports on equipment history and pm, work orders and productivity, inventory control. Equipment history includes

manufacturer, model, purchase date and location for each piece of equipment.

Program name: FMS: Fleet Maintenance Program

Vendor: Vector Solutions

1355 Terra VistaLane

Colorado Springs

Colorado 80911

Memory required: 256K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Covers six main service areas including work order, tire use, part use, fluid (fuel, oil, coolant, ATF, PSF) use, pm, and mechanic labour services. Manual anadem

disk for \$25.00. Inquire vendor for price.

Program name: FLMS

Vendor: Wood Technologies

4550 Kearny Villa Rd.

Suite 118

San Diego, Ca 92123

Memory required: 512K

Hardware: IBM-PC, PC/XT, PC/AT

Synopsis: Nine modules for integrated fleet equipment maintenance management

including work orders, pm, emissions certification, labour analysis, pool vehicle, bulk

fuel accounting, mechanic work assignments, vehicle analysis and charge back. Inquire.

APPENDIX C

EQUIPMENT REPLACEMENT ANALYSIS USING AVERAGE ANNUAL EQUIPMENT COST

98

Replacement Analysis Worksheet

 $\label{eq:max_max_max_max_max_max} \mbox{Mean Annual Cost} \quad \mbox{MAC}_{\mbox{\scriptsize R}} = \frac{\mbox{\scriptsize P} \cdot \mbox{\scriptsize S}_{\mbox{\scriptsize R}} + \sum\limits_{\mbox{\scriptsize T}=1}^{\mbox{\scriptsize R}} \mbox{\scriptsize X}_{\mbox{\scriptsize T}}}{\mbox{\scriptsize R}}$

(1) Year	(2) Original Purchase Price	(3) Resale or Salvage Value	(4) Depre- ciation	(5) Total Yearly Cost	(6) Cummu- lative sum of Col. 5	(7) Total Costs	(8) Replace- ment Period	(9) Mean Annual Vehicle Costs
[1]	[P]	[S,]	[(2)-(3)] [P-S _K]	[X,			[R]	[(7)÷(8) [MAC _R]
ı	16,500	10,627	5,873	4,856	4,856	10,729	1	10,729
2	16,500	6,844	9,656	5,877	10,733	20,389	2	10,195
3	16,500	4,408	12,092	7,299	18,032	30,124	3	10,041*
4	16,500	2,839	13,661	8.520	26,552	40,213	4	10,053
5	16,500	1,828	14,672	9,741	36,293	50,965	5	10,193
6	16,500	1,177	15,323	10,963	47,256	62,579	6	10,430
7	16,500	758	15,742	12,184	59,440	75,182	7	10,740
8	16,500	488	16,012	13,306	72,746	88,758	8	11,095
9	16,500	315	16,185	14,427	87,173	103,358	9	11,484
10	16,500	203	16,297	15,448	102,621	118,918	10	11,892

^{*} APWA Equipment Manual

APPENDIX D

OTHER EXPONENTIAL FORECASTING METHODS

Double and Triple Exponential Smoothing

The concept of exponential smoothing can be extended to certain cases where the demand changes over time. In Chapter 3, equation 3-16 gives the relationship for single exponential smoothing. If this formula is applied to the output of the initial smoothing function, this implies double exponential smoothing has occurred. This process can be repeated again so that triple exponential smoothing is achieved. These processes can be shown by the following equations, [21]

$$S_t = \alpha X_t + (1 - \alpha) S_{t-1}$$

$$S_t^2 = \propto X_t + (1 - \propto) S_t^2$$

$$S_t^3 = \alpha X_t + (1 - \alpha) S_t^3$$

Brown's Linear Exponential Smoothing

This linear-exponential smoothing technique uses the following rational. Since both single and double smoothing values log the actual data whenever a trend exists, the difference between these two values can be added to the single smoothed value and adjusted for trend. The basic equations used in this process are:

$$S_{t}^{1} = \propto Y_{t} + (1 - \propto) S_{t+1}^{1}$$

$$S_1^2 = \propto S_1^1 + (1 - \propto) S_{1,1}^2$$

Where

S1 = Single Smoothed Statistic

S2 = Double Smoothed Statistic

Winter's Method

This method applies the smoothing process three times:

- 1. To estimate the average value of the time series.
- 2. To estimate the trend component.
- 3. To estimate the seasonal index.

Each of the three stages has its own smoothing constant which can be adjusted as the situation warrants. These individual modifications can be made to any one of the constants without having to alter the others.

Adaptive-Response-Rate Exponential Smoothing

This method is conceptually similar to single exponential smoothing. The only difference is that the value of the smoothing constant varies. The value of α adapts automatically whenever a change in the data pattern dictates that a change is desirable. The advantage of this method is that it

is capable of representing almost all data patterns. The basic equation for adaptive-response-rate exponential smoothing is:

$$\hat{\mathbf{Y}}_{t+1} = \boldsymbol{\alpha}_t \, \mathbf{Y}_t + (1 - \boldsymbol{\alpha}_t) \, \hat{\mathbf{Y}}_t$$

Holt's Exponential Smoothing

Using this method, the trend present in the time series is dealt with by a smoothing constant that is different from the smoothing constant applied to the actual observations. This technique gives some extra flexibility to the analyst but it requires the use of two smoothing parameters. Since two parameters must be quantified, the trial and error process of finding the best combination of parameters may be costly and time-consuming. The basic equations in this method are:

$$S_{t}^{h} = \alpha Y_{t} + (1 - \alpha) (S_{t-1}^{h} + C_{t-1})$$

 $C_{t} = \beta(S_{t}^{h} - S_{t-1}^{h}) + (1 - \beta) C_{t-1}$

APPENDIX E

BOX-JENKINS SOFTWARE PROGRAMS

104 Software Vendors of Box-Jenkins Programs

		Program	Type of	Batch/
Organization	Address	Name(s)	Models	Conversational
Applied Decisions Systems, Inc.	33 Hayden Ave. Lexington, MA 02173	SIBYL/RUNNER	Univariate and Multivariate	Conversational
Automatic Forecasting Systems, Inc.	P.O. Pox 563 Hathoro, PA 19040	PACK Systems and AUTOBJ	Univariate and Multivariate	Conversational and Batch
Gwilym Jenkins & Partners Ltd	1700 Echo Trail Norman, OK 73069	GENISIS	Univariate and Multivariate	Batch
IBM Corporation	Data Processing Division 1133 Westchester Avenue White Plains, NY 10604	APL Forecasting and Time Series Analysis	Univariate and Multivariate	
Charles R. Nelson Associations, Inc.	4921 N.E. 39th St. Scattle, WA	PDQ, et al.	Univariate and Multivariate	Conversational and Batch
SAS Institute, Inc.	P.O. Box 8000 Cory, NC	SAS	Univariate and Multivariate	Conversational and Batch
Computing Associates, Inc.	P.O. Box 625 DeKalh, IL 60115	The SCA System	Univariate Multivariate	Conversational and Batch
Statistical Laboratory, Iowa State University	c/o Bill Meeker Route I Ames, IA 50010	TSERIES	Univariate	Batch
BMDP Statistical				
Software, Inc.	1964 Westwood Boulevard Suite 202 Los Angles, CA 90025	BMDP	Univariate Multivariate	Conversational and Batch

APPENDIX F

PUBLIC AGENCY EQUIPMENT TYPES

Equipment Typically Used by Public Agencies

Portable Compressors Snow Blower Attachments

Sidewalk Plows Self Contained Snow Blowers

Loaders Compressor Trucks

1/2 Ton Pickups Rollers

I Ton Pickups Dozers

Vans Pothole Patchers

Small Pickups 5 Ton Dump Trucks

Garbage Trucks Tandem Dump Trucks

Graders

Sewer Drags

Tanker Trucks Sewer Jet

Automobiles Vacuum Trucks

Excavators Line Painters

Backhoe Loaders Gang Mowers

Street Brooms

APPENDIX G

FRAPOF EQUIPMENT INVENTORY MODULE

Instructions for Use of FRAPOF Model

The FRAPOF model consists of two groups of files on diskette. One group consists of the equipment cost files, the other group consisting of the analysis files. Each cost file contains data about the various cost factors described in previous chapters. The data in each of the cost files can be combined into one file called "ALLCOST.WK1" for use with the analysis files. This is done using the LOTUS command "FILE-COMBINE-ADD". The cost data files to be combined are as follows:

- 1. O&MCOST.WK1 operating and maintenance costs
- DOWNTIME.WK1 downtime costs
- 3. PARTCOST.WK1 parts inventory costs
- 4. TRAINING.WK1 training costs
- 5. OBSOCOST WK1 obsolescence costs
- 6. OWNCOSTS.WK1 ownership costs

The analysis files consist of the following files:

- 1. EQUIP91,WK1 1991 equipment inventory file
- 2. ALLCOST.WK1 total equipment costs
- 3. FORECAST.WK1 forecasting module
- 4. REPLACE.WK1 replacement module
- PRIORITY, WK1 priority module

A description of these files is found in Chapter 4.

The Forecasting Module

Cost data from the file called ALLCOST.WK1 is used in the forecasting module file called FORECAST.WK1. By placing the cost data in the appropriate columns in the spreadsheet, LOTUS 1-2-3 calculates the next year cost by pressing the F9 function key. The Replacement Module

Data from the forecasting module called FORECAST.WK1 is used in the replacement module called REPLACE.WK1. By placing the data in the appropriate columns, LOTUS 1-2-3 determines if the equipment items in the spreadsheet should be replaced. The F9 function key is used to perform this operation.

The Fleet Replacement Priority List

Prioritizing the fleet replacement list is done with the use of the "DATA SORT" command in LOTUS 1-2-3. The SORT is done using the replacement priority factor as the primary key in the DATA-SORT menu. This value is sorted in descending order. The resulting sort provides the user with a fleet replacement priority listing. The cumulative equipment cost column can be used to draw a line for any particular budget amount.

		APPENDIX G	EQUIPME	EQUIPMENT INVENTORY MODULE	JLE				RESEN	PRESENT YEAR:		1981		
								_	LAST UPDATE:	DATE:	Z	NOV.15/91		
		EQUIPMENT			ORIGNAL			WNUAL	USAGE	ANNUAL USAGE (HOURS)	•			
WIT *		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1984 1985	1986	1987	1988	1969	1990	1991
w	813	Portable Compressor	1969	INGERSOL RAND	\$15,000									
9	9021	Portable Compressor	1989	INGERSOL RAND	\$15,000									
9	9039	Portable Compressor	1989	INGERSOL PAND	\$15,000									
9	101	Portable Compressor	1961	INGERSOL RAND	\$8,000									
8	5	Sidewalk Plows	1961	BOMBARDIER	\$35,000									
9	117	Sidewalk Plows	1961	BOMBARDIER	\$35,000									
604	125	Sidewalk Plows	1961	BOMBARDIER	\$35,000									
909	9280	Sidewalk Plows	1989	BOMBARDIER	\$55,000									
74	8194	Sidewalk Plows	1988	TRACKLESS	\$52,000									
74	6156	Sidewalk Plows	1986	TRACKLESS	\$48,000									
74	6222	Sidewalk Plows	1986	TRACKLESS	\$48,000									
74	7220	Sidewalk Plows	1987	TRACKLESS	\$50,000									
74	8202	Sidewalk Plows	1988	TRACKLESS	\$52,000									
74	9184	Sidewalk Plows	1989	TRACKLESS	\$55,000									
7	9168	Sidewalk Plows	1989	TRACKLESS	\$55,000									
	3600	-	2000		-									
2	3		1961	MICHIGAN	9110,000									
305	3512	Londer	1973	CASE	\$51,000									
102	2606	Loader	1987	MICHIGAN	\$118,000									
302	5608	Londer	1975	CASE	\$55,000									
402	9369	Londer	1989	CATERPILLAR	\$110,000									

					ORIGINAL										
		EQUIPMENT			PURCHASE		•	ANNUAL USAGE (HOURS)	USAGE	HOUR	9				
* LIN		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1985	1986	1987	1988	1983	1990	1991	
402	522	Loader	1989	CATERPILLAR	\$110,000										
102	6012	Loader	1986	CASE	\$117,000										
102	6020	Loader	1986	CASE	\$117,000										
202	2127	Loader	1961	INTERNATIONAL	\$85,000										
202	9163	Loader	1979	INTERNATIONAL	\$73,000										
302	191	Londer	1980	CASE	\$79,000										
302	5012	Loader	1985	CASE	\$85,000										
302	5020	Loader	1985	CASE	\$85,000										
402	442	Londer	1990	CATERPILLAR	\$160,000										
402	434	Londer	1990	CATERPILLAR	\$160,000										
402	459	Londer	1990	CATERPILLAR	\$160,000										
110	9506	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9214	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9222	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9230	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9248	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	3399	1/2 Ton Pickup	1983	CHEV	\$9,000										
110	9255	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9263	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	9271	1/2 Ton Pickup	1989	CHEV	\$13,800										
110	5030	1/2 Ton Pickup	1985	CHEV	89,500										
110	5261	1/2 Ton Pickup	1985	CHEV	\$9.500										
110	6152	1,2 Ton Pekup	1986	CHEV	\$10,000										
110	6244	12 Ton Pickup	1900	CHE	\$10,000										

					OPIGNAL									
		EQUIPMENT			PURCHASE		•	NNUAL	USAGE	ANNUAL USAGE (HOURS)	8)			
WIT .		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1962	1986	1987	1988	1989	1980	1991
1 1 1 1 1														
110	6335	1/2 Ton Pickup	1986	CHEV	\$10,000									
210	8383	1/2 Ton Pickup	1988	DODGE	\$14,200									
210	8397	1/2 Ton Pickup	1988	DODGE	\$14,200									
210	8405	1/2 Ton Pickup	1968	DODGE	\$14,200									
210	8413	1/2 Ton Pickup	1968	DODGE	\$14,200									
210	8421	1/2 Ton Pickup	1988	DODGE	\$14,200									
210	8439	1/2 Ton Pickup	1988	DODGE	\$14,200									
210	6201	1/2 Ton Pickup	1986	DODGE	\$10,000									
210	6219	1/2 Ton Pickup	1986	DODGE	\$10,000									
210	6227	1/2 Ton Pickup	1986	DODGE	\$10,000									
210	6235	1/2 Ton Pickup	1986	DODGE	\$13,200									
210	7050	1/2 Ton Pickup	1967	DODGE	\$13,200									
210	7068	1/2 Ton Pickup	1967	DODGE	\$13,200									
210	7092	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7100	1/2 Ton Pickup	1967	DODGE	\$13,200									
210	7118	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7126	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7134	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7142	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7159	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	71167	1/2 Ton Pickup	1967	DODGE	\$13,200									
210	7175	1/2 Ton Pickup	1987	DODGE	\$13,200									
210	7183	1/2 Ton Pickup	1987	DODGE	\$13,200									
110	6606	1/2 Ton Pickup	1989	CHEV	\$13,800									
210	139	1/2 Ton Pickup	1990	DODGE	\$14,000									

					OHIGNAL									
		EQUIPMENT			PURCHASE		Š	NUALL	ANNUAL USAGE (HOURS)	HOURS				
W LIND		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1985	1986	1987	1988	1989	1980	1991
			-				-	1				-	-	-
210	147	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	155	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	238	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	246	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	253	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	561	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	279	1/2 Ton Pickup	1990	DODGE	\$14,000									
210	1152	1/2 Ton Pickup	1991	DODGE	\$14,400									
	250	Too Too	900	ğ	614 800									
	212		380	CHEV	200									
111	8838	One Ton Truck	1988	CHEV	\$14,800									
Ξ	5286	One Ton Truck	1985	CHEV	\$13,200									
111	5294	One Ton Truck	1985	CHEV	\$13,200									
=	6342	One Ton Truck	1986	CHEV	\$12,500									
::	6329	One Ton Truck	1986	CHEV	\$12,500									
11	6367	One Ton Truck	1986	CHEV	\$12,500									
211	6529	One Ton Truck	1986	DODGE	\$12,500									
211	7018	One Ton Truck	1987	DODGE	\$13,300									
211	7026	One Ton Truck	1987	DODGE	\$13,300									
211	8487	One Ton Truck	1988	DODGE	\$14,800									
211	8503	One Ton Truck	1988	DODGE	\$14,800									
211	9300	One Ton Truck	1969	DODGE	\$16,000									
211	8495	One Ton Truck	1988	DODGE	\$14,800									
211	7190	One Ton Truck	1967	DODGE	\$13,300									

E				ORIGNAL		~	ANNUAL USAGE (HOURS)	USAGE	HOUR	69			
CLASS MODEL MANUFACTURER	i	MANUFA	CTURER	PRICE	1983	1984 1985	1985	1986 1987	1987	1988	1963	1990	18
13 One Ton Truck 1990 DODGE	-	DODGE		\$18,000									
54 One Ton Truck 1990 DODGE		DODGE		\$18,000									
302 One Ton Truck 1990 DODGE	_	DODGE		\$18,000									
9212 One Ton Truck 1989 DODGE	_	DODGE		\$16,000									
1158 One Ton Truck 1991 FORD	_	FORD		\$20,400									
5520 One Ton Truck 1988 CHEV	-	CHEV		\$14,800									
1177 Utility Truck 1991 DODGE		bood	w	\$20,400									
8783 VAN 1988 CHEV	-	CHE		\$14,000									
5244 VAN 1985 CHEV	-	SHE		\$12,400									
6167 VAN 1986 DODGE	_	DOD	w	\$13,700									
5175 VAN 1986 DODGE		0000	w	\$13,700									
5233 VAN 1986 DODGE	_	000	36	\$13,700									
SST7 VAN 1968 DODGE		000	35	\$14,000									
8543 VAN 1988 FORD	_	FORD		\$14,000									
96 VAN 1990 CHEV		CHE	_	\$15,500									
104 VAN 1990 CHEV		CHE	_	\$15,500									
112 VAN 1990 CHEV		CHE		\$15,500									
46 VAN 1990 DODGE		ğod	25	\$15,500									
61 VAN 1990 DODGE		DOD	w	\$15,500									
79 VAN 1990 DODGE		DODG	w	\$15,500									
87 VAN 1990 DODGE		000	**	\$15,500									
285 VAN 1990 DODGE	_	DOD	*	\$15,500									
293 VAN 1990 DODGE	_	000	æ	\$15,500									

					ORIGNAL									
		EQUIPMENT			PURCHASE			ANNUAL USAGE (HOURS)	USAGE	(HOUR	S)			
* LIND		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1985	1986	1987	1988	1989	1990	1981
312	1209	VAN	1991	FORD	\$17,500									
312	1217	VAN	1991	FORD	\$17,500									
312	1365	VAN	1981	FORD	\$17,500									
114	5005	Small Blok-110	1985	CHE	610,000									
114	45	Small Pick-up	1988	CHEV	\$14,000									
114	8378	Small Pick-up	1988	CHEV	\$14,000									
214	9839	Small Pick-up	1989	DODGE	\$14,000									
114	334	Small Pick-up	1990	CHEV	\$14,500									
214	28	Small Pick-up	1990	DODGE	\$14,500									
214	8	Small Pick-up	1990	DODGE	\$14,500									
28	5228	Hoist Truck	1985	CHEV	\$61,500									
120	9239	Hoist Truck	1985	CHEV	\$61,500									
420	2065	Hoist Truck	1982	NTERNATIONAL	\$39,000									
124	3492	25 Yd Collectomatic	1983	CHE	\$82,000									
424	8609	25 Yd Collectomatic	1985	INTERNATIONAL	\$85,500									
424	5047	25 Yd Collectomatic	1986	INTERNATIONAL	\$93,000									
424	6054	25 Yd Collectomatic	1986	INTERNATIONAL	\$83.000									
424	6278	25 Yd Collectomatic	1986	NTERNATIONAL	\$93,000									
424	7037	25 Yd Collectomatic	1987	NTERNATIONAL	\$111,500									
424	400	25 Yd Collectomatic	1987	INTERNATIONAL	\$111,500									
424	7102	25 Yd Collectomatic	1987	NTERNATIONAL	\$111,500									
454	7110	25 Yd Collectomatic	1981	NTERNATIONAL	\$111,500									

					UHIGNAL									
		EQUIPMENT			PURCHASE		₹	NNUAL	ANNUAL USAGE (HOURS)	HOUR	6			
NIT #		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1985	1986	1987	1988	1989	1990	1981
							-	į			Ì			
454	7128	25 Yd Collectomatic	1987	INTERNATIONAL	\$111,500									
454	7144	25 Yd Collectomatic	1987	INTERNATIONAL	\$111,500									
424	8869	25 Yd Collectomatic	1985	INTERNATIONAL	\$85,500									
424	1188	25 Yd Collectomatic	1988	INTERNATIONAL	\$130,000									
424	8829	25 Yd Collectomatic	1988	INTERNATIONAL	\$130,000									
426	1020	25 Yd Collectomatic	1991	INTERNATIONAL	\$146,000									
426	1038	25 Yd Collectomatic	1991	INTERNATIONAL	\$146,000									
426	1111	25 Yd Collectomatic	1991	INTERNATIONAL	\$146,000									
125	3483	15 Yd collectomatic	1983	CHEV	\$60,000									
425	2524	16 Yd collectomatic	1982	INTERNATIONAL	\$56,000									
425	2532	16 Yd collectomatic	1982	INTERNATIONAL	\$56,000									
425	5105	16 Yd collectomatic	1985	INTERNATIONAL	\$63,000									
428	6290	Water Tanker	1986	NTERNATIONAL	\$43,000									
237	8644	Comment Cars	1988	DOOGE	\$12,000									
137	5310		1985	CHEV	\$9,100									
237	1102	Compact Cars	1991	DODGE	\$14,000									
783	5111	Compact Cars	1985	DODGE	\$9,100									
237	5129	Compact Cars	1985	DODGE	\$9,100									
237	5137	Compact Cars	1985	DODGE	\$9,100									
237	5145	Compact Cars	1985	DODGE	\$9,100									
237	7042	Compact Cars	1987	DODGE	\$10,500									
297	8851	Compact Cars	1988	DODGE	\$12,000									

1983 ORIGNAL MANUFACTURER PRICE

MODEL

EQUIPMENT

WIT #

\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$12,500	\$12,500	\$12,500	\$12,500	\$14,000	897,000	5137,000	\$125,M30	0000	000'95	\$57.000
\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	\$12	512	\$14	585	\$137	\$125	\$186,000	958	153
DODGE	ELGN	ELGN	JOHNSTON	CATERPILLAR	CASE	CASE															
1988	1988	1988	1986	1968	1988	1968	1968	1968	1988	1988	1969	1969	1969	1989	1981	1978	1988	1986	1981	1987	1988
Compact Cars	Steet Broom	Steet Broom	Street Broom	Large Backhoe	Small Backhoe	Small Backhoe															
8669	8677	8685	8701	8719	8727	8735	8743	8750	8768	8776	9147	9154	9164	9170	1102	8651	9999	6305	2134	7080	8690
237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	146	146	546	292	354	38

					מומות										
		EQUIPMENT			PURCHASE		٩	ANNUAL USAGE (HOURS)	USAGE	HOUR	(6)				
* DNU		CLASS	MODEL	MANUFACTURER	PRICE	1983	1984	1985	1986	1987	1988	1989	1990	8	
					-										
466	5709	Gang Mower	1965	JOHN DEERE	\$20,000										
466	7275	Gang Mower	1977	JOHN DEERE	\$26,000										
168	2048	Gang Mower	1982	JACOBSON	\$18,000										
366	4026	Gang Mower	1984	CASE	\$6,400										
366	4034	Gang Mower	1984	CASE	\$6,400										
366	6138	Gang Mower	1986	CASE	\$7,000										
366	6146	Gang Mower	1986	CASE	\$7,000										
466	6606	Gang Mower	1979	JOHN DEERE	\$17,000										
466	9107	Gang Mower	1979	JOHN DEERE	\$17,000										
999	3	Gang Mower	1980	FORD	\$17,500										
286	3048	Gang Mower	1983	YAZ00	\$18,600										
766	3073	Gang Mower	1983	YAZOO	\$18,600										
166	8805	Gang Mower	1988	JACOBSON	\$28,000										
177	6897	Blower Attachment	1976	ROOTS	\$50,000										
377	5863	Blower Attachment	1975	SMI	\$50,000										
377	5889	Blower Attachment	1975	SMI	\$50,000										
377	9188	Blower Attachment	1979	SMI	\$60,000										
377	146	Blower Attachment	1980	SMI	\$60,000										
112	5914	Blower Attachment	1965	SICARD	\$25,000										
277	5922	Blower Attachment	1965	SICARD	\$25,000										
277	5930	Blower Attachment	1965	SICARD	\$25,000										
577	9329	Blower Attachment	1989	WILDCAT	\$110,000										
223	9335	Blower Attachment	1989	WILDCAT	\$110,000										
577	9343	Blower Attachment	1989	WILDCAT	\$110,000										

		EQUIPMENT			PURCHASE		₹	ANNUAL USAGE (HOURS)	JSAGE	HOUR	8			
WIT *		CLASS	MODEL	MODEL MANUFACTURER	PRICE	1963	1984	1985 1986 1987	1986	1987	1968	1969	1990 1991	1981
6	9350	Rouse Attachment	1989	WIDCAT	\$110.000									
\$	1016			SICARD	830,000									
202	2119			SICARD	\$30,000									
218	4116	Compressor - Mounted	1985	DODGE	\$16,000									
218	5122	Compressor - Mounted	1985	DODGE	\$16,000									
218	1188	Compressor - Mounted	1991	DODGE	\$25,000									
218	1196	Compressor - Mounted	1991	DODGE	\$25,000									
98	9228	Small Sweeper	1989	POWER BOSS	\$20,000									
257	404	Large Roller	1974	GALION	\$33,000									
307	2543	Small Dozer	1982	CASE	\$27,000									
331	1906	Pothole Patcher	1985	FORD	\$86,500									
431	3474	Pothole Patcher	1983	INTERNATIONAL	\$71,350									
416	9025	5 Ton Dump Truck	1989	NTERNATIONAL	\$91,000									
416	9033	5 Ton Dump Truck	1989	NTERNATIONAL	\$91,000									
416	170	5 Ton Dump Truck	1989	NTERNATIONAL	\$91,000									
416	9008	5 Ton Dump Truck	1989	NTERNATIONAL	\$91,000									
416	9906	5 Ton Dump Truck	1989	NTERNATIONAL	\$91,000									
416	9074	5 Ton Dump Truck	1988	NTERNATIONAL	\$91,000									

					ORIGNAL									
		EQUIPMENT			PURCHASE		•	NNUAL	ANNUAL USAGE (HOURS)	HOUR	33			
* LIND		CLASS	MODEL	MANUFACTURER	PRICE	1963	1981	1985	1986	1987	1988	1989	1990	18
	1				8 8 8 8 9 9 8 8				1					1
416	2442	5 Ton Dump Truck	1982	NTERNATIONAL	\$41,000									
416	3077	5 Ton Dump Truck	1983	NTERNATIONAL	\$41,000									
416	5155	5 Ton Dump Truck	1962	INTERNATIONAL	\$62,500									
416	5163	5 Ton Dump Truck	1985	NTERNATIONAL	\$62,500									
416	5171	5 Ton Dump Truck	1985	INTERNATIONAL	\$62,500									
416	6062	5 Ton Dump Truck	1986	INTERNATIONAL	\$86,500									
416	6070	5 Ton Dump Truck	1986	INTERNATIONAL	\$86,500									
416	1919	5 Ton Dump Truck	1986	INTERNATIONAL	\$96,500									
416	6179	5 Ton Dump Truck	1986	NTERNATIONAL	\$96,500									
416	6187	5 Ton Dump Truck	1966	INTERNATIONAL	\$96,500									
416	6195	S Ton Dump Truck	1986	NTERNATIONAL	\$86,500									
416	6203	5 Ton Dump Truck	1986	NTERNATIONAL	\$96,500									
416	6211	5 Ton Dump Truck	1986	INTERNATIONAL	\$96,500									
416	6245	5 Ton Dump Truck	1986	INTERNATIONAL	\$96,500									
416	6252	5 Ton Dump Truck	1986	INTERNATIONAL	\$96,500									
416	7078	5 Ton Dump Truck	1987	INTERNATIONAL	\$99,000									
416	1066	5 Ton Dump Truck	1991	INTERNATIONAL	\$95,000									
416	1074	5 Ton Dump Truck	1981	INTERNATIONAL	\$95,000									
416	1082	5 Ton Dump Truck	1981	INTERNATIONAL	\$95,000									
416	1090	S Ton Dump Truck	1881	INTERNATIONAL	\$95,000									
417	7200	Tandem Dump Truck	1987	INTERNATIONAL	\$116,500									
417	7218	Tandem Dump Truck	1987	INTERNATIONAL	\$116,500									
417	8448	Tandem Dump Truck	1988	INTERNATIONAL	\$120,000									

		i di di			ORIGNAL		-	Con Local Control		Č				
*		CLASS	MODEL	MANUFACTURER	PRICE	1963	1984	1985	1986	1987	1988	1989	1990	1991
22	7013	Sewer Jet	1987	INTERNATIONAL	230,000									
10	7611	Grader	1987	CHAMPION	\$100,000									
10	9826	Grader	:983	CHAMPION	\$110,000									
10	6084	Grader	1986	CHAMPION	\$100,000									
	6000	-	9000	WOODLAND SOU	000000									

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FRAPOF OWNERSHIP MODULE



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			CRENA											NEXT										NEXT
	EQUIPMENT		RECES	E UFE			ANCAL	EOLPHE	or depre	CHICK				YEAR			MUA	ECUPAR	NTSICR	SEWU	Ē			YEAR
DIT #	QASS	VOOR.	PICE	BPECI	1903	1984	196	300	1967	198	1989	1990	190	1900	90	1984	1965	196	187	97.	195	1990	381	90
6 9013	Portable Compressor	1989	\$15,000	1	0	0	0			0	2143	2143	2,143	2140			0		0		15,000	12,857	10714	1571
5 921	Portable Compressor	1989	\$15,000	1	0	0	0	0		0	210	2143	2143	2,143	0		0	0		0	15,000	12,657	12714	151
6 9039	Particle Compressor	1989	\$15,000	7	0	0	0	0		0	2,143	2143	2143	2,143		0	0	0	0		15,000	12,857	10,714	8,571
6 1101	Pertable Compressor	1981	\$8,000	7	114	1,143	1,43	1,143	1,140	1,143	0	0	0	0	5,714	4571	1,429	2296	1,143	P	0	0	0	0
504 0109	Skinesk Plovs	1981	\$25,000	6	5,833	5,830	1,603	1,833	5,833	0	0	0		0	22,332	17,500	11,567	5,933	0		0	0	0	
60- DIT	Stewak Rova	1981	\$35,000	6	5,833	5,850	1,600	5,833	5,805	0	0	0		0	22,320	17,500	11,567	5,833	0		0	0	0	
604 0105	School: Flour	1981	\$35,000	. 6	5,833	5,833	5,833	1,803	5,833	4	0	0		0	23,330	17,500	11,667	5,833	0		. 0	0	0	0
504 5000	Scienak Rows	1989	\$55,100			0	0	0		0	1,157	8,157	8,157	8,157	0	0	0	0	0		55,000	6,00	2,57	27,500
N BIN	Sidewalk Rows	1988	\$2,000	. 6	0	0	0			1,607	1,607	1,657	6,667	1,607	0	0		0	0	52,000	2,335	34,567	25,000	17,000
74 656	Schwak Plovs	1986	\$4,000				0	6,000	8,000	£,000	8,000	5,000	5,000	8,000	0	0	0	41,000	41,000	220	24,000	1000	8,000	
74 5222	School Povs	1995	\$48,000	8		0		£,000	8,000	8,000	8,000	8,000	£,000	8,000	0	0		4000	4,00	2200	3,000	15,000	6,000	
14 720	Stimple Pows	1907	150,000				0	0	1,300	8,330	1,500	8,333	8,300	8,200		0		0	52,000	41,50	11,122	25,000	11,87	8,223
74 520	School Povs	198	\$2,00		0	0	0	0	.0	Let	1,507	1,507	1507	1,057				0		QM	0.22	3,607	21,000	17,333
74 2/34	Sidwalk Rows	1989	15,00				0	0	0		1,67	9,167	1/57	1,157		0					5,00	6,833	2,50	2500
NOR	Salvayk Rovis	1959	25.00	6	0		0	0	0	0	1,167	1)5	1067	1,157	0	0	0				:5,000	6,833	3,90	17,500
102 758	Laste	1367	\$115,000	12	0	0	0	0	9,833	9,530	9,500	9,833	8,833	9,833		0	0		115,000	100,157	8,333	81,530	1,67	8100
32 352	Laster	1973	\$3,000	12	4,250	4250	4,200	٥	0	0	0	.0	0	0	130	4,250	0					. 0	. 0	
102 7686	Loader	1987	\$115,000	12	0	0		0	8,533	9,833	9,533	9,833	9,833	9,833	0		0	0	118,000	102,167	8,333	8,500	7,50	2,00
300 5608	Loader	1975	\$5,00	12	4,9%	4,583	4,92	4,503	4,900	0	0	0	0	0	18,333	12750	9,167	4,583	0		0	. 0		0
CC 239	Loader	1959	\$110,000	12	0	0		0	0	0	2,5	9,167	1,107	1/67	0	0	0		. 0		110,000	12,523	11,507	8,500
42 MT	Loader	1989	\$110,000	12	0	0		0	0	0	8,57	9,157	1,157	1/57	9	0	0		0		110,000	100,000	11,907	82,500
102 5012	Loader	1986	\$17,000	12	0		0	1,750	9,750	1,750	9,750	9,750	1,750	1,750	0	0	0	117,000	107,250	\$7,5X	17,750	71,000	\$250	9,500
122 5000	Loster	1986	\$17,000	12	0		0	1,750	9,750	1,750	9,750	9,750	1,750	1,750	0	0	0	117,000	107,250	\$7,52E	E,750	71,000	\$250	9,500
202 2127	Losder	1981	\$25,000	12	TIPED	7,083	7,003	7,883	1,083	7,883	7,083	7,083	7,063	7,063	71,613	63,750	96.967	4,93	42,500	25,67	9,333	21,250	1087	7,983
202 9163	Loader	1979	\$73,000	12	8,085	1,080	6,063	6,063	6,083	6,083	6,383	5,083	1,083	0	4,67	42,583	36,500	21,617	MIN	18250	2,167	£083		
302 161	Looder	1980	\$75,000	12	6,583	6,500	4,92	1,583	6,583	1,583	8,583	8,583	6,583	5,583	\$5,250	200	4,003	33,500	12,917	26,333	19,750	11)57	1,500	0
302 5002	Loader	1965	\$15,000	12	0	0	7,063	7,063	1,063	7,063	7,083	7,083	7,583	7,863	0	0	85,000	17,817	70,633	83793	6,567	4,503	Q300	25,67
302 5000	Loeder	1965	\$15,000	12	0		7,883	7,003	1,000	7,060	7,083	7,083	7,063	7,863	0	0	85,000	17,87	72,533	63,750	4,507	6,583	6200	25,67
42 040	Loeder	1990	\$160,000	12	0	0	0	0	0	0	0	11,300	11,000	12,235	. 0	0	0	0	0	1	0	152,000	10,00	120,222
C 101	Louder	1990	\$150,000	12	0		0	0	0	0	0	12,333	13,333	13,233		0	0		0			150,000	14,57	120,333

200 710	210 7155	20 716	213 7136	213 7126	210 7118	210 71X	200 7000	207 305	25 750	21	20 00	29 62	22 62	255 843	28 80	210 803	200 845	210 6397	200 658	113 635	120 021	210 612	12 52	110 511	. 15 871	133 611	10 800	10 38	10 88	113 520	110 800	110 82%	113 SSS	A	1	100			
12 los Polys	12 on Pour	12 for Pour	12 for Poly	12 for Poly	1,2 Ton Pidup	(2 los Pola)	(2 lor Pote	12 los Polip	(2 lot Pota	(2 list Pisto)	(2 los Pous	12 for Poly	(2 for Poly)	UZ Ton Policy	(2 lon Polup	IC lon Polap	(Ø Ton Polup	(@ Ton Polup	(@Ten Polup	t@Ton Roup	Oppus 20	10 len Polup	is in fidu	in in in	12 la 700	Star Folip	12 10 1040	State and St	12 on Pour	12 on Police	12 on Poly	(2 for Policy	til 'en Polis	Lade		CMS	EQUIPMENT		
18	18	8	16	18	15	89	15	89	18	100	198	150	150	100	188	198	1986	196	1360	1966	100	128	×	麗	100	8	18	18	100	1989	1980	1989	1580	15	11	9009			
20,000	\$15,500	\$15,250	\$13,200	\$13,200	MCD5	XCDS	\$1220	XZDS	20,000	MILE	10,00	12	1000	\$14,200	\$14,230	\$14,200	\$14.200	\$14,200	\$14,200	\$17,000	\$15,000	2000	22,522	22.52	200	MILE	MIN	2500	20100	\$12,500	203,00	207,000	20.E00	1100		Dec 20m	PHONE LE	WEIG	
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200	ä	50	300	9,900	9,900	9,900	9,900	2500	500	5	500	100	500	H.200	14,200	14,200	14.200	16200	1628	500	5,000	5,000	EII.	387			•									ń	STA		
5500	8	60	8	600	500	600	100	18	8	8	8	250	250	1250	10,050	10,550	10,550	10550	888	550	250	550	0	0	100	1300	100		1200	280	200	3500	1000	0		ŝ			
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			ORIGINAL											TRIF										ISI
	EDJPWENT		RIPCHAS	-			MULB							YEAR			NNUALE							YEA
MI f	CUSS		PRICE		1900	1394	1965	1988	1967	158	190	1990	1991	1902	1983	1994	195		1907	1988	1989	1990	1951	199
218 7175	LQ Ton Piolop	1987	\$12,200	4	0	i		0	1,300	2,300	3,000	3,300	3,300	0	0	0			13,200	9,900	6,000	1,300	0	
210 7183	LQ Ton Ficksp	1967	\$12,200	4			0	0	2,300	3300	330	3,300	3,300	0	0	0		4	12,200	9,900	6,500	2,300	0	
110 9099	(Q Ton Rokup	1989	\$12,500	4	0		0	0		0	3,60	3,450	3,450	3,60	0	0	0	4	0	0	13,500	10,350	5,900	14
210 138	1,0 Ton Pickup	1990	\$14,000	4	0	0	0	0	1	0	0	3,500	3,500	1,500	0	0	0	0	0		0	14,000	10,500	7,5
210 147	(@ Tan Pokup	1990	\$14,000	4			0	0		0		3,500	3,500	1,500	0	0	0	1	0		0	14,220	10,500	1,
210 155	12 Tan Pokup	1990	\$14,000	4			0	0	0	0		3,500	3,500	3,500	0	0	0				0	14,000	10,500	7,
210 238	1g Ton Rossa	1990	\$14,000	4		0	0			0		3,500	3,500	1,500	0	0					0	14,000	10,500	7)
20 0245	12 Tan Poiss	1990	\$14,000	4		0	0		0		,	3,500	3,500	2,500	0	0				. 0	0	14,000	10,500	1)
210 0253	1g Ton Rokup	1990	\$14,000	4		0	0		0		1	3,500	3,500	2,500		0		0	0	0	0	14,000	10,500	7)
210 0291	10 Ton Rokup	1990	\$14,000	4	0	0	0	1	0			3,500	1,500	1,500		0	1	0	0	. 0	0	14,000	10,500	7)
210 0279	12 Tan Rokus	1990	\$14,000	4	0	0	0		0	10		2,500	2,500	1500	0			0	0	0	0	14,000	10,500	7,
210 1152	1(2 Tan Rokup	1991	\$14,400	4	0	0	0		0	9	£	0	3,500	1,600	0	1		0	0	0			14,400	12,
111 8512	One Ten Truck	1988	\$14,800	4	0	0				1,700	136	3,700	3,700	1700	0			0	0	14,500	11,100	7,400	2,700	
111 8538	One Ten Truck	1988	\$14,800	4	0	0			0	1,708	2,00	3,730	3,700	3,700	0			0	0	14,800	11,100	7,400	2,700	
111 5286	One Ton Truck	1965	\$13,200	4	0	0	3,300	3,300	2,300	2,300	2,30	- 1		0	0	0	13,200	9,900	1,500	1,300			0	
111 5294	One Ton Truck	1985	\$13,200	4	0	0	3,300	3,300	2,300	1,300	2300		0	0	0	0	13,200	9,900	5,600	2,300	0		0	
111 6342	One for Truck	1966	\$12,500	4	.0	0	4	3,125	1,125	1,125	1/2	3,125	0	0	0	0		12,500	1,375	1,250	1,925		0	
111 6358	One Ton Truck	1985	\$12,500	4	0	0		1,125	1125	1,125	312	3,125	0	0	0	0	0	12,500	1,275	6,250	1,125		0	
111 6367	Che Ton Truck	1986	\$12,500	4	0			3,125	1125	1115	3,12	3,125	0	0	0	0	0	12,500	8,375	6250	1,125	0	0	
211 5255	One Ton Truck	1966	\$12,500		0		0	2,125	2125	1/25	3/2	3,125	0	0	0	0	0	12,500	8,375	6250	3125	0		
211 7018	Ore Ton Tuck	1967	\$13,300				0	0	1325	3,25	3,22	3,325	3,325	0	0	0	0	0	12,000	8,975	6,850	3,25		
211 7025	One Ton Tuck	1967	\$13,300	4	1		0	0	2325	335	3,23	3,325	3,325	0	0	0	0	0	12,300	8,375	6,550	1,25		
211 8407	One Ton Truck	1968	\$14,800		0	9	0	0	- 1	3730	3,70	3,700	3,700	1,700	0	0		0		14,500	1(,100	7,400	1,700	
211 8503	One for Truck	1968	\$14,500	4	0		0	0		3,700	3,70	3,700	3,700	2,700		0				14,800	11,00	7,400	1,700	
211 8300	One for Tuck	1969	\$15,000		0		0	0		0	4,00	4,000	4,000	(000		0		0			16,000	12,000	1,000	
211 8495	One for Tuck	1968	\$14,800	4	1		0	0		3,700	3,70	3,700	3,700	1,700		0			0	14,500	11,700	7,400	1,700	
21 7190	One Ton Truck	1967	\$13,300	4	:		0	0	1325	3,35	1,35	3,325	1,325	0	0		0	0	13,300	9,875	6,552	135	0	
211 13	One for Tuck	1990	\$18,000	4		0	0	0	0	0		4,500	4,500	4,500	0			- 4	0	0		18,000	12,500	i
211 54	One Ton Truck	1990	\$15,000			0	0	0	0			4,500	4,500	4,500	0		0	- 1	0			18,000	12,500	i
211 302	One Ton Truck	1990	\$15,000	4	0	0	0	0	0			4,500	4,500	(500	0		0	1	0			18,000	13,500	
	One Ton Touck	1989	\$15,00	4	0	0	0	0	0		4,005	4,000	4,000	4,000	0		0	1	0		18,000	12,000	8,000	4
211 1156	One Ton Topic	1991	214	4	0	0	0	0	0		- 4		5,100	5,100	0		0	1			0		20,400	1
111 8520	One Ton Truck	1988	\$14,80	4	0	0	0	0	0	2,730	2,700	3,700	3,700	1,700	0	0	0		. 1	14,800	11,100	7,400	3,700	

			CRGNIL											101										Ю
	EQUAVENT		POHSE					UPIBI						1918			WALE							154
NA #	CLASS	1008	PRICE	BPECI	1983	1984	1955	1986	1907	98	175	1990	1201	1902	1900	協	1985	1986	1967	1988	1969	1990	1991	18
113 670	VIII	158	\$14.000	4						150	3572	1500	156	150				۰		14,000	er ten	7000	1500	
112 594		-	\$12.40		i	-	-	2100							i	-	240				-	0		
212 867		1985	\$12,700	4	0		0	145	145	165	1/5	145						12700	1275	6,550	145			
212 675	VAN	195	\$12,700	4			0	145	145	165	1/5	145	0	0	0		0	12,700	1275	150	145			
212 600	YES	1985	212,700	4	0	0		145	145	145	1/5	145			0		0	12700	1275	650	16	0		
212 677	UNK	1988	\$14,000	4	0	0				158	250	1500	2500	150	0	0	0		0	N,000	10,500	7,000	2,500	
32 50	URN	1988	\$14,000	4	0			0	0	150	150	3,500	1500	1520	0	0	0		0	14,000	12,500	7,000	3,500	
112 %	VAN	1960	\$15,500	4	0		0	0	0			1,875	1875	1575	0	0	0	0	0	0		15,500	11,525	1
112 104	VAN	1990	\$15,500	4	0	0	0	0	0	0	0	3,875	1,575	1875	0	0	.0	0	0	0		15,500	11,625	1
112 0112	WK	1990	\$15,500		0	0	0		0	0	0	3,875	1,075	1,675			0	0		0		15,500	1(625	1
212 0045	W	1960	\$15,500	4		0	2	1	0	0	0	1,875	1575	28%	0	0	0	0		0		15,500	1(625	
212 000	528	1990	\$15,500	4		0	0	0	0	0	0	1875	1575	1875			0	0		0	0	15,500	11,525	
212 0079	WK	1990	\$15,500	4			0	0			0	1875	1875	185	0		0	0			0	15,500	11,625	
212 007	VAN	1990	\$15,500	4	0	0	0	0	3			1875	1575	185	0		0	0	0		0	15,500	11,25	
212 025	VAN	1960	\$15,500	4	0	1	0	0	:	8	0	1875	355	185	0	0	0	0	0		0	15,500	11,25	
212 630	VAN	1960	215,500	4	0		0	0	0		0	1,675	1575	\$55	0	0	0	0				15,500	11,85	
312 125	VAN	1991	\$17,500	4	0		0	0		:	0	0	425	435	0	0	0	0	:	0		0	17,500	1
312 1217	W	1961	\$17,530	4	0	:	0	0	1	:		0	475	425	0		0	9	:		0	0	17,500	,
312 1365	TAN	1981	\$17,500	4	0	0	0	0	0	1	0	0	425	Ų5	0	0	0	0		0	0	0	17,500	1
114 5085	Small Pok-up	1965	\$15,000	4	0		2500	2,500	2,500	150	150	0	0	:	0	9	10,000	1,500	5,000	2,500	0	0	0	
114 8154	Small Pot-up	1968	\$14,000	4	0		0	0	0	150	150	1,500	1,500	150	0	0	0	0	0	14,000	10,500	7,000	1,500	
114 5375	Smil Pd-up	1986	\$14,000	4	0	1	0	0	0	150	150	1,500	1500	1500	0	0	0	0	0	14,000	10,500	7,000	1,500	
214 903	Small Pol-up	1989	214,000		0			0	1	5	150	1500	1500	150	0		0	0	0	1	14,000	10,500	1,000	
114 334	Small Fot-up	:390	2450	4	0	:		0	0	1	0	172	155	125	0		0	0				14,500	11,875	
24 2	Small Rok-up	1990	2450	0 4	0	0	0	0			0	1,25	155	155	0		0	0		0		14,500	1075	
24 3	Small Poli-up	1990	2450	0 4		0	0	0	:	:		1,25	105	155	0		0					14,500	10,075	
-	Heid Toda	1985	25	8		0	7,588	7,598	7,88	1,98		7,588	7,986	7,68	0					-		21,000		
	Host Took		201,53				7,588	7,598	1,00	1,98	-	7,588	7,980	7,80	0							22,063	15,375	
420 2015	Hoist Tsuck	1963	138,00	0 8	495	485	4,575	4,575	455	455	455	4,875	0	ŧ	3,25	20,200	34,375	19,500	14,55	1/3	4,675	0	9	
	25 Yel Collectorals		102,00									10,250									-	10,250		
	25 Yd Colectored		25.50									11,538			0							12,063		
	25 Yd Colectored	-	200	-		0						11,25			0							4,500		
Q* 605	25 Yt Colectorus	198	1200	0 5		0		11,55	1,55	11,25	1,55	11,555	11,55	11,55				EM	8,35	5/2	2.2	4,500	3,55	

23 52	513 JZ2	227 619	班展	220 857	227 859	227 853	227 702	227 516	227 9.37	625.22	27 8	227 111	127 500	227 594	43 020	62.505	455 200	45 204	55	8	435 1038	425 1000	474 829	Q: 811	京 200	424 7144	\$517.5B	424 7110	AN THE	400,100	424 7637	のなか	13NU				
Conpact Cars	Compact Cars	Corped Cars	Compact Cars	Compact Cars	Compact Clars	Compant Cars	Congad Cars	Compact Cars	Compact Cars	Compact Cars	Conpact Cars	Cospet Cars	Compact Cars	Congret Cars	West and	E Modednik	E Modednste	15 15 collectorate	15 tracledonale	2 Hi Caledonate	2 A Calectrace	25 to Calectrade	Strichledenic	StiCalectraic	516Calacterate	25 H Celectroic	Stickente	5 H Celectratic	S19Celectrade	5 H Colectratic	519 Celectrade	2 N Collectratic	cus	MEMINE			
26	9	×	N	×	32	Ni.	36	×	×	落	*	8	×	20	38	26	×	100	15	藤	18	18	*	18	18	B	187	8	8	8	8	100	WOOR.				
\$12,000	\$12,00	\$12,000	\$12,000	\$12,000	\$12,00	\$12,00	\$10,500	\$9,10	59,10	25,18	\$9,00	\$14,00	\$5,18	\$12,00	MAN	100	250,00	256,00	250,000	\$140,00	\$146,00	\$146,00	\$130,00	\$130,00	285,500	\$111.50	\$111,500	\$11150	\$11150	\$11150	\$111.50	SELON	PRIZ DIPET	PURDICE LIE	CRICIAL	121	
***	-	-	-	47	4	679	-	-	-	-	un	99	-	6/9	69	00	01	-				-	-	-	***	***	Photo:	-	-	-	-	-		m			
		0						•	•	•				•			000	100	7500			•	•							0	0	0	8				
	•	0			•		0										7,00	7,000	ğ	0	0	0	0	0	0	0	0	0	•				2	>-			
								ä	100	8	12		120			1,03	7,000	7,000	18	0	0				1100							-	8	YANY ECHNISH DESERVICE			
		_		_	_			1,000	1,820	1,500	1,600		1,000	_	7,15	7,075	7,00	7,000	7,500		_	_			10,68							Ħ.	18	SHIT			
	-	_	-	-		_	210	122	1,52	1,52	150		122		15	7,875	7,000	7,000	7500			_		_	13,680	1300	1300	13,50	13.00	13.50	13,00	12	189	WO IN			
0 240	200	0 2400	200	248	200	245	218	100	150	150	100	-	60	8	25	5 7,875	0 7,00	0 7,000	0 7,500				0 15.20	1,750	10,550	330	13,00	1338	13.00	100	100	8	1 1	CUICE			
-	260			200		83	100			(22)			(2)	100	16	100	20 7,00	2 120	150				8250 E	1828	10 to 10	11,001	1130	1300	1500	100	2500	123	18	-			
260		9	200		200	2,00		100	133		12	9								0	0	2	50 15250			01 1100	00 11500	01 11 NO	00 1288	01 1358	01 TES	11.00	1				
248	20	248	20	ě	20	200	12	8	8	8	8	•	(8	20	35	1885	000	7,00	18	0	0			16250	100								8				
8	ě	8	8	260	2400	8	2180	0	0			2,000		2,48	7.15	7,075		0	7,500	6,250	8,750	6,750	6250	55	1,58	10	120	13,938	13,938	13,508	13,500	Ē	28				
6	260	2400	200	268	248	26	2180					2,800		240	15	THE SEL				23	120	120	1250	11.250	1,58	11,938	200	13538	13,538	13500	2	器	護	Ŕ	ğ		
																	4300	900	5000										0	0			8				
	-						100							-			OM	OK	228	-		_											*				
		•	-	-		_	-	8/8	813	500	500	_	500	-		5000	35,000	35,000	SIL						2530						_		1	MAN			
0	0													•	4,000	812	30,000	20,00	27,530	-			•	•	0 74,813	0						2000	8	EDJP.			
0	0	•			-	-	-	7,200	7280	7,280	280	0	7,280	•										•		0 111.500	0 111.500	0 111.500	0 111/500	0 111500	005111 3			SUSA			
	•	•	0	0	0	0	11,500	548	8	8	8		8		100	22.0	27,000	2,000	200	0			40		21,12							8,315	8	HANNE BENEVE LIGHTED THANK			
1200	12	120	12,000	200	200	2000	8	1	É	160	E	0	36	220	200	25	100	600	2500		•	•	12000	100,000	2008	100	1350	8823	88	883	035.03	87.8	8	ď.			
250	300	888	900	100	100	190	58	ĕ	5	ä	100		150	100	28	3(500	ige	7,000	100	0	0	0	10,750	10750	679	200	200	55	200	200	NE S	th th	16				
122	1200	7,200	7,200	7,200	1,200	7,00	630							120	\$	22			7500				005.78	25.50	100	986	100	88	88	883.23	100	88	100				
600	400	4,50	400	4,80	600	4,000	2100		_			14,000		680	7,19	15,75				16,00	146,000	14,00	823	11.28	21,355	55,750	87,78	55/30	55/SI	8578	878	95	55				
0 2400	2.60	2,400	2,400	6 2,400	2,400	2,400						11200		260	35	7,875				146,000 107,750	27,130	SCIE.	5,000	65,000	15.50	430	4(51)	41,813	41,812		1,83	11250	186	YEAR	NO.		

			CR3W.											ND7										NE
	EQUIPMENT		PLRONS	E UFE		00	AMUAL	O,PIO	T DEPPE	MICH				YEAR		- 1	WEN.	GUPVE	TSALVA	EWLE				YE
pet #	OJASS	MCCE.	PRICE	EXPECT	1983	1984	1985	***	1987		1988	-	130	1952	1983	1984	1985	1986	1987	1988	1589	1990	1991	19
207 8735	Consect Cas	1988	\$2.00	5	0				1	2,400	2,400	2,400	2,41	2,400		0		,		2000	1,500	7,200	4,800	24
27 540	Conpact Cas	1988	\$2.00	5	0	0	0		0	2,400	2,400	1,400	2,40	2,400		0	0	1	. 0	12,000	3,500	7200	480	24
207 8750	Conpect Cas	1988	\$2,00	5	0	0			0	2,4,0	2,400	1,400	2,48	2,400		0	0		0	12,000	1,500	7,200	4,800	2
207 9768	Conpact Cars	1968	\$12,000	5	0	0		0	0	2,400	2,400	2,400	2,400	2,400		0	0		0	12,000	1,500	7,200	4,800	2
207 6775	Compact Cars	1968	\$2.00	5	0	0	0	0	1	2,400	2,400	2,400	2,400	2,400	0	0	0	1	0	12,000	1,600	7,300	4,800	2
207 9147	Compact Cars	1989	\$12,500	5	0	0		0	1		2,500	2,500	2,500	2,500	0	0		- 1	0		12,500	10,000	7,500	5
27 954	Compact Cars	1989	\$12,500	5	0			0	1	0	2,500	2500	2,500	2,500	. 0	0			0		12500	10,000	7,500	5
207 9162	Compact Cars	1989	\$250	5	0	0		. 0	1	0	2,50%	2500	2,500	2,500	. 0	0		0	0		12,500	10,000	7,500	
207 9170	Compact Cars	1985	\$12.500	5	0	0	0	0	1	0	2,500	2500	2.500	2,500	0	0				0	12500	10,000	7,500	
207 1100	Compact Core	1991	\$14,000	5	0	0	0	ū	1	0	0	0	2,800	2,500	0	0	t	0	0	0	0	0	14,000	11
146 9051	Street Broom	1978	\$87,000	8	10,375	10,875	10,875	10,675		0	0	0	1	0	12,525	21,750	10,675	0	٠	0	0	0		
145 8586	Sheet Brown	1988	\$127,000	8	0		0	0		17,125	17,125	17,725	17,725	17,125	0	0		0		137,000	1/9875	102,752	85,835	5
545 5305	Steel Boom	1986	\$125,000	8	0	1	0	15,605	15,825	15,825	15,625	15,625	15,525	15,625	0	0	0	125,000	139,375	11,750	303	62,500	45,875	3
252 2534	Large Backhoe	1981	\$196,000	12	0	0	0	0	t	0	0	0	15,500	15,500	0	0	0			0	0	i	188,000	170
354 7360	Small Backhoe	1987	\$55,000	6	0	0	0		9,333	1,333	1,333	9,333	9,10	1,333	0	0	0		58,000	4,667	F,133	25,000	18,667	3
354 9690	Small Backhoo	1988	\$57,000	6	0	8	0		0	1,500	9500	9,500	9,535	9,500	0	0	0		0	57,000	0,500	HM	28,500	3
	Garg Hower	1965	\$21,000	8	0	ě	0	0	0	0	0	0		0	0	0		0	0	0	0	0	0	
	Gang Mower	1977	\$25,000		3,250	1250	3,250	0	0	0	0	0		0	6,500	2250			0	0	0	0	.0	
	Gang Nower	1982	\$12.000		2250	2,250	2,550	2250	2,250	1250	2,150	2,250	0	0	15,750	12,500	!1,250		4,750	4,500	2,250	0	0	
	Gang Nower	1984	\$1.400		0	800	800	800	800	800	800	600	800	800		£400	5,500	-	4,000	-	2,400	1,600	300	
	Gang Nover	1984	21,400		0	800	800	800	800	800	500	800	800	500		€400	5,500	-		-	2400	1,600	800	
	Gang Mower	1966	\$2,000		0		0	875	875	875	175	875	675	875	٠	0		1,000	1,125	-	4,215	3,500	2,65	
	Gang Mower	1986	\$7,000		0		0	875	875	875	175	875	85	E75	٠	,		100	6,125	0.000	4,375	3,500	2,655	
	Gang Moves	1979	******		2125	2,125	2,125	2125	2.125	0	0	- 4	0		3,500	6,375	4250	-	0		0	0		
	Gang Mower		\$17,000		2,125	2,125	2,125	2,125	2.125	0	9	0	0		,	6,375	4,250							
	Gang Hower		\$17,500		2,188	2358	2,186	238	2,188	2,188	0	- 0	0		12,538	1,750	6,903	44.0			0		0	
	Garg Wower		\$11.000		2,325	2.25	2,125	235	2.325	1325	235	235	2,325		12,600	15,275		11,625	-	-	1,550	2,25	0	
	GargNover	1982	\$18.800		2,325	2,325	2,225	235	2,325	1,325	2,25	2,325	2,35		12,600	15,275	12,950	0.000			4,550	2,15	0	
166 8105	Garg Nover	1988	121,000		0		0		0	3,500	1,500	3,500	2,500	3,500	0	0	0			21,000	25500	21,000	17,500	
	Bowy Atachment	1978	\$50,000		3,333	3,333	1,333	3,333	3,333	3,333	2,533	2,222	3,300		25,667	23,333	25,000		13,333		1,507	2,113	Ŗ	
377 9663	Bows Atsolment	1975	\$50,000	15	3,335	3,333	2,300	3,222	2,333	3,232	2,335	2,332		0	am	20,000	16507	13,333	10,000	6.667	1,333			ö

			CRIGINAL											107										1
	BUPIER		PHONE					2PE						198				EUR/B		-				1
UNITA	OJASS	WODE.	PICE	BRC	90	98	125	198	æ	30	26	180	9	×	92	184	185	196	36	据	96	190	301	
377 989	Sow Radmed	1975	55000	15	120	122	122	1333	133	133	un	330	۰		222	286	155	1233	1220	157	130			
377 pre5	Bow lacinet	1975	250,000	15	400	420	420	4,000	400	400	422	420	4300	400	420	520	XX	230	2000	24,000	1100	1530	12300	
377 16	Sove litarines	1960	200,000	15																			15300	
277 5914	Sove Rachment	195	25,00	15	0			0			0				0									
277 5822	Bowe Atachment	195	\$25,000	15	0	1	0	0			0	0	0		5							0	0	
277 5850	Bowr Rachment	1965	25,00	15	0	1	0	0	0		0		0	0					0			0	0	
577 9039	Bowr Atachment	196	\$110,000	15	0	0	0	0	0		7,00	7,00	1,335	1,00	0		0		0		110,000	100.607	15,000	
577 9035	Bove Atachment	1569	\$110,000	15	0		0	0	0		7,20	7,00	7,223	1,23				0	0		110,000	地形	15,223	
5199	Bow Atachment	1989	\$110,000	15	0	1	0	0	0		7,22	7,223	7,333	125	:		9		0		110,700	102,507	8,300	
577 9050	Bove Atachment	1989	tracom	15	0		0		0	0	7,20	7,500	7,333	7,333	0	0	0	0	0	0	110,000	12,50	95,300	
202 2101	LoaderSnebler - bed	190	non	15	0	0		0	0	0	0		0				0	0	0	0	. 0			
202 2119	Loade/Snobler - Bed	190	\$30,000	15	0		2	0	8	0	:		0		:	9	0	0	0	0	0	1		
218 5114	Compreser - Visualis	195	25,00	7	0		2,28	2,256	228	226	226	225	22%	126		:	15,000	13,714	11,69	2,143	65	451	22%	
218 5:22	Conpresar - Viburia	195	1500	7	0		226	128	226	226	225	228	226	226		:	10,000	1374	11,438	8,143	t/IS	421	22%	
216 1136	Completer - Viburia	1901	\$5,000	7	0	0	t	0	0	0			151	15:				:	0	0	1	0	25,000	
218 1195	Congress - Violes	120	25,00	7	0	0	1		0	0		0	151	151		0				9		0	25/00	
63 125	Strd Swept	196	20,000	10	0	1	1		0	0	235	2,38	2,000	230	0	0				1	1M	12.00	15,000	6
257 644	Large Rober	121	D)	10	1,00	138	:	0		0	1	0	0	0	UM									1
20 50	Small Corr	120	\$7,00		270	278	270	2700	270	276	270	270	170	170	230	2.50	12.30	5.70	1190	11.00	117	ser	179	
																							0.55	
221.000	Potols Patcher	-	28,51		0	0						25					:						6.7%	
421 361	Potesia Patcher	190	21,29	7	12,123	1,10	12,100	1,12	12	12	12.55	11/2		0	7,35	8,5	236	477	253	20,380	10	F		1
415 905	5 Ton Dump Truck	1966	\$9,00	5	0	0	:	0	0		18,20	18,200	120	11,220				:			31,000	72,800	9,00)
416 9000	5 Ton Dump Truck	198	\$21,000	5	0	0		0	1	0	18,25	13,200	2,20	11,220							9(,000	72,800	9,00	į
415 9041	5 Ton Cump Truch	190	\$1,00	5	3	0	1	0			-	11,200	-	-							31,000	72,800	54,000	ı
415 902	5 Ton Dump Track	1939	\$31,000	5	0	0				0	16.25	13,220	2,30	15,230	0			:			71,000	72,800	54,500	į
415 9065	5 Ton Dump Truck		\$31,000			.0			2			12,200		-		1					11,000	72,800	54,600	į
416 9014	5 Ton Dump Track	1988	\$21,000	5		0	:		:	18,230	18,20	12.20	12,700	122	0	-				91,000	72,500	54,500	36,400	į
416 342	5 Ton Dump Truck	192	\$1,00	5	8,200	8.200	8,2%	120	8200	0					2,80	2452	15.40	8.200						i

			ORGAN											NEG										NEO
	REMINDS	1	PURCHS	E UFE		1	ANUL.	EQUPAG	NT DEPHE	DUTON				YEAR			ANDL	EQ.PIE	E SALVA	EW.				YEAR
202.4	CLASS	MODE.	FRCE	9790	1923	1964	185	1985	1367	1988	186	180	*	1900	1963	94	185	100	187	1988	100	190	-	1900
416 5155	5 Ton Dump Truck	1985	\$2,50	5	0	0	12,500	12,500	12,500	12,500	12,500	12,300			0	0	630	SOME	II,500	25,000	1250			
415 5153	5 Ton Dump Truck	1965	\$2,50	5	0	0	12,500	12,500	12,500	12,500	12500	12,500					62,500	5230	37,500	25,000	12500			
415 5171	5 Ton Dump Truck	1965	\$2,500	5	0	0	12,500	12,500	12,500	12,500	12,500	12500			0		52,500	52,000	37,500	25,000	12.500	1	0	
415 8052	5 Ton Dump Truck	1985	\$86,500	5	0	0		17,300	17,300	17,300	17,533	17300	17,000		0	0	0	8550	19,200	51,900	3500	1730	0	-
415 6070	5 Ten Dump Truck	1995	\$86,500	5	0	0		17,300	17,300	17,300	17,300	17,300	17,300	0	0	0		85,500	59,200	51,900	34500	17,300		
415 6161	5 Ton Dump Truck	1986	\$86,500	5	0	0		17,300	17,300	17,300	17,000	17,300	17,300		0	0		56,500	69,200	\$1,900	34,500	17,300		
415 5179	5 Ton Dump Truck	1986	\$14,500	5	0	0		17,300	17,300	17,300	17,300	17,300	17,300		0	0		56,500	69,200	51,900	34,500	07,300	. 0	
416 EVET	5 Ton Querp Truck	1985	\$86,500	5	0	0		17,300	17,300	17,300	2,00	17,000	17,300		0	0	0	86,500	69,200	51,900	34,600	17,000	0	
416 0/85	5 Ton Dump Truck	1985	\$86,500	5	0	0		17,300	17,380	17,300	17,300	17,000	17,300	1	0	0		86,500	69,200	\$1,900	34,600	17,300		
416 6203	5 Ton Quarp Truck	1986	\$85,500	5	0	0	0	17,300	17,300	17,300	17,300	17,000	17,300		0	0		86,500	69,200	51,900	34,600	17,300		
115 8211	5 Ton Dump Truck	1986	\$86,500	5	0	0		17,300	17,300	17,300	17,300	17,000	17,300		0	0	0	86,500	69,200	51,900	34,500	17,000	1	
416 6245	5 Ton Dump Truck	1986	\$85,500	5	0	0	0	17,300	17,300	17,300	17,330	17,000	17,300		0	0		85,500	69,200	51,900	34,500	17,000	1	
416 6252	S Ton Dump Truck	1988	\$36,500	5	0	0		17,300	17,300	17,300	17,336	17,356	17,300		0	0	0	85,500	69,200	51,900	34,500	17,500		
416 7078	S Ton Dump Truck	1967	\$38,000	5	0	0		0	17,500	17,500	17,500	17,500	17,600	17,600	0	0			88,000	72,400	2300	35,700	17,600	
416 1256	5 for Dump Truck	1901	135,000	5	0			0		0	0		19,000	19,000	0	0		0			0	1	95,000	71,0
416 1074	STon Dump Truck	1201	\$16,000	5	0	0	0	0		0			19,000	15,000	0	0		. 0			0	1	95,000	75,0
415 1002	5 Ton Dump Truck	190	\$15,000	5	0		0	0	0	0	. 0		19,000	19,000	0	0					0		95,000	71,0
415 1390	STon Dump Truck	180	\$85,000	5	0	1	0	0	1	0	0	0	19,000	19,000	0	0			0		0		95,000	75,0
417 7200	Tarden Dump Tradi	1907	\$116,500	5	0	0		0	23,300	22,300	21,300	22,320	21,300	22,300	0	0			116,500	\$1,200	5500	650	22,330	
417 7218	Turken Dump Truck	1967	\$118,500	5	0	0	0	0	23,300	23,300	23,30	23,330	21,300	22,300	0	0	0	0	116,500	11,200	530	4,55	21,380	
417 6446	Tarden Dump Trade	198	\$20,000	5	0	0	0	0	0	24,000	ND	24,000	24,000	24,000	0			0	0	120,000	30,000	72,000	4,00	20
1013 ES	Severalet	1967	\$20,000	ŧ	0	0	0	0	11,250	11,250	11,50	11,25	11,250	11,250	0	0	0	0	90,000	71,752	9,500	91,291	6,88	22)
501 7611	Grade	1307	s:mm	10	0	0		0	10,000	10,000	1200	12,000	10,000	10,000	0	0		0	100,000	90,000	52,000	70,000	50,000	51,0
51 536	Grader	1966	\$110,000	10	0	0	0	0	0	0	11,000	11,000	11,000	11,000	0	0		0	0	0	1 000	99,000	80,000	77,0
501 6064	Grane	196	\$100,000	10	0		0	10,300	10,000	10,000	130	10,000	10,000	10,000	0	0	0	100,000	90,000	50,000	72,000	60,000	50,000	40
501 5000	Grader	1986	\$100,000	10	0			10,300	10,000	10,000	12,000	10,000	12,000	10,000	0	0		100,000	90,000	80,000	70,000	60,00	50,000	40

APPENDIX I

TYPICAL FRAPOF O&M COST SPREADSHEET

1991 NOV.15/91

PRESENT YEAR:

YEAR TO-DATE COSTS

1988

1984 1985 1986 1987 ANNUAL EQUIPMENT O & M COSTS

EQUIPMENT CLASS MODEL

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APPENDIX 1

HODDLE	
M COST N	
0	

l													
9	9013	Portable Compressor	1989						503	909	2,500	1,524	\$5,132
9	9021	Portable Compressor	1989							1,180	2,667	2,670	\$6,517
9	9039	Portable Compressor	1989							840	825	1,620	\$3.28
9	101	Portable Compressor	1981	828	1,98	2,988	2,964	1,679	2,305	2,470	2,400	2,100	\$17.618
8	8	Sidewalk Plows	1961	6,012	5,867	16,588	14,169	14,479	15,140	15,060	22,120	12,430	\$121,865
804	117	Sidewalk Plows	1981	2,748	5,159	10,154	9,175	16,392	15,735	15,760	13,065	9,486	\$97,674
8	125	Sidewalk Plows	1961	2,128	4,737	13,673	5,343	20,046	14,710	14,699	12,658	15,520	\$103,514
8	9290	Sidewalk Plows	1989							7,305	6,811	18,845	\$32,961
74	8194	Sidewalk Plaws	1988						18,964	19,950	47,450	42,354	\$128,718
74	6156	Sidewalk Plaws	1986					17,343	19,393	25,150	26,235	14,400	\$102,521
74	6222	Sidewalk Plaws	1986				5.747	24.819	25.002	22,430	28,233	20,469	\$126,700
74	7220	Sidewalk Plows	1987					10,716	22.144	22,013	10,715	15,200	\$80,788
74	8202	Sidewalk Plows	1988						16,990	16.032	23,280	16.200	\$72,500
74	9184	Sidewalk Plows	1989							8,070	47,435	4.644	\$60,149
74	9168	Sidewalk Plows	1969							15,900	11,470	20,077	\$47.447
102	7598	Londer	1987						16,715	19,121	20,120	21.730	\$77,686
305	3512	Londer	1973	31,382	29,006	35,872	32,331	46,115	22,750	22,364	22,370	22.467	\$224,657
102	2606	Londor	1987						18,014	18,129	19,034	22,188	\$77,365
305	9099	Loader	1975	33,165	12,507	27,402	34,501	40,836	37,724	38,862	12,619	60,123	\$297,739
507	0000	- Constant	1080							7 507	16.390	22 830	Ter 727

			*	NNUALE	ANNUAL EQUIPMENT O & M COSTS	TORMC	SOSTS					TO-DATE
	EQUIPMENT CLASS	MODEL	1963	1981	1985	1986	1987	1988	1989	1990	1961	COSTS
	Loader	1989							8,725	14,535	23,299	\$46,559
	Loader	1986					22,255	39,020	39,400	31,155	32,170	\$164,000
	Loader	1986					24,220	41,011	43,639	21,696	32,740	\$163,306
	Loader	1981	8,705	19,220	35,365	50,069	54,156	26,800	37,504	36,200	16,250	\$284,269
	Londer	1979	19,047	23,690	24,516	28,049	31,652	52,200	29,900	19.240	39,700	\$267,994
	Loader	1980	21,079	40,021	46,905	59,531	56,748	40,035	39,092	18,072	45,165	\$366,648
5012	Londer	1985			696'6	21,013	23,394	37,002	36,154	35,410	47,200	\$210,142
9050	Londer	1985			9,106	19,005	25,780	63,332	64,094	39,200	33,479	\$253,996
	Loader	1990								11,700	20,574	\$32,274
	Loader	1990								11,300	27.120	\$38,420
	Loader	1990								8,275	15,200	\$23,475
	on Ten Bellin	900									2002	9
41.00	1/2 Ton Pickup	1989							1.854	1111	4.332	\$13.963
	1/2 Ton Pickup	1989							2,491	5,130	3,883	\$11,504
0528	1/2 Ton Pickup	1989							2,917	8,745	5,851	\$17,513
3248	1/2 Ton Pickup	1989							3,225	6,212	8,932	\$18,369
3399	1/2 Ton Pickup	1983		1,510	1,825	3,255	4,194	3,288	3,514	5,804	7,799	\$31,189
3255	1/2 Ton Pickup	1989							9,715	6,025	5,812	\$21,552
9263	1/2 Ton Pickup	1989							662	2,100	2,908	\$5,670
3271	1/2 Ton Pickup	1989							1,54	3,008	3,794	\$8,346
2030	1/2 Ton Pickup	1985			2,994	4,704	6,318	16,005	15,028	9,530	17,268	\$71,847
	1/2 Ton Pickup	1985			2,044	5,122	9,188	8,654	8,156	3,780	11,006	\$47,950
5152	1/2 Ton Pickup	1986				1,929	5,016	6,300	6,724	14,200	15,300	\$49,469
	A STATE OF THE PARTY OF THE PAR											The second

			2	ANDAL EC	ANNUAL EQUIPMENT O & M COSTS	OAMC	STS					TO-DATE
NIT #	EQUIPMENT CLASS	MODEL	1983	1984	1965	1986	1987	1988	1969	1980	1981	costs
110 6335	1/2 Ton Pickup	1986					6,662	10,218	11,823	8,043	1,879	\$38,625
210 8389	1/2 Ton Pickup	1988						4,664	5,174	11,250	5,150	\$26,238
210 8397	1/2 Ton Pickup	1988						8,065	9,025	4,260	11,269	\$32,619
210 8405	1/2 Ton Pickup	1988						4.978	4,733	7.977	11,138	\$28,826
210 8413	1/2 Ton Pickup	1988						2584	2500	3000	5,780	\$13,864
210 8421	1/2 Ton Pickup	1988						7,290	7,187	11,100	2,900	\$28,477
210 8439	1/2 Ton Pickup	1988						2,879	2,840	4,537	7,620	\$17,876
10 6201	1/2 Ton Pickup	1986					4,584	11,043	11,708	8,015	11,160	\$46,510
210 6219	1/2 Ton Pickup	1966					3,337	7,069	7,612	5,825	5,920	\$29,783
210 6227	1/2 Ton Pickup	1986					4,853	14,230	12,640	9,274	9,190	\$50,187
210 6235	1/2 Ton Pickup	1986					3,950	8,656	8,147	8,520	5,644	\$34,917
210 7050	1/2 Ton Pickup	1987					2,306	7,942	8,325	6,501	5,468	\$30,542
210 7068	1/2 Ton Pickup	1987					2,061	2.040	1,870	3,554	8,050	\$17,575
210 7092	1/2 Ton Pickup	1987					1,749	3,560	3,591	5,310	869	\$14,779
210 7100	1/2 Ton Pickup	1981					2,221	13,560	13,667	8.824	11,400	\$49,672
210 7118	1/2 Ton Pickup	1987					2,484	6,434	6,158	6,895	12,972	\$34,943
210 7126	1/2 Ton Pickup	1987					6,662	2.480	2.856	5,350	12,170	\$29,518
210 7134	1/2 Ton Pickup	1987					1,420	6,353	6,523	2,465	3,155	\$19,916
210 7142	1/2 Ton Pickup	1987					1,799	6,940	7,005	5,960	10,086	\$31,790
210 7159	1/2 Ton Pickup	1987					2,297	7,120	7,735	6,920	8,119	\$32,191
7167	1/2 Ton Pickup	1987					1,968	6,159	9,037	8,870	5,420	\$31.454
2117 015	1/2 Ton Pickup	1981					3,767	5,100	5,349	7,820	5,475	\$27,511
210 7183	1/2 Ton Pickup	1987					1,971	7.727	8,894	8,780	9,486	\$36,85
10 9099	1/2 Ton Pickup	1989										8

YEAR TO-DATE

ANNUAL EQUIPMENT O & M COSTS

UNIT		EQUIPMENT CLASS	MODEL	1983	286	1965	1986	1987	1988	1989	980	188	COSTS	
210	147	1/2 Ton Pickup	1980								185	1,885	\$2,070	
210	155	1/2 Ton Pickup	1990									1,635	\$1,635	
210	238	1/2 Ton Pickup	1990								4,920	3,810	\$8.730	
210	246	1/2 Ton Pickup	1990								5,510	7,093	\$12,603	
210	253	1/2 Ton Pickup	1990								4,950	3,586	\$8,536	
210	28	1/2 Ton Pickup	1990								5,415	7,245	\$12,660	
210	279	1/2 Ton Pickup	1990								3,540	3,805	\$7,345	
210	1152	1/2 Ton Pickup	1991										8	
Ξ	8512	One Ton Truck	1988						3,605	3,750	9,760	7.210	\$24,325	
111	8538	One Ton Truck	1988						7,340	7,983	7,270	6,817	\$29,410	
Ξ	5286	One Ton Truck	1985			1,555	6,284	8,552	13,934	15,599	11,150	21,379	\$78,453	
Ξ	5294	One Ton Truck	1985			3,179	7,832	7,759	15,029	14,663	12,300	11,010	\$71,772	
Ξ	6342	One Ton Truck	1986					3,248	8,468	9,296	14,890	5,553	\$41,455	
Ξ	6329	One Ton Truck	1986					8,898	8,775	8,456	7,960	10,089	\$44,178	
Ξ	6367	One Ton Truck	1986					6,320	7,457	7,874	13,120	15,817	\$50,588	
211	6229	One Ton Truck	1986					2,758	9,760	10,444	6,085	14,02	\$43,072	
211	7018	One Ton Truck	1987					3,259	2,182	2,483	8,802	4,704	\$21,430	
211	7026	One Ton Truck	1987					3,882	4,671	4,198	4,415	12,426	\$29,592	
211	8487	One Ton Truck	1988						8,769	9,814	20,348	20,628	655,653	
211	8503	One Ton Truck	1988						7,486	7,698	11,365	16,143	\$42,692	
211	9300	One Ton Truck	1989							986	3,544	6,244	\$10,754	
211	8495	One Ton Truck	1968						8,576	7,448	9,670	18,823	\$44,517	
211	7190	One Ton Truck	1987						11,656	11,725	10,420	10,990	\$44.791	
211	13	One Ton Truck	1990								7,620	5,265	\$12,885	

Compression					\$	ANNUAL EQUIPMENT O & M COSTS	UIPMEN	FORMC	OSTS					TO-DATE
Des Ten Track 1999	UNIT #		EQUIPMENT CLASS		1983	1984	1965	1986	1987	1988	1983	1990	1981	COSTS
2020 Care Ton Truck 1990 Accordance Accordance 1990 Accordance Ac	Ξ	22	One Ton Truck	1990									2,370	\$2,370
150 Carton Truck 1999 150	=	302	One Ton Truck	1990									3,630	\$3,630
1170 Chen Ton Thorse 1991 1992 199	=	9212	One Ton Truck	1989								1,974	6,530	\$8,504
1177 Ullimy Thuck 1988 1.40 1.60 1.40	=	1168	One Ton Truck	1991									4,362	\$4,362
7773 UNING 1991 2.648 2.648 2.648 2.648 2.648 2.648 2.648 2.648 2.648 2.648 2.649 2	=	8520	One Ton Truck	1988						19,831	20,930	19,058	11,410	\$71,229
100 100	=	1117	Utility Truck	1991									8,999	88'88
924 VAN 11848 5,054 9,040 819 1,020 <th< td=""><td>13</td><td>8783</td><td>VAN</td><td>1988</td><td></td><td></td><td></td><td></td><td></td><td>2,488</td><td>2,986</td><td>4,210</td><td>6,842</td><td>\$16,526</td></th<>	13	8783	VAN	1988						2,488	2,986	4,210	6,842	\$16,526
1999 1994 1996	12	5244	VAN	1985			5,054	9,406	5,884	11,240	12,685	11,545	10,399	\$66,213
1206 1207 1206 1206 1206 1206 1207 1207	2	6167	VAN	1986					3,888	7,903	6,713	1691	669'6	\$37,894
853 VAN 1984 1,156 4,170 4,270 2,820 2,820 4,822 1,822	12	6175	VAN	1986					1,236	8.027	8,515	10,910	6,562	\$35,250
100 270 270 100 270 100 270 100 270 100 270 100 270 270 100 270 <td>12</td> <td>6233</td> <td>VAN</td> <td>1986</td> <td></td> <td></td> <td></td> <td>1,156</td> <td>4,170</td> <td>4,270</td> <td>3,268</td> <td>6,730</td> <td>4,552</td> <td>\$24,146</td>	12	6233	VAN	1986				1,156	4,170	4,270	3,268	6,730	4,552	\$24,146
150 150	12	8577	VAN	1988						319	5,441	764	5,311	\$11,835
100 100	12	8543	VAN	1988						2,640	2,287	6,383	11,951	\$23,261
101 VAX 1990 210 3.0449 104	12	8	VAN	1990								340	4,043	\$4,383
112 VAN 1990 215 278 1 201	12	ş	VAN	1990								250	3,669	\$4,209
140 VAV. 1990 1400 4779 1750 1500 1700 1700 1700 1700 1700 1700	12	112	VAN	1990								215	2,781	\$2,996
61 VAM 1990 417 678 77 WAS 1990 72 1300 72 84 1340 72 8	12	46	VAN	1990								1,040	4,766	\$5,806
77 VAM 1900 R94 1420 17 VAM 1900 R02 1300 255 VAM 1900 2271 4.541 1500 VAM 1991 7307	12	61	VAN	1990								417	876	\$1.280
67 VAN 1990 602 1,300 and	12	2	VAN	1990								924	1,420	\$2,344
255 VAV 1990 2.27 4.581 253 VAV 1990 2.27 4.581 253 VAV 1991 4.780	12	87	VAN	1990								602	1,380	\$1,982
253 VAV 1990 3,207 3,807 1509 1209 VAV 1991 4,780	112	285	VAN	1990								2.221	4,581	\$6,802
1209 VAN 1991 4,780	112	283	VAN	1990								3,207	3,807	\$7,014
	112	1209	VAN	1981									4,780	24.780

YEAR	TO-DATE	1990 1991 COSTS	024.16	451 \$451	5,520 3,942 \$33,358	1,735 5,599 \$15,834	2,160 9,898 \$14,722	1,910 3,502 \$7,270	,780 718 \$2,498	606 1,002 \$1,608	833 1,508 \$2,341	13,670 8,745 \$75,071	7,550 12,140 \$67,881	17,840 15,187 \$89,894	200 000	00000	41.520	33,800	44,105 31,198 \$180,524	25,810 36,120 \$134,267	36,200 48,533 \$159,428	44,720 60,314 \$172,108	44,305 45,091 \$163,705	
		1989 19			9,170 5,5	2,800 4,7	1,272 2,1	1,858 1,9	2	•	-	17,493 13,6	14,450 7,5	13,023 17,4	000				38,804 44.	37,322 25,7	38,275 36,	36,184 44,	37,900 44,	
		1988			8,934	2,700	1,392					15,821	14,380	10,900		05,010	28.750	26,960	44,795	35,015	36,420	30,890	36,409	
	STSO	1981			3,187							10,929	11,299	11,255	200	23,03	11.473	13,931	21,622					
	ANNUAL EQUIPMENT O & M COSTS	1986			28							8413	8,062	9,668	000	900'00	10,33							
	OUIPMBN	1985			1.021									6,832		010,13	200							
	ANNUALE	1961												2,927		9,619								
		1983												2,262										
		MODEL	32	186	1985	1988	1988	1989	1990	1990	1990	1985	1985	1982	-	2	200	1986	1986	1987	1987	1987	1987	
		EQUIPMENT CLASS	NA.	VAN	Small Pick-up	Small Pick-up	Small Pick-up	Small Pick-up	Smell Pick-up	Small Pick-up	Small Pick-up	Hoist Truck	Hoist Truck	Hoist Truck		23 rd Collectomatic	25 Vd Collectomatic	25 Yd Collectomatic	25 Yd Collectomatic	25 Yd Collectomatic	25 Yd Collectomatic	25 Yd Collectomatic	25 Yd Collectomatic	
		_	1171	1365	5065	8154	8378	9839	33	28	8	5228	5236	5065	1	265	200	6054	6278	7037	7094	7102	7110	
		* LIND	315	312	114	114	114	214	114	214	214	128	120	420	1		474	424	424	424	424	424	424	

Fig. Part Conjunction Part					•	NNUALE	ANNUAL EQUIPMENT O & M COSTS	TOAMC	STSOC					TO-DATE
1,14 SVV Collectomatic 1971 SV Collectomatic 1980 SV Collectomatic 1981 SV Collectomatic 1982 SV Collectomatic 1982 SV Collectomatic 1983 SV Collectomatic 1984 SV Colle	* LING	į	EQUIPMENT CLASS	MODEL	1963	1984	1985	1986	1987	1988	1989	1990	1981	COSTS
20 VI Collectomete 1987 3 14102 3 1410														
100 100		144	25 Yd Collectomatic	1987						35,500	37,805	33,105	61,508	\$167,918
8011 2010 Coloscopander 1980 1.5.00 <th< td=""><td>.,</td><td>269</td><td>25 Yd Collectomatic</td><td>1985</td><td></td><td></td><td></td><td></td><td></td><td>46,241</td><td>45,450</td><td>45,785</td><td>51,178</td><td>\$188,654</td></th<>	.,	269	25 Yd Collectomatic	1985						46,241	45,450	45,785	51,178	\$188,654
8622 3 NO Collections (1984) 1984 3 NO Collections (1984) 1984 3 NO Collections (1984) 1,5,1,11 14,6,55 2,5,6,6 1,5,1,11 14,6,55 2,5,6,6 1,5,1,11 14,6,55 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,11 14,6,5 2,5,6,6 1,5,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1	~	118	25 Yd Collectomatic	1988						14,608	17,700	19,908	44,964	\$97,180
1020 25 V Colomenomes 1931 25 V Colomenomes 1932 25 V Colomenomes 25 V Colomeno	~	828	25 Yd Collectomatic	1968						12,131	14,625	22,645	37,158	\$86,559
103	-	050	25 Yd Collectomatic	1881									7,179	87.179
111 25 VG Collectometric 1931 25 VG Collectometric 1931 25 VG Collectometric 1931 25 VG Collectometric 1932 25 VG Collectometric 1933 25 VG Collectometric 25 VG Collectometric 1933 25 VG Collectometric 25 VG Collec	-	939	25 Yd Collectomatic	1991									7,982	\$7,982
3443 19 Vol collectorwide 1983 6,077 15,110 26,078 33,268 <t< td=""><td></td><td>Ξ</td><td>25 Yd Collectomatic</td><td>1991</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3,480</td><td>\$3,460</td></t<>		Ξ	25 Yd Collectomatic	1991									3,480	\$3,460
2323 1 VV Colochecumos 1923 2 8.00 21 74.01 8.62 2.50 20 8.00 4.00 1.00 1.00 1.00 1.00 1.00 1.00 1	-	483	16 Yd collectomatic	1983		6,077	16,910	26,618	29,320	30,825	32,045	22,520	44,760	\$209,075
2331 (1974 collectrowinds) 1932 13,720 20.017 40,791 83,322 34,100 22,000 34,600 20,101 8,000 20,000		524	16 Yd collectomatic	1982	9,593	21,401	24,581	23,639	29,182	57,820	56,829	20,045	19,640	\$262,730
100 10 10 10 10 10 10 1		532	16 Yd collectomatic	1982	13,720	20,017	49,736	33,228	34,160	22,005	24,660	23,915	31,826	\$253,267
1,000 Wiley Travier 1986 1,1258 1,3258 3,1258	-	105	16 Yd collectomatic	1985			12,019	18,081	24,941	25,632	27,500	36,640	24,708	\$169,721
8644 Compact Cas; 1980 1,500 2,402 1,700 3301 Compact Cas; 1983 1,504 8,604 3,805 5,402 1,700 311 Compact Cas; 1983 1,644 0,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,60 9,00 2,40 1,50 1,50 9,00 2,40 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,50 1,	_	280	Water Tanker	1986				11,235	13,208	29,934	34,045	25,067	35,912	\$149,421
Style Compaction 1955 1,1996 2,549 5,644 3,549 5,499 1	w	644	Compact Cars	1988							2,462	1.790	1,320	\$5,572
1102 Compacticus 1991 1,464 900 2440 8,105 9139 Compacticus 1986 1,464 900 2440 8,106 9139 Compacticus 1983 1,816 1,782 1,746 1,746 9134 Compacticus 1983 1,817 1,819 1,347 1,340 1,347 914 Compacticus 1987 1,887 1,817 1,829 2,116 2,220 8691 Compacticus 1988 1,820 1,871 1,882 2,116 2,220 8691 Compacticus 1988 7,883 2,482 2,177 1,482 2,177 1,482 2,177 1,482 2,476 3,479	-	310	Compact Cars	1985				1,098	2,049	6,694	3,830	5,420	3,262	\$22,353
911 Compactions 1985 1,64 0.0 240 910	-	102	Compact Cars	1661									2,065	\$2,065
Stop Compactions 1955 Authority (A) 1960 A 1500		111	Compact Cars	1985					1.484	006	2,840	9,620	1,460	\$16,304
Staff Compactions 1983 2.188 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 1.345 2.116 3.220		139	Compact Oars	1985					3.598	5,198	7,582	9,740	11,477	\$37,595
9145 Compacticus 1985 1,381 9,046 9,212 7,100 1704 Compacticus 1987 1,581 9,046 9,212 7,100 1,04	-	137	Compact Cars	1985					2,189	4.174	3,799	1,345	3,965	\$15,472
Total Compatitions 1987 1,571 1,620 2.116 3,250 4 860 Compatitions 1988 783 2,462 3,470 4 3,470 1,400 771 1,400 1,400 1,400 1,400		145	Compact Cars	1985					1.391	9,065	9,212	7,180	8,553	\$35,421
8651 Compacticas 1988 785 2.462 3.470 1869 Compacticas 1898 707 1.480 1	,-	042	Compact Cars	1987					1.071	1,829	2,116	3,220	6,144	\$14,380
8669 Compact Cars 1598	-	651	Compact Cars	1968						783	2,462	3,470	1,067	\$7,772
	_	699	Compact Oars	1598						708	717	1,480	1,347	1252

													5
				4	NNUALE	ANNUAL EQUIPMENT O & M COSTS	OWYO	OSTS					TO-DATE
* HND	_	EQUIPMENT CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1991	COSTS
237	7298	Compact Cars	1988						802	884	475	1,460	\$3,421
237	8685	Compact Cars	1988						579	759	787	951	\$3,056
237	8701	Compact Cars	1988						1,000	944	1,824	1,734	\$5,502
237	8719	Compact Cars	1988						530	208	1,035	810	\$2,883
237	8727	Compact Cars	1988						467	480	662	1,609	\$3.198
237	3735	Compact Cars	1988						486	473	1,194	1,503	\$3,656
237	8743	Compact Cars	1988						366	2,248	2,505	1,400	\$6,519
237	8750	Compact Cars	1988						2.444	2,389	896	749	\$6,550
237	8768	Compact Cars	1988						879	883	2,067	2,321	\$6,150
782	8776	Compact Cars	1988						280	328	1,688	679	\$2,975
237	9147	Compact Cars	1989							8	847	1,707	\$2,637
237	9154	Compact Cars	1989							18	858	1,034	\$1,710
237	9162	Compact Cars	1989								250	1,281	\$1,531
237	9170	Compact Cars	1989								1,496	1.28	\$2,787
162	1102	Compact Cars	1981										8
146	8651	Street Broom	1978	12,349	27,740	23,889	34,852	33,000	43,204	41,133	27,240	36,700	\$280,107
146	8586	Street Broom	1988						27,726	32,600	45,325	64,018	\$169,669
546	6305	Street Broom	1986				14,139	26,359	33,742	36,377	41,505	41,025	\$193,147
252	2134	Large Backhoe	1981										8
8	7080	Small Backhoe	1987						8,340	8,345	15,940	14,200	\$46,825
354	8690	Small Backhoe	1988						6,030	6,118	11,547	20,936	\$44,631

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			•	ANNUAL EQUIPMENT O & M COSTS	NBWGING	TORMO	SOSTS					TO-DATE
UNIT #	EQUIPMENT CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1661	COSTS
		į		1		1						
"	-	200		797	2,23/	2,640	40.	999	2	38	2,520	\$14,628
1275	Gang Mower	1977	1,939	1,582	3,496	1,887	2,035	2,405	2,654	2,417	10,063	\$28,478
66 2048	Gang Mower	1982	1,389	8.048	8.810	7,503	2,795	2,017	883	621	4,760	\$36,826
9204 998	Gang Mower	1984		27	999	1,717	2,587	1,372	2,194	3,670	2,350	\$14,572
66 4034	Geng Mower	1984		2	1,245	937	1,385	2,262	2,317	1,702	3,843	\$13,745
66 6138	Gang Mower	1986				733	3,742	2,492	2,821	2,572	2,795	\$15,155
66 6146	Gang Mower	1986				494	1,917	4,477	3,234	2,919	4,046	\$17,087
6606 991	Gang Mower	1979	4,285	699	343	4,394	3,058	5,539	5,339	2,687	5,159	\$31,473
1016 9907	Gang Mower	1979	066	1,609	692	225	1,699	1,495	1,229	2,166	1,656	\$11,761
30	Gang Mower	1980	2,979	1,320	1,255	4,435	1,551	1,74:	1,705	28	1,960	\$17,520
66 3048	Gang Mower	1983		58	8	8	306	1,864	2,057	2,020	4,375	\$10,790
66 3073	Gang Mower	1983		3,332	2.710	1,954	1,187	822	1,080	1,231	1.884	\$14,200
9902	Gang Mower	1988						3,775	3,550	1,353	9,632	\$18,310
77 6897	Blower Attachment	1976	1,269	8	898	28.112	32,653	7,865	7.815	3,230	1,657	\$83,474
377 5863	Blower Attachment	1975	1.112	3,756	4,373	4,655	17,285	17,490	15,632	3,640	14,200	\$82,143
5889	Blower Attachment	1975	8,991	473	5,225	4,246	8,824	19.045	14,550	4.460	8,550	\$74,361
8816 778	Blower Attachment	1979	5,598	3,233	8,446	13,038	24,070	34,209	34.220	4.120	15,230	\$142,164
377 146	Blower Attachment	1980	3,766	3,050	4,617	4,122	21,498	26,023	26,650	7,348	9,739	\$106,813
277 5914	Blower Attachment	1965	7,495	575	5,396	3.843	16,058	30,800	38,430	25,260	14,329	\$142,186
277 5922	Blower Attachment	1965	6.092	2,636	8.728	16.054	24,114	48.643	45,550	17,700	12,240	\$181,757
277 5930	Blower Attachment	1965	1.829	939	6.896	10.536	24,493	26.215	25,500	18,115	16,829	\$133,352
577 9329	Blower Attachment	1983							21,693	10,400	28,400	\$60,493
5228 775	Blower Attachment	1983							13,700	19,650	13,100	\$46,450
677 0243		000									00000	

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			4	ANNUAL EQUIPMENT O & M COSTS	DUIPMBN	LORMO	OSTS					TO-DATE
	EQUIPMENT CLASS	MODEL	1963	1984	1985	1986	1981	1986	1989	1990	1981	COSTS
9350	Blower Attachment	1989							24,300	9,505	18,200	\$52,005
2101	Loader/Snowblower - fixed	1962	28,420	4,636	7,420	17,552	43,272	35,421	38,900	32,415	25,405	\$233,441
2119	Loader/Snowblower - fixed	1962	18,233	7,827	13,554	15,977	44,727	28,010	31,700	30,059	29,556	\$219,643
						-					-	8
4 1	Compressor - Mounted	2			3,432	6,377	9,486	13,023	0,150	000	12,786	916'994
22 1	Compressor - Mounted	2			2,149	3,830	96.0	8,913	8,925	388	12,333	206'654
188	Compressor - Mounted	1991									2,565	28,58
138	Compressor - Mounted	1981									10,452	\$10,452
9228	Small Sweeper	1989							123	3,344	2,819	\$6,288
404	Large Roller	1974	4,756	4,617	1,120	5,671	5,429	3,570	3,480	9,050	1,650	\$39,343
55	Small Dozer	1982	2,946	24,729	7,573	17,322	888	4,655	1,032	1,250	6,603	\$66,998
288	Pothole Patcher	1989							2,045	10,090	9,814	\$21,949
3474	Pothole Patcher	1983		4,711	9,939	10,671	20,244	162'6	9,355	13,467	21,630	\$99,808
9055	5 Ton Dump Truck	1989							9,00	16,946	22,290	\$48.240
9033	5 Ton Dump Truck	1989							11,600	24,100	45,034	\$80,734
8	5 Ton Dump Truck	1983							6,823	16,155	23,291	\$46,269
9028	5 Ton Dump Truck	1983							4,365	20,045	24,613	\$49,023
990	S Ton Dump Truck	1989							4,420	21,340	30,985	\$56,745
3074	5 Ton Dump Truck	1988						4,703	6,495	25,660	36,912	\$73,770

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			•	NNOALE	DUIPMEN	ANNUAL EQUIPMENT O & M COSTS	COSTS					TO-DATE
UNIT #	EQUIPMENT CLASS	MODEL	1983	1984	1985	1986	1987	1988	1989	1990	1861	COSTS
416 2442	5 Ton Dump Truck	1982	5373	6,842	11,256	22,948	9,707	14,760	10,768	16,946	9,075	\$107,675
416 3077	S Ton Dump Truck	1983	2,099	4,384	4,070	7,527	25,091	24,631	25,987	16,900	20,678	\$131,367
416 5155	5 Ton Dump Truck	1985				30,855	36,296	52,550	53,426	47,120	33,320	\$253,567
416 5163	5 Ton Dump Truck	1985				17,938	27,665	28,200	30,868	25,300	47,514	\$177,485
416 5171	S Ton Dump Truck	1985				23,158	37.729	28,700	31,583	32,500	35,736	\$189,406
416 6062	5 Ton Dump Truck	1986					17,245	33,300	25,824	36,330	58,200	\$170,899
416 6070	5 Ton Dump Truck	1986					22,900	28,260	25,468	49,320	33,223	\$159,171
416 6161	5 Ton Dump Truck	1986				12,059	20,574	40,820	38,558	25,700	46,091	\$183,802
416 6179	5 Ton Dump Truck	1986				8,946	23,859	27,043	30,731	31,250	50,173	\$172,002
416 6187	5 Ton Dump Truck	1986				7,884	15,195	35,328	35,279	23,540	36,782	\$154,008
416 6195	5 Ton Dump Truck	1986				8,400	20,449	45,900	46,661	20,800	52,100	\$194,310
416 6203	5 Ton Dump Truck	1986				7,298	14,829	21,650	22,350	23,001	37,524	\$126,652
416 6211	5 Ton Dump Truck	1986				10,170	23,657	27,348	28,425	47,980	38,479	\$176,059
416 6245	5 Ton Dump Truck	1986					7,961	15,985	16,260	16,710	29,421	\$86,337
416 6252	S Ton Dump Truck	1986					7,691	13,790	15,445	19,320	19,418	\$75,664
416 7078	5 Ton Dump Truck	1987					10,891	28,120	27,478	19,500	37,601	\$123,590
416 1066	S Ton Dump Truck	1981									1304	\$1,304
416 1074	5 Ton Dump Truck	1981									1370	\$1,370
416 1082	5 Ton Dump Truck	1961									2761	\$2,761
416 1090	5 Ton Dump Truck	198									1118	\$1.118
417 7200	Tandem Dump Truck	1987					21.923	46,450	55,789	45,800	55,820	\$225,782
417 7218	Tandem Dump Truck	1987					27,310	61,045	55,116	44,250	62,463	\$250,184
417 8448	Tandem Dump Truck	1988						33,800	42,059	40,550	39,889	\$156,298

				2	ANDAL EQ	DIPMENT	OWAGO	STS					IO-DAIE	
WIT #		EQUIPMENT CLASS MODEL	MODEL	1983	1984 1985 1986 1981	1985	1986	1987	1988	1989	1990	1991	COSTS	
-	-			1	İ		i	-	-		1			
452	422 7013	Sewer Jet	1987						11.19	14,360	18,525	22,020	\$66,095	
8	7611	Grader	1987						28390	32,873	23,990	44,044	\$129,297	
5	9296	Grader	1969							14,376	33,312	38,150	\$65,636	
8	6084	Grader	1986					25,013	46,120	37,863	31,005	24,390	\$164,391	
9	6009	Grade	1086					07.091	40.04	49.090	20.040	27 769	****	

APPENDIX J

TYPICAL FRAPOF FORECASTING MODULE

PPEND	OLJ PRESENTYSAR:		1991		08 11 00		FORECAS THE YEAR		DULEFOR	TEAR	1992							SUV	9.86		SUM	S.W			COST	23
NE I	EQUIP. CLASS	MODEL	1983		1965				1969	1990	1351	n	2 12	X4	X5	5 X	13)		X3		m	12	COEFF.	CONST.	15AR	×
		1060						523	EX	250	150	1	0 0				. 1				15 300	2	496	44	202	
	9012 Partable Compressor	1968						340	1.180	250	1,570		0 0			0				;	14 534	14	145	600	\$2,523	
	9021 Partable Compressor								1,00	85	1,530		0 0			*			6						\$1,502	2
	9039 Partable Compressor	1909				5000											5			3	7,250	14	390	315	\$1,575	
8	1101 Pariable Congressor	1961	825	1,984	2,388	2364	1,679	2,325	2,470	2,430	2,100		2 1	113	5	6		19,715	45	9	193,225	25	75	1,803	\$2,578	
664	139 Sideselk Plans	1901	8,212	5,867	18,588	14,760	14,00	15,140		22,130	12,430		2 1				8		45	9	681,671	26	1,226	1.1	\$19,500	2
554	117 Sidesak Plans	1961	2,748	5,150	10,154	9,175	16,352	15,735	15,760		15.530						8			9	555,812	25	1,141	4	\$18,558	
524	125 Scienali Plans	1981	2,128	4,737	13,573	5,343	20,046	14,710	14,699	12,658								12314		9	505,320	25	1,479		\$13,597	1
	0090 Sidewalk Plans	1989							7,305	5,811	18,345		0 1				1 2			3	77,452	14	5,770	(53)	\$22,527	1
	8194 Sidensk Plans	1988							15,950	47,450	2,354		0 0					4 128,718		4	370,630	30	9,767	130	155,597	
	5:55 Sidesalk Ploes	1986							2,50	25,235	14,400		0 0			2 :		122	15	5	308,519	55	20	20,217	\$20,79	
	6222 Sidensk Roes	1986				5,747	24,819	25,000	22,430	28,233	20,489		0 0			1				8	484,090	81	2,322	12,98	123,245	
	7229 Sidewalk Plons	1987					10,716	22,144	22,013	12,715	15,200		0 0	0		2				5	239,903	55	Q45		\$15,610	
	8202 Sidewalk Plans	1968						18,990	16,222	22,250	16,200		0 0			1				4	123,534	30	488	16,906	\$136	
	9184 Sidewalk Plans	1989							8,070		4,544		0 0			0				3	116,572	14	0.713		\$15,524	
74	9:88 Sidewalk Pows	1989							15,900	11,90	20,377	0	0.0	0	0	0	1 2	3 47,47	8	3	99,071	14	2,089	11,539	\$16,953	
	7538 Loader	1987						15,715	19,121	20,120		0					2 3			4	202,237	35	1,604	15,411	\$23,433	
33	3512 Leader	1973	31,322	29,006	25,672	12,331	45,115		233	2,370	2,451		2 :		5	6		9 234,557		9	891,720		0,860		\$5,515	
œ	7506 Loader	1987						10,014	18,129	15,004	22,188	0	0 1	0	0	1	2 3	4 77,005	10	4	200,126	- 20	1,343	15,965	\$22,596	Ü
93	SESS Loader	1975	32,165	12,507	27,402	34,501	40,E36	37,724	38,952	12,513	60,123	1	2 :	4	5	6	7 8	9 207720		9	1,520,000		2,230		\$44,275	
33	9069 Loader	1982							7,507	15,390	23,830	0	0 1	0 0	0	0	1 2	3 48,727		3	139,777	14	1,152		\$21,899	
330	9377 Leader	1989							8,725	14,505	20,299	0	0 1	0	0	0	1 2	3 45,550		3	107,000	18	7,267	945	\$30,094	1
93	STIZ Loader	1985					22.255	39,020	39,488	31,155	32,170	0	0 1	0	1	2	3 4	5 154,000	15	5	500,065	25	1,187	29,211	\$36,390	1
331	6020 Loader	1986					24,220	610,00	43,539	21,898	32,740		0 1	0	1	2	1 4	5 153,306	15	5	47,643	55	[229	33,344	\$11,579	
22	2127 Leader	1981	1,705	19,222	2,365	50,063	54,155	25,800	37,554	36,220	18,250	1	2 :	1	5	6	7 6	9 254,260	45	3	1,480,01	255	1,006	25,400	\$36,753	1
22	9163 Loader	1979	1200	23,890	24,516	2.04	31,852	\$2,200	29,923	19,240	33,700	1	2 :	3 4	5	6	1 8	1 257,894	45		1,44,151	755	1,736	21,095	\$38,450	
330	181 Leader	1960	21,079	402	45,905	553	55,748	40,005	39,852	18,072	6,355	1	2 :	1 4	5	6	1 8	9 355,545	45	9	1,828,815	255	(77	41,124	\$40,353	
300	Str2 Loader	1265			1,963	21,013	23,394	37,002	38,154	35,410	4,200	0	0	1 2	1	4	5 6	7 20,140	25	7	900,815	140	5,472	8,128	\$51,813	1
100	SEED Leader	1985			9,106	19,005	25,730	\$3,330	54,154	39,200	20	0	0	1 2	1	4	5 6	7 251,995	28	1	UPAG	140	5.422	14.536	\$57,574	
200	447 Loader	1990								11,700	354	0	0 1	1		0	0.1	2 32.274	1	2	284	1	1.00	2.826	\$23,442	į.
402	434 Loader	1990								11,300	27,120	0	0			0	11	2 38.420	3	2	65,540	9	15.820	14.520	\$42,540	1
100	450 Loader	1990								8,275	15,200	0	0	1	0	0	0 1	2 22,675	3	2	38,875	5	6,325	1,250	\$22,125	
113	\$100 t.D Ton Polyo	1589							1,000	2,271	2,807	i	0 1			0	1 2	2 5.09		1	13,983	14	894	746	13,820	i
113	9214 12 Ton Pickup	1389							1,854	7,777	4.332	0	0		0	0	1 2	3 13.90	6	3	2.04	N	129	2176	\$7,132	í.
	9000 10 Ton Fickup	1580							2.6	5.130	3.883		0		0	0	1 2	1 1153		3	24.400	14	96	2.40	\$5,227	ì
	9000 1.0 Ton Pickup	1989							280	874	5.881		0 1	i	0	è	1 2	1 (7.9)		3	37.960	14	140	2304	\$8,172	ì
	\$343 LD Ton Picture	1989							1225	5212	A 177		0 1			i	1 2	1 18.30		1	045	14	2854	418	\$11.830	
	3390 LC Ton Pickup	1983		1.510	1,825	3255	4.194	3,288	1514	5,804	1,799		13	2 2	i	5	1 7	\$ 21.18	36		172,245	394	750		17.24	
	\$355 LC Ton Pickup	1980		1,010	· ipea		400	-	1,715	6.825	592		0			í	1 2	3 21.55		3	322	14			\$3.281	
	\$253 (2 Ten Pokup	1540							962	2,100	2308	i	0			÷		1 557		3	12586				\$4136	
	SST1 1/2 Ton Pokus	1989							1.544	3,008	1766		0 1			ï	. ;	1 130		3	1550	14			\$5,000	
	5000 (12 Ton Pickup	1995			2394	4704	6.318	16,005	15.005	9.530	17.258	·	0	1 2				7 71.85		,	34.572				\$18,000	
		1955			204	5,122	8,135	8.854	1,150 1,150	1780	11.000		0	1 2			1 1	7 47.99		,	214.970	140			\$10,150	
	S291 (§2 Ton Pidup				4,079	1,009	5,015	6300	6,734	14,200	15,000		0			:		400			200,550	20	275		\$17,725	
	6152 1/2 Ton Police 6264 1/2 Ton Police	1935				1,929	12,737	9,643		12,250	15,000	0	0 1		2	:		6 9238		6	254,100	91	2/04		\$8,885	
						4,01	5.620	10.218	11,146	12250	1,570		0 1			:	::	5 38.52		5	104,100	9			\$4,000	
	6335 1/2 Ton Pickup	1555					1,002	4554	5.174	11,250						2	1 1	4 2628		4	6930				12.40	
	8389 1/2 Ton Picket	1988						4,004		11,250	5,150		0	1	0	1	6 5			4						
20	8387 1/2 Ton Poliup 8405 1/2 Ton Poliup	1965						8,065	8,025 4,730	1,250	11,259			0 0			2 2 2	4 250		4	81,971 82,977	X			\$12,500	

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12 CHINN 188	unit e	EQUP. CUSS	MODEL	1923	1984	1985	198	1967	1988	1989	1990	180	E	2 23	8)	5 2	17)	3 19	'n	n	•	m	R	COEFF.	CONST.	YEAR	KEK
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Company	312	1205 VAN	1994									ON	0	0 0	0	0 0	0	0 1	4780	1	1	4,780	- 1		C10		
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No. Companies No. Comp						1,021	1,584	2,157																			
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State Stat	214	36 Small Pick-up	1990								822	1,52	٥	0.0	0	0 0	0 0	1 2	2341	1	2	139	5	95	19	210	\$14,5
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SING DIFFERENCE SERVICE AND AND THE CARE AND AND THE TOTAL THE TOT	41	2000 Hotel Truck	92	2202	230	112	1,353	11,255	10,900	13,023	930	15,167	1	2 3		3 6	5 7	. ,	ELSK	-	9	19,21	26	(33	81	19,15	200,
No of St Victorians 18	124	34EQ 25 Yel Colectoratio	1905		9,219	21,375	25,000	224	23,610	30,749	22,930	2,05	0	1 2	1	4 5	5 6	7 8	199,800	36	5	84,23	24	228	14,85	\$35,165	\$146
0.00 0.00	Ç4	5096 25 Yel Collecteratio	195			8,533	22,914	13,15	41,040	38,364	41,250	3,50		0 1	2	3 4	5	6 7	21,54	28	7	1,000,402	14	5,224	9,811	\$51,40	\$146
No ST ST Middlement 197	Q4	6047 25 Yel Collectomatic	1985					11,473	21,750	34,219	220	41,520	0	0 0		1 2	1	4 5	148,272	15	5	522,400	5	6,59	10,576	\$48,730	\$146
Not 50 Velocimente ser 50 20 20 20 20 20 20 20 20 20 20 20 20 20	Çί	6054 25 Yel Collecteratio	1985					12,000	25,960	26,704	33,115	230	0	0 0		1 2	1	4 5	135,510	15	5	49,03	5	5,98	12,534	\$43,170	\$146,
Non-State Measurement of Recoloury 1550 et 400 et 2 1 2 4 4 500 et 4 4 500 et 2 1 20 4 500 et 4 6 500 et 2 1 20 4 500 et 4 6 500 et 2 1 20 4 5	44	6276 25 Yel Collecteratio	1935					21,022	4,795	38,804	4,125	31,198	0	0 0		1 2	1	4 5	185,524	15	5	500,034	5	1,96	30,566	\$1.50	\$146,
N TO S VANCAMENTE DE	Q¢	7057 25 Yel Collecterratio	1967						35,015	37,222	25,810	36,120	0	0 0		0 1	1 2	3 4	134,257	10	4	121,569	20	500	35,816	\$31,518	\$146,
Not Syndhomore 12	4	7094 25 Yel Collecterratio	1907						38,420	38,275	36,200	48,530	0	0 0		0 1	1 2	3 4	159,428	10	4	415,702	20	14	31,291	14,01	\$146
N 70 SVM-Sement on	Q4	7102 25 Yd Collecterratio	1967						30,890	36,154	4,720	50,214	0	0 0		0 1	1 2	1 4	172,138	10	4	CLER	30	9,50	18,825	167,239	\$146,
The STANDARDSCHEEP	424	7110 25 Yd Collectenatic	1967						38,439	27,900	44,305	45.00	0	0 0		0 1	1 2	3 4	163,725	10	4	425,488	X	326	32,814	149,139	\$146
\$\ \text{MSET} \text{Modelmanker} \text{MSET} MS									34,754	17,850	19,455	43513	0	0 0		0 1	1 2	1 4	155,570	10	4	4230	30	2,794	31,134	\$45,858	\$145
No 01 TS (Andreader 1982 1882 1	424	7144 25 Yel Collectoratio	1967						35,500	27,805	32,105	61,538	0	0 0								456,457	30	7,32	23,549	\$80,311	\$145
N 80275 N Colectronic 1988 1219 1 M255 20545 20128 0 0 0 0 0 1 0 3 4 81598 10 4 20194 30 4.210 80 49245 20 80 20 80 80 80 80 80 80 80 80 80 80 80 80 80	424	5509 25 Yd Coledonatic	195						46261	45,450	45,765	51,78	0	0 0	0	0 1	1 2	1 4	188,854	10	4	479,208	30	1,25	43,577	150,050	\$146
H 1000 25 NG Collectromatic 1881 1,179 0 0 0 0 0 0 0 0 1 1,179 1 1 1,779 1 0 7,779 27.179 28 1000 25 NG Collectromatic 1891 1,000 25 NG Collectromatic 1891 1,	424	8811 25 Yd Celledonatic	1988						14,508	17,790	19.900	4,964	0	0 0	0	0 1	1 2	3 4	\$7,180	10	4	360,586	30	9,22	275	\$47,514	\$145
8 1339 2516 Collectoratic 1961 1 7,962 1 0 7,962 \$7,962 \$1	424	8629 25 Yd Cefedanatic	198						12.131	14,825	22.545	37,150	0	0 0	0	0 1	1 2	3 4	M.559	10	4	27,948	30	130	864	142,415	\$145
	425	1020 25 Yd Colectoratic	1991						,,,,,,		-	7,179	0	0 0	0	0 0	0 0	0 1	7,179	1	1	1,179	1		7,179	\$7,179	\$145
26 1111 25 Tel Collectorate (1961 1 3.460 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460 1 1 3.460												1,962	0	0 0	0	0 0	0 0	0 1	7,982	1	1						
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											700																	
	PRESENTION		1201				FORECK	TING NO	DUEFO	HUK	35%																COST	EQUP.
					OFFICE	0575 FOR	HEB	8;												SW	SUM		SUN	SUM			NET	COST
UNITA	EQUIP. QUES	M008.	190	1984	1985	196	1907	1903	1989	1990	2	Z	R	8	[4]	5 1	5 3	7 12	13	Yt	χ_3	,	m	12	COEFF.	CONST.	198	NBI
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125	3453 15 Total Advance	190		5,077	15,910					21500			1	2	3	4 !	5	6 7		38,075	36	,	1,000,146	204	3761	8,173	\$43.000	\$17,000
	2524 16 Totalecterate				24,581					2005										22,730			THERE	285	2,247		\$8,45	
	2532 16 Totalectmets		12,720	20,017						23,915													1,289,579		377		\$30,000	157,500
Q5	SIGS 16 Técolectionate	1965			12019	UE	2(31)	2,52	27,500	3,340	3/72	1	0 0	1	2	3 .	1	5 6	1	189,721	28	7	757,000	140	2,791	13,002	\$25,409	\$17,900
48	530 Non Tarke	1986				11,225	13,255	25,334	34,345	2007	252		1 1	0	1	2 :	1	4 5		16/21	25	5	534,540	91	4,555	8,500	\$11,217	\$2,000
217	8644 Conpact Cos	1988							2,452	176	1,20		0 0	0	0	0 1	,	1 2	1 3	5572	6	5	10,000	14	571	2,999	\$715	\$14,000
137	S210 Compact Cars	195				1,058	2,049	6.654	1530	5/20	130		1 0	0	1	2 :	1	4 !	. 6	22,263	21	6	87,270	91	316	1,919	\$5.532	\$14,000
237	1102 Congact Cus	1991									2,005																	\$14,000
237	5111 Corpact Cars	1985					1,484	900	2840	1620	1,480	1	0.0	0	0	1 :		3 4	5	15 304	15	5	57,584	55	80	650	\$5,862	\$14,000
227	5129 Compact Cus	1985					3,598	5,198	7,582	1740	11,07	4	1 1	0	0	1 :	1	3 4	5	37.995	15	5	133,005	55	2,039	1,429	\$12,609	\$14,000
227	5137 Congact Cars	1985					2,189	4174	3,799	1,345	196	-	0 0	0	0	1:	2	2 4	5	15,472	15	5	47,139	55	72	2,878	\$3,211	\$14,000
237	5145 Conpact Day	1385					1.221	9,085	9,212	7,150	1,553	1	0 0	0	0	1 :	2	3 4	1 5	35,421	15	5	118,502	55	1,242	3,250	\$10,810	\$14,000
217	7042 Congoct Cars	1387					1,01	1,839	2,116	1,220	8,544		0.0	0	0	1 :	2	3 1	5	14,380	15	5	\$4,577	55	1,50	(505)	\$5,337	\$14,000
227	8651 Conpact Cars	1988						763	2452	2,470	1,057	4	0 0	0	0	0	1	2 :	4	7,772	10	4	20,36	30	183	1,486	\$2,401	\$14,000
227	9669 Compact Cars	1388						708	717	1,480	1,347		0.0	0	0	0	1	2 :	4	4252	10	4	11,970	30	250	305	\$1,733	\$14,000
227	8677 Compact Cars	1986						802	684	475	1,460		0 0							3/21	10	4	9.435	30		414	\$1,297	\$14,000
237	8685 Conpact Cars	1588						579	759	767	951	-	0.0	٥	0	0	1	1	4	3,056	10	4	8,222	30	112	403	\$1,045	\$14,000
237	8701 Compact Cars	1988						1,000	944	1,824	134		0.0	0	0	0	U	2 :	4	\$112	10	4	15,296	30	350	605	216	\$14,000
237	6719 Compact Care	1986						530	508	1,005	810			٥	٥	0	1	2 8	4	2,600	10	4	7,80	30		379	\$1,063	\$14,000
	8727 Compact Cars	1933						62	450	602	1,539		11							1,98	10		9,509	30		(100)	\$1,707	\$14,000
227	8735 Compact Cars	1988						485	43	1,194	1,523	1	0.0	0	0	0	1	2 3	4	2,858	10	4	11,025	30	27	(29)	\$1,857	\$14,000
	ST43 Conpact Cars	1938						366	128	2,505	1,430		1 0							65R	12	4	17,977	30		790	22,470	
237	8750 Conpact Cars	1968						2,444	2,389	968	76	- 0	0.0	٥	0	0	13	2 1	4	630		4	12,122	30		3.254	\$11	\$14,000
	ST66 Compact Cars	1988						879	883	2007	2221		0.0							6,50	10	4	18,130	33		150	\$2,915	
	6776 Compact Cars	1965						280	228	1,568	53		0.0							2,975	10	4	8716			125	\$1,363	
	9147 Compact Cars	1969							83	807	1707		0.0							120	6	3	6,838	14		76	250	
	9154 Compact Cars	1369							18	658	1,034		0 0							1,710	6	3	(40)	14		[44]	\$1,586	
	9152 Conpact Care	196								20	120		0.0							1,231		2	2,812	5		[78]	2212	
	9170 Compact Cars	1969								1,495	120		0 0							2,767	1	2	4,078	5	223		\$1,086	
257	1102 Compart Cars	1991											0 0	0	0	0 1		0 0	0	0		0	0	0	ŧ	0	20	\$14,000
145	MS1 Steel Stoom	:23	1236	2740	23,899	MER	33,000	4224	41,133	220	370	1	1 2	3	4	5 1		7 8	9	表证	45	9	1,539,279	265	2,312	12.50	\$4,95	\$150,000
145	6566 Street Street	1966						2725	32,500	6325	505		0 0		٥			2 2	4	1953	10	4	44,073	30	1216	12.017	\$72,818	\$154,000
545	6005 Street Broom	1966				14,139	25,359	27,70	28,977	4,535	41,25	-	0 0	0	1	2 :	1	4 5	6	银炬	21	6	707,296	91	5,214	13,541	130,441	\$154,000
252	2134 Large Baddice	1201										0	0	0	0	0 1	1	0 0	0	0	0	0	0	0	ť	0	n	\$195,000
164	1060 Small Backhoe	197						8343	1115	15,940	41798				٥			, ,		46.03	11		129.552	30	2512	5.413	\$18,000	\$85,000
	8890 Small Backhos	1986						6,000		11,547										4,01			136,551	30	505	[1,279]	121,695	
466	5709 Gangliower	1965		752	2237	1,840	1,544	1,905	1,960	1,060	150		1							14,628	36	8	58,167	204	50	1,514	\$2,063	\$32,000
	7275 Gang Nove:	1377		1,582	3,496	1,867	2,005	2,405	2,654	2,417	1000		2							21,478	45	9	176,225	265	564	345	\$5,994	\$22,000
150	2048 GangMower	1982	1,369	8,948	8,910	7,513	2,795	2,017	883	521	4768		2							30,035	45	9	152,993	265	500	E,503	\$1,580	\$22,000
366	4005 anglilower	1964		27	655	170	2,587	1,372	2,954	3,570	2350		1							14,572	36	8	81,350	204	376	131	\$1922	\$30,000
	4004 Gang Mover	1964		54	1,245	837	1,385	2,262	2,317	1,702	180		1							12,745			72,755	204	42	[4]	21,500	\$32,000
	6138 Gang Nover	1966				723	270	2,492	2,821	2572	276		0							15,155	21	6	52,607	91	2X	1,813	27,239	\$30,000
	6145 Gang Nower	1986				44	1,917	4,477	1,234	2319	4,045		0 0							17,007	21		\$9,500	91	59	896	\$4,800	\$31,000
	9099 GangMower		4,265	553	343	CR	1,055	5,539	5,339	2,507	1/5		2							31,473	45	9	178,052	285	345	1,773	\$5,221	222,000
456	P107 Ganglilower	1379	950	1,509	题	25	1,699	1,435	1,229	2,166	155	1	2	3	4	5 1	5	7 8	9	11,781	45	9	65,494	265	111	750	\$1,803	\$25,000

	PRISERVER		301				FORECAS	ZNGVO	DULEFOR	YEAR	1982															COST	EQUIP.
					DENC	ISTS FOR	NEYEA	8:											SW	11,2		SW	SN			NEUT	0051
UNTV	EQUIP CLASS	MODE.	90	1984	95	1985	30	1988	1989	1990	197	B	21	O N	15	18	D 18	13	Ts	Is	,	m	R	COSF.	CONST.	YEAR	: BW
Gre .	33 Gang Mover	190	289	1700	1,255	4425	153	170	138	Carl	1950		,	1 /			, ,		17.520			1140		(12)	2.50		\$35,000
	304 Gang Nover	1963	254	3	50	90	335	186	2357	2000							6 7		10,790	×	í	72.454	7%	50	0.239		223,000
	3573 Gang Mover	1963			2,710		1187	822	1,580	1,231							6 7		14,700			5351	25	044			223,000
	8805 Gang Nover	1988		-		-		1,775	1,530	1,253							1 1		18,210		4	2,42	20	1,527	734		\$30,000
177	661 Bowe Attachment	1976	1,259	300		25,112	12,653	7,85	7,85	3,230	1,557	1	2	3 4	5	5	1 1	9	83,474	6	9	41,96	25	78	184	\$9,556	\$114,000
377	5803 Blows Attachment	1975	1,112	3,756			17,255				14,200						7 1		82,143	6	9	98,072	25	1,456	1,847		\$114,000
	5859 Blover Attachment	1975	1301	473	5,225	4,245	1,024		14,550	4,480							7 8		74,361	6	9	415,448	255	75	4,625		\$114,000
	9155 Bower Attachment	1979	5,596	3,233			24,070				15,230		2				7 8		14,164	6		824,728	285	1,890	5,334		\$114,000
	145 Blower Adachment	1980	1,766	3,050	4,617	4,122	21,466		25,530	7,348			2				7 8		106,813	6	9	\$36,818	755	1,713	2,305		\$114,000
	5914 Blover Atlachment	1965	7,465	575	5,396	1,843	16,058		38,430					3 4			11		142,185	6	9	905,348	255	3,240	[403]		\$114,000
	5522 Blower Attachment	1965	6,132				24,114			17,700		1			5		11		18,757	6		1,004,802	285	2,93-	5,527		\$114,000
	5530 Slower Atlachment	1965	1,039	239	8,595	12,536	\$6,493	25,25	25,500								1 8		133,352	6	,	807,175	265	2574	1,40		\$114,000
	9329 Bower Attachment	1989								10,400							11		52,433	6		127,090	14	3,25			\$114,000
	9335 Blower Attachment	1989								19,550			0				1 3		45,450	6	3	92,300	14	(33)			\$114,000
	934) Bower Attachment 9250 Bower Attachment	1989							10,540	25,015	15,200						1 1		57,895 52,005	6	3	127,390	14	5,800			\$114,000
5//	NEXT COME ASSURED	7993							24,000	3,300	16,200	•		4.1			1 2		22,005		2	8/3/0	14	(2,05)	22(40)	311,225	\$114,000
202	2101 Loader/Snibble - for	1962	25,00	4,535	7,420	17,552	41,272	35,01	38,900	32,415	25,405	1	2	3 4	5	6	7 8	9	222,441	45	9	1,319,211	26	2,5%	1320	\$38,612	125,000
202	2119 Leader/Sovider - for	192	18,723	7,527	13.554	15,977	4,70	28,210	31,700	303	25,556	1	2	3 (5	5	1 1	9	21,543	45	9	129,58	25	2,572	11,945	\$37,764	\$229,000
	5:14 Corpresor - Nour					6,377			10.195								5 6		60,916		1	200,500	10	1,40	1,198		\$25,000
	5r22 Congressor - Mount				2,149	3,530	57%	693	8,925	7,336							5 6		45,502	25	7	229,361	14	1,47			\$25,000
	1188 Compressor - Moust										5,585						0 0		5,565	1		5,565	1				\$25,000
28	1196 Compressor - Would	30									142	0	0	0 0		0	0 0	1	11/62		1	140	1		10,62	110/62	\$25,000
523	SQS Stul Sweepe	39							125	134	2,819	0	0	0 0	0	0	1.2	2	1255	1	3	15,270	14	1,36	(520)	SUE	229,000
22	4044 Large Roller	1374	475	410	1,120	5,671	5,69	150	1,60	9,050	1,550	1	2	3 4	5	6	1 8	1	31,343	6	9	28,25	25	9	4,00	\$4,60	\$105,000
307	2540 Small Dazer	1922	2,945	20729	7,573	17,322	558	傷	1,000	1,250	EM	1	2	3 4	5	5	7 8	9	55,598	45	9	22,42	25	(1,25)	1420	\$56	\$25,000
201	90N Potela Pather	1959							205	10.090	284			0 3		0	1.2		21,949		,	51.50	14	150	(63)	\$1506	\$25.400
41	3474 Potrole Patcher	1953		Ų11	9,939	19571	20,244	9,791	3,255	2,457	21,530	0	1	2 1	4	5	6 7	8	96,538	35	8	35,977	24	1,42	5,058	\$18,994	322,400
415	9025 5 Ton Dump Track	1969							2,004	15,945	22,290	0	0	0 0	0	0	1.0	1	414			199,766	14	650	2794	\$25,36	\$35,000
	9635 5 Ton Dump Track	1963								25,100							1 2		80,734	- 6	1	194,912	14	1575		\$80,36	
	9041 5 Ton Dump Truck	1959								15,155			0				1 3		45,255	6		125,006	14	8,23		\$31'81	
	9058 5 Ton Dump Truck	1362								20,045							1.2		45,003	- 6		118,254	14	10,124		\$36,56	
	9066 5 Ton Dump Truck	1989											0				1 2		56,745			140,055	14	13,250		\$45,40	
	9014 5 Ton Dump Truck	1388						4,700		25,850		0		0 0			2 1		71,770	10	4	26,20	20	11,579		147,28	
	2442 5 Ton Dump Truck	1982	2273		11,256				10,798			1			5			9	107,675	4		2420	265	500		\$14,960	
	3077 5 Ton Dump Truck	1983	2,099	4,384	(070		25,051		25,987				2			6	1 !		121,367	45	9	829,637	285	2,8%		126,997	
	5155 5 Ton Dump Truck	1905				20,355	35,396		27/58				0				4 1		251,567	21	6	810,321	91	1,32	37,594	145,125	
	5163 5 Ton Dump Truck	1365				17,908			20,352				0				4		171,485	21	6	6E294	91	4,096		143,25	
	51.71 5 Ton Dump Truck	13.5				23,158	37,729		31,503								!!		152,406		6	507,964	91	1,43		\$36,5%	
	5062 5 Ton Dump Truck	1986					17,245		25,834				0				1 1		170,536	15	5	267,627	55	8,49	8,558		
	6070 5 Ton Dump Truck	1995					22,900		24				0				3 4		151,171	15		516,219 734,945	55	4171		\$40,00 \$40,00	
	6161 5 Ton Dump Truck 6179 5 Ton Dump Truck	1966					22,574		30,552									6	172,002		6	718,005	8	5,236	12,306	\$51,67	
410	DITA S ISLINGUED BACK	130%				0,90	4,0	61,962	04/21	41,230	30,773		٧				1 3		11/2/42	21		112,000		0,525	7,40	821,00	**2,000

	PRESENT YEAR		1991				FORECAS	TNS NO	DULE FOR	YEAR	1992															1200	EQUP.
					0880	OSTS FOR	HE YEAR	1											SUM	SJW		SUM	SUM			TISH	COST
NI I	EQUIP. CLASS		1983	1584	1985	1986	1967	1968	1389	1990	1991	B					165		Ys	X1	1	m	D	COEFF.	CONST.	TEAR	NEW
45	6187 S Ton Dump Track	1996				7.884	15,195	35,328	35,279	23,540	36,782	0	0 1	1	2	1	4 !		154,008	21		623,766	91	480	8,720	10.00	\$85.00
46	6195 5 Ton Dump Truck	1986				8,400	20,49	45,900	45.50	20,830	52,100	0	0 1	1 1	2	1	4 5	1	1943/0	21		790,242	31	62E	10.254	\$54415	\$85.00
es	6263 5 Ton Dump Truck	1986				7,258	14,829	21,650	22,250	20,001	37.5%	0	0 1	1	:	1	4 5	5	125,552	21		531,455	3:	5,008	3,674	\$39,743	\$1500
45	6211 5 Ton Dump Truck	1555				10,170	22.557	27,348	1845	9,980	38,479	0	0 1	1	2	1 .	4 5		176,059	21		724,002	91	6,150	1,784	\$51.902	\$850
65	6245 5 Ton Dump Truck	1988					7,90	15,985	15,290	15,710	28.42	0	0 1	0	1	1 :	3 1	1 5	86.337	15	5	302,656	55	4,385	U74	\$31,361	\$95.00
45	GS2 5 Ton Dump Truck	1555					7,531	12,790	15,48	192.10	15,418	0	0 1	0 0	1	1	3 1	5	75,864	15	5	255,575	55	2.8%	6,638	\$71,626	\$95.00
05	1076 5 Ton Dump Truck	1967					10,591	28,120	27,478	19,500	37,50		0 1	0	1	1	3 4	1 5	123,590	15	5	415,570	55	448	11.2%	\$30,150	9/52
48	1866 5 Ton Dump Truck	1991									1384	0	0 1	0	0	0	0 0	1	1,304	1	1	1,304	1		1,334	\$1,304	2253
45	1074 5 Ton Dump Truck	1991									1370	0	0 1	0	0	0	9 1	1	1,370	1	1	1,379	- 1		1,370	\$1,370	\$95.0
45	1982 5 Ton Dump Truck	1991									2781	0	0 1	1	0	0.	0 1	1	2,761	- 1	1	2.791	1	1	2,761	\$2.761	\$35.0
85	1090 S Ton Dump Truck	1991									\$118	0	0	0	0	0	0 1	1	1,118	1	1	US	- 1	t	1,118	\$1118	195,1
	7200 Tanden Dump Truck							46,450	55,789	65,800	55,830		0 1					5	225,762	15	5	744,600		67%	25,013	95,300	\$132,5
	7218 Tander Dump "ruck						27,310	\$1,045		4250	61,40	0	0 1	1	1	2	2 1	5	250,184	15	5	854,363	55	5,251	33,984	\$96,090	\$132,0
87	848 Tandam Dump Track	1998						32,800	42,039	41,550	29,889	0	0 1	1	0	1	2 :	4	155,255	10	4	399,124	30	1,5%	34,885	\$43,254	\$132,0
Ø.	7013 Soverüst	1957						11,190	14,380	18,535	22.23	0	0	1 0	0	1	2 :	4	66,065	10	4	183,565	30	3,590	7,360	\$25,500	\$104,5
	7511 Goder	1987						28390		21,990	44,544	0	1	0 0	0	1	2 :	1 4	129,297	13	4	342,262		2,808	22,805	\$1,34	
	9096 Grade	1999							14,375	22,312	38.50	0		0	0	0	1 3		85,838	- 5	3	195,450		11,867	4,839	\$52,367	
	6084 Grader	1986					25,013	4120	37,863	21,005	24,390		1	0	1	2	3 .		184,391	15	5	475,812	55	(1,536		\$27,370	
501	6682 Grader	1985					27.83	4243	9,039	21,648	21,763	0	1	0 0	1	2	3 .	4 5	153,524	15	5	453,841	55	2,170	38.624	\$25,586	123

APPENDIX K

TYPICAL FRAPOF REPLACEMENT MODULE

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APPENDIX ECUPMENT REPLACEMENT MODULE PRESENT YEAR: 1601

PERMIT ECUPACIO REPURCIBILI NOCICE PRESENTERS INVI

EQUIPMENT. COST ANNUAL DIVINERSHIP EQUIPMENT COSTS FORECAST ANNUAL EQUIPMENT ONLY COSTS FORECAST MES-1 UNTA CLASS 6 9013 Particle Compressor 1989 \$20,000 0 0 0 0 0 15,000 12,957 10,714 8,571 0 805 1500 1504 19700 6 901 Probble Compressor 1999 \$75.500 0 0 0 0 0 0 15000 17857 10714 8571 1.90 1.90 2.00 11,465 6 9039 Portable Compressor 1969 \$20,500 8 0 0 0 0 0 15,000 12,857 10714 8,571 840 825 1,630 \$1,875 . 6 III Patable Commencer 1981 \$2,000 \$714 457 3,455 2,266 1145 0 0 0 0 85 1981 298 2984 1,675 2,275 2,470 1,480 2,180 1,578 604 109 Sidnesk Plant 1881 \$52,400 22,305 17,500 11,507 5,503 0 0 0 0 0 0 0 0 E/12 5,887 15,598 14,199 14,479 15,744 15,000 27,720 12,50 604 117 Sebush Plans 1801 SE2-400 23.000 17.580 17.687 5.600 0 0 0 0 0 0 2.746 5.751 10.754 5.755 15.760 15.760 15.466 5466 5465 54.555 604 125 Sidewalk Plants 1801 \$22:400 22:200 17:500 11:607 5:200 0 0 0 0 0 0 0 0 2:109 4727 13:073 5340 70:094 14770 14:00 15:00 \$30:000 604 800 School Pour 0 0 0 0 0 0 55000 45000 14607 17500 7.95 6.8tt 98.865 \$20.527 1989 507-000 0 74 ES4 Sidewalk Plant 1996 \$62,400 0 0 0 0 52,800 43,300 34,967 26,000 17,300 18,004 18,003 47,603 42,004 \$50,507 74 \$56 Sidewalk Plant 1966 \$52,400 0 0 48,000 40,000 32,000 34,000 15,000 £000 £ 17.340 19.350 25.150 26.225 14.406 \$20.791 74 5022 Sidewak Plants 1966 \$57,400 0 48,000 43,200 32,000 24,000 15,000 £,000 - 1 5347 24538 25002 22400 31200 20408 \$20246 74 1770 Schools Pires 1967 \$52,400 0 0 0 0 50320 H,567 33,000 25,000 H,567 8,000 10,715 22,144 22,013 15,715 15,000 \$15,419 74 822 Sidesalt Pleas tos toam 0 0 0 0 0 52,000 43,000 34,007 26,000 17,003 16 000 16 000 01 010 16 000 610 510 74 SIM Sidesa's Plant 1985 \$52.400 0 0 0 0 0 0 55000 45803 36667 27506 \$170 G.CB 454 \$18.004 14 BISS Schools Pires 1919 \$57.400 0 0 0 0 55000 45803 36807 77506. 15,900 11,470 20,077 -\$18,903 102 758 Looder 1967 \$100,000 \$ 0 0 0 118,000 106,167 96,000 88,500 T4,667 68,800 16715 19.121 21.120 21.730 \$23.433 300 550 louder 102 7606 Looder 1967 \$160,000 0 0 0 0 116,500 196,167 98,503 56,500 78,657 68,503 \$8,004 18 100 15 004 00 188 \$20,600 NESS \$100,000 NO.00 10,750 9.167 4.580 0 0 0 0 0 0 00,005 12,507 27 AUG 54.501 44.606 37,774 MERC C.519 (0.17) 544,275 302 5676 Loader 0 D D 0 110000 30000 91867 80500 7 507 15 300 22 833 531 859 400 KSS looder 400 BSTT Loader 1000 \$100,000 0 0 0 0 0 0 0 110,000 00,000 01,007 07,000 \$25.00 WOLD SOLD SOLD 0 102 EFF2 Looder 1966 \$160,000 ° 0 0 117,000 197,250 \$7,500 \$7,750 76,000 \$0,250 \$1,500 22.255 30.000 30.400 21 155 32.170 \$30.200 n 0 0 0 117,000 187,250 97,500 87,750 74,000 88,250 59,500 24.223 41.011 43.630 21.636 22.740 \$21.970 102 8030 Loader 202 2137 Looder THE THEM THE STREET WAS AND AND AND THE THE HOS WAS THE THE THE STREET WAS STREET WAS AND SHIPS SHOW WITH HIS DEC. 202 9163 Loader 1879 \$78000 468F 428G 353G 3647 343D 1829 1218F 468D 0 0 1847 258D 1550 258D 250D 1520 1520 1520 1520 302 IBI Loofer 1800 \$100,000 \$1.50 \$2.807 40,000 \$1.500 \$2.807 \$2.000 \$1.570 \$1.907 \$5.500 \$ 2 2070 40,000 \$1.000 \$ 0 0 85,000 77,517 70,633 63,753 52,667 49,563 42,500 25,417 9 99 21 813 23 28 37 800 36 154 35 40 17 200 19 19 19 2 320 520 Inote: 1985 \$199.000 100 Still Looker 1965 \$160,000 0 0 85,000 77,917 78,000 (0,750 56,607 46,903 42,500 35,417 0 108 18 005 25 760 40 300 64 004 36 700 30 470 470 50 400 1990 \$160,000 0 0 0 0 0 0 0 000,000 146,667 122,533 11 300 50 CM \$30 A48 400 840 Londer 402 0434 looder 1990 \$160,000 0 0 0 0 0 0 0 40,000 146,667 133,333 11300 27/20 \$49,940 0 000 \$160.000 0 0 0 0 0 0 000.007 120.000 £ 575 15.200 \$22.125 400 059 lauder

REPLACE EQUIP?

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		TIGNATOS		COST	,	UNUAL O	wes	P EQUIP	NEVT CO	175			F	DRECAST	ANNUAL SC	UPIEN	CON CO	575				FORECA	NES:
107.4		CLASS	WODE.	101	196	1984	1985	1986	1967	1988	35	1980	1881	1900	1963 1984 1	E5 196	6 1967	1988	1985	1990	190	19.0	10-
10 8	206	10 Ton Pokus	1989	\$14,700	٥			0			12,800	1350	6300	1,60					1,000	2271	287	23.00	
10 1	214	(Q Ton Polup	1989	\$14,700	0	0	0	0			12,800	10,250	5,900	1,450					1,854	1777	4,322	\$7.00	
10 8	222	10 Ton Pokup	1989	\$14,700	0	0	0	0			12,800	10,250	6,900	3,450						3130			
10 8	230	10 Ton Polup	1989	\$14,700	0	0	0	0			13800	13,50	6,900	3,60					2,917	1745	5,851	\$1,772	
13 8	248	12 Tan Pidua	1989	\$14,700	0	0		0	0		12800	1050	5,900	3,450					3,225	4212	850	\$11,500	
10 3	399	10 Tan Pichup	1983	\$14,700	9,000	1750	4,530	2,290					0	0	1510 13	25 225	5 (194	328	3514	1804	179	\$7,315	
10 8	255	10 Ton Pidup	1989	\$14,700	0	0		0	0		13,800	10,350	8,900	3,450					9,715	6,025	582	\$3,281	
113 8	253	10 Ton Polisp	1989	\$14,700	0	0		0			13800	10,350	6,900	3,450					682	2100	2908	\$4,136	
10 R	271	10 Ton Rolup	1989	\$14,700	0	0	0	3	0		13,800	10,350	6,900	3,450					1,544	1,008	374	\$5,002	
10 9	000	12 Ton Polsop	1985	\$14,700	3	0	£500	7,125	4750	2,375			0	0	11	64 47E	4 5318	16,005	15,028	1,500	17,258	\$19,004	
10 5	251	1/2 Ton Plokup	1965	\$14,700	0	0	2,500	7,125	4790	2,575			0	0	2.0	44 5,12	2 9,155	8,654	8,156	1,780	11,006	\$12,160	
10 6	157	12 Ton Plotup	1986	\$14,700	0	0		10,000	7,500	5,000	2,500		0	0		1,92	9 5,015	6300	1724	11,200	15,000	\$17,725	
10 5	244	12 Ton Pokup	1986	\$14,700				10,000	7,500	5,000	2500		0	0		327	1 12,737	9,43	IUE	11250	152	\$8,885	
10 5	335	12 Ton Polup	1986	\$14,700	0	0	0	12,000	7,500	5,000	2,500		0				5,652	1028	11,823	1043	US	\$4,200	
10 5	369	12 Ton Pickup	1986	\$14,700		0				14,200	10,550	7,100	1,550	0				4564	5174	11,250	5,50	\$2,40	
10 8	397	12 Ton Rokup	1986	\$14,700	0	0	0	0	0	14,200	10,550	7,100	1550	0				8,05	9,005	1250	11,29	19,367	
10 8	45	12 Ton Rickup	1986	\$14,700	0	0	0	0		14,200	10,650	7,100	1,550	0				4,678	472	1,977	11,700	\$12,538	
10 8	413	12 Ton Pickup	1988	\$14,700	0	0		0	0	1900	13650	7100	1,550	0				284	2500	3000	5,780	\$5,988	
10 8	Q1	12 Ton Police	1988	\$14,700	0	0	0	0	0	14,230	10,650	7,100	1,550					7280	7,587	11,100	2,900	\$4,805	
10 5	43)	12 Ton Fokip	1988	\$14,700	0	0	5		0	14,200	1050	1,00	150					2,579	2340	137	7,520	38,46	
10 2	201	12 Ton Robus	1985	\$14,700	0	0	0	10,000	7,500	5,000	2500	9	0				4,584	100	11,728	105	11,52	\$12,235	
10 5	29	1,2 Ton Pickup	1986	\$14,700	0	0	0	12,000	7,500	5,000	2,500		0	0			1,157	7,00	7,512	325	5,000	17,127	
10 50	27	12 Ton Pickup	1986	\$14,700	0	0	0	12,000	7,500	5,000	2,500	0	0	0			4,853	14,230	1256	1274	1,90	\$11,153	
10 50	235	12 Ton Pickup	1986	\$14,700	0	:	0	13,200	1,900	6,000	1,000		0				1,050	1,552	US	1,320	5,544	\$7,959	
10 70	150	1/2 Ton Pickup	1987	\$14,700			0	0	13,200	9,900	5,600	1,300					2,306	130	1,325	(3)	5/00	\$7,513	
10 70	100	1/2 Ton Polius	1987	\$14,700	0		0	0	13,200	9,900	€,600	1,000		0			2,061	200	1,570	1554	8,050	\$7,500	
10 70	322	1/2 Ton Pickup	1987	\$14,700	0		0	0	13,200	9,900	E,600	2,300	0	0			1,749	1,500	1,57	\$210	500	\$2,773	
10 71	100	(2 Ton Pickup	1967	\$14,700			0	0	13,200	3,900	£,600	1,300		0			2221	13,560	13,667	424	11,400	SIAJEI	
10 71	118	(@ Ton Pickup	1987	\$14,700			0	0	13,200	9,900	5,600	1,300		0			2484	6,414	5,158	(805	12FT	\$13,400	
10 71	26	(@ Ton Pidup	1967	\$14,700		1	0	0	13,200	9,900	6,500	2,500	0	0			1,602	2,40	2,858	:20	12,170	\$10,069	
10 71	134	t@ Ton Pokup	1967	\$14,700		0	0	0	13,200	1,940	6,600	2,300	0	0			1,420	6,253	6,523	:45	3)55	\$3,658	
10 71	10	1/2 Ton Pidup	1967	\$14,700		0	0	0	13,200	1,900	560	2,300	0	0			1,799	5,540	7,005	1300	10,585	\$11,000	
10 71	53	10 Ton Pidup	1967	\$14,700			0	0	17,300	8,900	5,500	2,300	0	0			2,297	7,50	1,75	1320	6,158	\$9,871	
10 71	57	12 Ton Pokup	1967	\$14,700		0	0	0	13,200	9,900	1,500	1,300	0	0			1,958	1,19	1,037	1,570	5/8	\$3,175	
	75	10 Ton Polup	1967	\$14,700			0	0	13.200	9,900	5,530	1300					1767	5 100	530	1220	105	1730	

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		FOLIPMENT		COST			DIVIERS			-				TOMECAST		OUP.
NT	,	QASS	WOOE.	-		1984			-		1969	1990			ANNUAL EQUIPMENT COM COSTS FORECAST (1900 1984 1985 1986 1987 1988 1987 1992 1992	
									*****		****	-	******			
210	7183	12 lon A kp	1967	\$14,700	0	0	0	6	1220	5,900	1500	130		0	1,971 7,707 8,864 8,765 9,465 92,167	
10	935	1/2 Ton Policip	1989	\$14,700	0	0	0	0	0	0	12,800	10,350	6,900	1,450	10	
20	139	1/2 Ton Pickup	1990	\$14,700		0	0					14,000	10,500	7,000	200 2,006 \$3,072	
20	147	1/2 Ton Pokup	1990	\$14,700	0	0	0	0		0		14,000	10,500	7,000	16 1,865 \$1,965	
210	155	1/2 Ton Policy	1990	\$14,700	0	0	0	0		1	0	14,000	10,530	7,000	1,635 \$1,635	
20	238	1/2 Ton Pokup	1990	\$14,700	0	0	0	0)		14,000	10,500	7,000	4320 1,810 \$2,700	
210	0246	1/2 Ton Polop	1990	\$14,700	0	0	0	0		0		14,000	10.500	1.000	5,510 7,880 SA,616	
20	0250	1/2 Ton Polop	1990	\$14,700	0		0				0	14,000	12,530	7,000	490 150 1222	
21	0261	1/2 Ton Polup	1990	\$14,700	0	0	0	0			0	14,000	10,500	7,000	\$415 7,245 \$5,075	
210	0079	1/2 Ton Pickup	1990	\$14,700		0	0	0	. 0	0		14,000	10,500	7,000	3540 3,805 \$4,010	
20	1152	1,2 Ton Polup	1996	\$14,700	0	0	0	0	0	0	0		14,60	10,800	33	
111	8512	One Ton Took	1988	\$20,400	0	0	0	1		14,800	11,600	7,60	3,700	0	3,605 3,750 9760 7,210 \$10,266	
111	8538	One for Track	1988	\$30,400	0	0	0	0		14,830	11,100	7,40	1700	0	7,940 7,963 7,270 6,817 96,710	
111	5396	One for Track	1985	\$20,400	0	0	13,200	9,900	6,500	1,330			. 0	0	1,555 6,564 6,552 12,604 15,500 11,750 21,200 \$22,000	
m	5294	One Ton Track	1965	22,400		0	13,200	9,900	5,500	2,000	0	0	. 0	0	2,179 7,802 7,789 15,009 14,960 12,300 11,010 \$15,672	
111	550	One Ton Truck	1986	\$20,400	0		0	12.500	9,375	620	1,125	0	. 0	0	2,248 8,468 9,266 14.500 5,550 \$11.601	
111	659	One Ton Track	1986	22,00	0			12,500	1,375	6250	1/2			0	EAST E.775 E.696 7.365 EL596 \$1,006	
m	5367	One for Truck	1986	20,40	0	0	0	12.500	9,375	1250	1/25			0	6,320 7,457 7,674 12,120 15,817 \$17,915	
211	55	One for Track	1986	523,400	0		0	12,500	1275	\$250	1/2			0	2,750 9,760 H2,644 6,865 H,025 SH,272	
211	7015	One for Track	1967	22,40	0		0	0	12,000	1975	550	135		0	129 210 240 632 474 533	
211	7025	One Ton Truck	1967	\$20,400	0	0		0	13,300	1375	(5)	125		0	1802 4571 458 415 1248 \$1088	
211	5457	One Ten Track	1968	\$20,400		0	0	0	0	14,500	11,00	7,400	1,700		\$760 \$264 \$234 \$3.55 \$5645	
211	8500	One Ton Track	1988	\$23,400	0	0	0	0	0	14,500	11,100	7,400	3,700		7,665 7,556 11,055 16,143 \$16,063	
211	9300	One for Track	1989	\$20,400	0	0	0	0	0	0	15,000	12,000	1,000	4,000	966 3544 6244 \$1,963	
211	8495	One for fluid	1988	\$20,400	0	J	0		0	14,800	11,100	7,400	1,700	0	8,576 7,448 9570 18,721 \$19,370	
211	7190	One Ton Truck	1987	\$21,410	0	0	0	0	13,300	9,975	£850	1325	0	0	11,656 11,725 10,420 10,990 \$10,372	
211	13	One Ton Truck	1990	\$20,400	0	0	0	0	0	0	0	18,000	13,500	9,000	7,520 5,265 \$2,910	
211	54	One Ton Truck	1990	\$20,400	0	0	0	0	0			18,000	12,500	9,000	2,370 92,379	
211	300	One for Truck	1990	\$20,400	0		0	0				18,000	12,500	9,000	2,500 \$3,500	
271	9212	One for Fruit:	1989	\$20,400	0	0	0	0			15,000	12,000	8,000	4,300	1,574 6530 \$11,086	
311	116	Yes Ton Truck	1991	\$20,400	0	0	0						20,400	15,300	432 \$32	
111	8520	One for Truck	1968	\$20,400	0	0	0	0	0	14,900	11,126	7,400	3,700	0	18,001 20,000 19,000 11.510 \$11,004	
211	1177	Little Trusk	1991	520,400	0								20.400	10.200	536 \$200	

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	ECUPVENT		COST		JANKE L	DINERS	PEOUP	MENT CO	575			- 8	FORECAST	ANNUAL EQUIPMENT DAY COSTS FOREDOS	
	CLASS	MODEL	181	36	1984	1965	1986	¥	122	1955	1990	1981	1982		10-0
6254	25 to Collectorate	196	\$146200	,			95,900	81.55	9.750	9.125	46500	3455	21.250	1351 286 2576 215 286 5616	,
625	Z 16 Colectoratio	1986	\$145200				27.000	81.575	410	9125	#500	MEZ	21.253	沙型 机液温粉 中级 沙漠 伊莱	
	25 Yel Collectomatic		\$145,200					111,500					41,813	E05 F107 E310 X-15 11 51	
	25 Yd Calecterad:		\$145,000					111,500					41.513	\$40 875 878 478 18C	
702	25 Yel Collectomatic	1967	\$146,200				0	111,500	\$1.503	89.825	1958	55,750	41.813	X50 X19 470 5024 9570	
7110	25 Ya Colecterratic	1967	\$146,000		0	0	0	111,500	E7.563	81.525	69,588	55,750	41,813	26.400 27.300 44.205 45.201 \$45.00	,
7128	25 Vá Callectomatic	1987	\$146,200			0	0	111,500	\$1.563	81,625	53.558	55,790	41,813	979 Y.80 N.55 Q10 16.65	
7148	25 Yr Collectomatic	1987	\$146,000			0	0	111,500	\$7.563	11.625	6588	55,750	41,813	25.500 37.805 33 105 81.508 \$80,31	
	25 Yr Colectoratic		\$145,200			£5.500		54.125					10,688	424 4540 4576 5.05 1946	
Bert	25 Ya Collectomatic	1988	\$141,200			0	0	0	120,000	113,750	97,500	81,250	65,000	14,508 17,700 19 105 44,964 \$47,51	
8529	25 Yd Colectoratic	1988	\$146,200			0	0	0	130,000	112,750	\$7,500	81,250	65,000	12.07 14.65 22.95 37.19 50.41	5
1020	25 Yé Colectomatic	1991	\$145,200			0	0		1		0	148,000	121750	7,00 91.0	
1036	25 Yd Colectomatic	1991	\$14200			0	0				0	145.000	127,750	7.802 \$1.00	
1111	25 1/3 Collectorcalic	1991	\$14,200			0	0	0	0	0	0	145,000	127,750	760 IV6	0
340	15 Tid sofectionals	1983	15/100	60,000	\$2.500	45,000	37,500	30,000	22,500	15,000	7,500	0	0	6577 16390 25518 2620 3625 3236 2236 4230 \$4300	6
25%	16 15 colectionals	192	SF,500	490	9,000	15,000	2300	21,000	14,000	7,000	0		0	\$500 21,401 24,501 20,000 20,000 50,000 20.45 10,500 204,6	5
SI	15 Técniscientic	1922	\$2,00	49,000	QM	25,000	25,000	21,000	14,000	7,000	0	0	0	1270 MOT 4078 MOR MOR MOR MAN 1107 MOR MOR	6
305	10 Yel collectorate	1965	2F,800	1	0	52,000	51,125	£30	38,375	31,500	23,525	15,750	7,675	219 100 140 252 250 240 270 250	9
250	Note Tarker	1985	\$2,000		0	0	4,000	3,00	ME	21,500	M3.3	7,107	Я	11,25 12,28 20,04 34,66 25,67 25,92 541,21	1
3544	Conpact Cars	1988	\$1600		0	0	0	0	12,000	9,500	7200	4,300	2.400	2.402 UND 1200 ST	5
210	Compact Cars	1965	\$14000		0	5,100	7,280	5,40	3540	1,520	0	0	0	1,098 2,048 6,004 3,000 5,400 1,000 1050	2
1102	Compact Cars	1981	\$14300	. 0	0	0	0	0	0	0	0	14,000	11,200	2,965	
5111	Compact Cars	1965	\$14300		0	\$100	7,280	5,400	1,540	1,520	0	0		1,494 900 2,540 9,730 1,400 95,56	2
5129	Compact Cars	1965	\$14000		0	\$,100	7,290	5,400	3,540	1,820	0			359 519 752 370 11,67 \$130	
	Compact Cars	1985	\$14,000	0	0	1,100	7,290	5,450	3,540	1,820	0			2188 4,174 3,795 1,365 3,955 23,31	
5145	Compact Cars	1985	\$14,000	0	0	¥,100	7,290	5,450	3,540	1,820	0	1	- 1	1,091 9,085 9,212 7,180 8,510 \$10,01	1
7042	Compact Cars	1987	\$14,000	0	0	0		10,500	8,400	5,300	4,200	2,100		1,071 1,029 2,116 3,120 6,144 \$6,33	7
8651	Compact Class	1986	\$14,000	0	0	0		0	12,000	9,600	7,200	4,500	2,400	763 2,462 1,470 1,057 \$2,40	1
8589	Compact Cars	1968	\$14,000	0	0			0	12,000	2,600	7,200	4,000	2,400	708 717 1,400 1,547 \$1,70	1
8677	Compact Cars	1966	\$14,000	0	0				12,000	9,500	7,200	4,000	2,400	802 884 475 1,460 \$1,29	7
8885	Compact Cars	1966	\$14,000	0	0			0	12,000	R/600	7,200	4,000	2,400	579 759 767 REI \$1,0A	5
6721	Compact Cars	1988	\$14,000	0	0		0	0	12,000	9,500	7,200	4,500	2,400	1000 94 128 178 129	

																								REU
																								EQUIP
	EQUIPMENT		COST		AMNUAL O								OPECAST			EOJP							FORECAST	(YES:
	CLASS	MODE.	HEV	1983	1984	1965	198	1987	1988	1989	1990	197:	1992	1983	1964	1985	1986	1987	:308	1989	1990	1961	1982	N0=0
	Compact Cars	1968	\$14,000	0	0	0	,	0	12,000	9,500	7,200	4,000	2,400						530	508	1,025	810	\$1,000	
3	Compact Cars	1968	\$14,000	0	0	0			12,000	9,500	7,200	4,000	2,400						10	400	92	1,609	\$1,767	
	Compact Cars	1968	\$14,000	0	0	0	1	0	12,000	9,500	7,200	4,000	2,400						-86	472	1,94	1,500	\$1,857	
4	Compact Cars	1988	\$14,000	0	0	9	-	0	12,000	9,500	7,200	4,80	2,400						26	2248	155	1,400	\$2,600	
1	Compact Cars	1968	\$14,000	0	0	- 6		0	12,000	9,600	7,200	4,500	2,400						2.44	2,389	168	749	\$11	
1	Compact Cars	1968	\$16,000	0	0	0		0	12,000	9,600	7,200	4,500	2,400						879	883	200	22	\$2,815	
1	Compact Cars	1988	\$14,000	0	0		0	0	12,000	9,600	7,200	4,600	2,400						250	326	1500	679	\$1,363	
3	Compact Cars	1909	\$14,000		0			. 0	0	12,500	10,000	7,910	5,000							12	57	1,707	\$2,500	
1	Compact Cars	1988	\$14,000	0	0		0	0	0	12,500	10,000	7,500	5,000							18	658	1,034	\$1,586	
	Compact Cars	1989	\$14,000	0	0		0	. 0	0	12,500	10,000	7,500	5,000								200	1281	\$2,312	
į	Compact Cors	1966	\$14,000	0	0	0	.0	0	0	12,500	10,000	7,500	5,900								1/60	1291	\$1,000	
	Compact Cars	1901	\$14,000	0	0	0	0	0	0			14,000	11.200										22	
	Strei Boon	1975	\$154,000	32,625	21,750	10,675		0	0			0	0	12.348	27,740	23,889	4,52	12,000	4304	41,133	27,740	35,700	\$42,65	
1	Steel Bason	1988	\$154,000	0	0		0	. 0	137,000	110,675	1279	85,625	68,500						21,735	32,500	635	64,018	\$72,816	
	Street Broom	1986	\$154,000	0	0	9	125,000	109,275	92,750	78,125	\$2.500	48.675	31,250				14,139	35,353	21/12	36,377	0,505	40,000	\$50,441	
	Large Badalice	1991	\$186,000	3	0	0	0	0	0		0	186,000	171,500										×	Ü
	Small Backton	1907	\$55,000		0	0	1	51,000	45,557	v,m	26,000	18,687	9,303						8340	136	SE	14,200	\$18,000	
	Small Backhoe	1968	\$95,000		0	0	9		57,000	0,500	38,000	28,500	13,000						6,000	E,118	11,50	28,630	\$22,595	E
1	Gang Mover	1965	\$30,000	0	0	0			0				0		752	2207	2,540	1,544	1,905	1,960	1,000	252	\$2,000	ŝ
1	Gang Mover	1977	\$30,000	1,500	1,250	0	0			0	0		0	1,535	1,500	2,406	1,887	2,035	2,425	2,654	242	1000	\$2,984	4
1	SingMover	1962	\$27,000	15,750	12500	11,250	9,000	US	4,500	2,250	0	. 0	0	1,388	E048	Litt	7,503	2,795	207	883	1 (2)	US	\$1,580	Œ.
1	Gong Mover	1984	\$30,000	- 0	5400	5,500	4,800	4,000	3,200	2,400	1,600	500	0		27	55	1,717	2,587	1,372	2114	357	2,39	1250	į.
į	Gang Nover	1964	\$30,000		6,400	5,500	(800	4,000	3,290	2,400	1,500	800			54	126	937	1,385	2252	,217	(10)	334	\$150	1
1	GangMount	1966	\$30,000			0	7,000	8)25	5,250	4,275	3,500	2,55	1,750				733	1,742	2,402	2,82	257	278	\$3,28	1
ļ	Gang Wower	1966	\$30,000			0	7,000	6)25	5,250	4,275	3,500	2,525	1,750				494	1,517	407	1234	201	4,04	54,80	1
1	Gang Mover	1979	\$30,000	1,500	8,375	4,250	2,125		0	0		0	1	4285	569	30	4,354	1,050	5,530	533	250	5,19	\$5,22	1
	Gangtiower	1979	\$22,000	8,500	5,375	4,250	2125		0		. 0			990	1,509	100	225	1,536	1,495	123	219	1,59	\$1,50	Į.
	Gang Mover	1980	\$22,000	10,008	8,750	6,563	4,375	2,186	0					2579	1,220	1,255	4,435	1,551	1,741	1,705	5 59	1,98	\$1,27	à.
1	Gang Wover	1983	\$22,000	15,500	15,275	13,850	11,525	9,300	6,375	4,650	2,005				28	50	90	306	1,864	200	200	4,37	\$3,50	Į
9	Canglillower	1983	\$22,000	1530	15,275	13,950	11,025	9,300	6,375	4,650	2,325	0			1,132	2710	1,854	1,100	822	1,080	122	1,58	\$ 507	į.
í	Gang Nows:	1988	532,000		0		0	0	28,200	24,500	21,000	17,500	14,000						2,775	3.59	133	150	11.0	1

		FOURIET		****			us for							and the same				_								EOUP:
				COST					erca																FORECAST	
97		QASS I		NEW		198	1985	1985	180	58	35	1380	190	1982	1962	98									1900	10-0
127	257	Bown Rochment	1975	214000	2597	23,333	20,30	150	1333	100	560	335	п	0	1259	24	56	28/1	2 12	E C	7,865	7,815	122	1,55	7 1959	
27	965	Bow Attrimet	195	214000	23,303	2000	1697	133	1000	鰋	120	В	0	0	UIZ :	175	42	45	517	251	0,60	552	350	14,20	0 0540	
57	925	Bove Abotimes	195	215,000	2,20	200	16,957	13,333	1000	650	LIII	R	0	0	UE	63	522	5 42	6 1	281	500	15	48	8,9	21,55	
97	988	Bove Abdress	1973	\$11,00	430	400	2,20	Z#	230	3,00	zm	1530	220	520	158	120	540	122	23	pa:	125	322	13	52	0 2528	
27	145	Sixe Atlanta	120	\$114,000	400	4,00	420	LE	ZMI	Z(D)	330	ZE	16,000	12,000	176	US)	450	7.45	22	,68 I	3,00	3,5	'X	9,70	9 220	
97	364	Bove Atschned	195	\$114,000	0	0	0	0	0	0	0	0	0		1,46	25	5,39	6 15	Q 16	159	X,5X	2,43	2,29	14,2	22,00	
977	902	Sover Atachment	1955	\$114,000	0	0	0	0	0	0		0	0		5500	255	870	152	9.29	J114 4	8,50	6,53	150	122	0 134,80	
97	900	Bover Attachment	195	\$114,000	0	0	0	0	0	0	0	0	0		1,529	15	Ļ	6 125	35 N	,es	18,215	253	NIS.	15,5	9 \$25,18	
77	303	Boxer Atachment	1989	\$114,000	0	0	0	0	0	0	10,00	12,97	£30	88,000								2155	10,40	23,4	0 \$25,87	
77	9025	Bover Attachment	1969	\$114,000	0	0	0	0	0	0	110,000	EF.	E.III	65,000								13,70	195	12,1	00,514,88	
577	990	Bower Attachment	1989	\$114,000	0		0	0	0	0	100	Q.E	8,333	62,000								10,54	245	722	0 530,59	
27	950	Boy Aladmet	186	\$14,000	0	0	0	0	0	0	HUE	ES	EM	5,00								35,30	130	182	10 S11,22	5
=	70	Lascer/Devisioner - fact	182	23/0			0		0			:	0		240	400	7,5	B 173	2 4	1272	50	3,0	1250	54	s sus	1
23	219	Lossin/Growblower - food	E	23,00	0	0	0	0	0	1		0	0	0	123	150	12.7	R SI	84	Œ	200	3,70	3/15	35	K 157,70	4
75	5:14	Compressor - Neurolad	195	1510	0	1	1630	1274	1,45	2/4	Œ	451	226	R			3,5	2 5	F 1	148	155	2,9	51-5	5 27	96 \$5,18	3
18	52	Conpressor - Nounted	196	usm	0	1	15,000	12714	1,43	910	US	451	226	я			23	0 2	300	5,796	890	2,3	5 72	125	E 108	9
78	1150	Compressor - Mounted	1981	\$5.00	0			0				0	530	2(43										55	E 25,9	5
25	1136	Compressor - Vounted	1551	25,30	0		0	0				0	2,000	2/49										124	E2 \$10,4	2
550	925	Smil Sweper	1989	\$39,000	0	0		0		9	2,20	18,300	15,000	HJIII								12	5 3	4 21	19 \$1,7	0
SI	qu	LagaRole	1914	\$15,00	1300	0		0	0	0		0	0	0	479	457	IJ	p 9	91	16	150	14	E 12	D 13	50 \$4,6	
E.	200	Snal Dear	×	95,00	3,30	2,50	1,00	1528	151	1,00	£12	500	2700	0	296	N/B	75	2 2	E .	12	450	1,0	2 2	2 6	m 18	8
n	93	Potole Pother	126	20							830	N/O	0.76	46								23	6 10	8 1	B14 \$15,0	15
3	30	Potois Patcher	180	製模	71,380	8,15	2,8	470	257	2,36	113	R	0			Q1	93	39 12	SIS	E)W	1,70	92	5 124	F 21.	20 \$15	×
100	900	5 for Damp Truck	196	225,000	0	1					9(33	72,500	54,500	X,CC								9,5	K 11.3	46 22	290 129,2	96
C.S	900	5 Ton Oump Truck	198	205,000	0						9.00	72,800	54,500	H-CO								11,5	00 2-1	0 6	DX 550.2	5
O.	994	5 Ton Oump Truck	190	\$15,000							9,35	72,500	54,500	X(C)								5,5	2 17	5 11	291 221,3	31
e)(929	5 for Oump Truck	186	\$15,000							9,30	75,500	9,00	1,00								4,2	E 212	16 24	913 EMS	20
csi	900	S STon Dump Truck	128	15.00							2.0	738	9.80	2.40								44	822	10 30	25 15	80

REPU																									
EQUE																									
(YES»	FORECAST				COSTS	DEN CO	NEVE	EQUE	WA		DRECUST				575	NEXT CO	PEQUE	MES	WA.		COST		EQUIPMENT		
10-0	変	RO 1951	99 99	86	g 18	1967	1986	1965	1984	1983	1982	190	1990	1969	1988	1967	196	195	1984	192	161	BOOM	CLASS		NT A
	\$47,391	90 3E90	5,465 2,660	23	47						15,200	35,400	54,500	72,800	F,000			0		0	15.00	198	5 for Dump fruid	9574	415
	\$14,960	46 1075	0,768 (5,94)	100 1	T HA	9707	2234	11,255	(IR	5373				0		0	8.200	15,400	24,500	12500	\$95,000	1982	5 Ten Dump Truck	2442	25
	\$28,987	m 20,518	5967 15900	21 2	51 245	25.000	1327	400	(394	2,099		0		0	0	8,200	15,400	24,500	12,800	41,000	\$15,000	1983	5 fon Dump Truck	3077	us.
	\$46,528	20 33,200	Q48 6,28	50 5	% 52.9	31.29	30,955					:		12500	25,000	27,500	50,000	02,500	0	0	\$15,000	1985	5 Ton Dump Truck	5155	415
	\$43,005	10 434	10,968 25 300	100 3	65 29,2	27,005	17,038					:	1	12,500	25,000	\$7,500	52,000	02.500		- 1	\$85,000	1985	5 Ten Dump Truck	5163	415
	\$75.862	30 25/36	1,500 37,530	00 3	29 28,7	37,729	21,158					1	0	12,500	25,000	37,500	50,000	62,500	0	1	\$35,000	1965	5 Tan Dump Truck	5171	415
	29,622	30 59,200	5,514 37,33	100 2	15 323	17,245						1	17,300	34,500	\$1,900	623	85,500		0		\$95,000	1986	5 Ton Dump Truck	6062	415
	\$4,345	20 33,223	5,468 0,335	100 2	00 21,2	22,900					0	t	17,500	34,500	\$1,900	55,225	85,500	0	0		\$35,000	1985	5 Tan Dump Truck	5570	415
	\$43,961	10,45,001	8,558 2,700	20 3	74 42.6	25,574	12,059					1	17,300	34,500	\$1,900	5,20	85,500		0	1	\$15,000	1985	5 Tan Dump Trick	0102	415
	19,867	50 52,03	0,731 21,250	X3 3	59 27,0	21,659	8,946					0	17,330	34,500	51,900	61200	85,500	0	0		\$35,000	1965	5 Ton Dump Truck	6179	415
	\$42,616	40 36762	15,279 20,540	25 3	95 E.I	15,195	7,664				0	0	17,330	34,500	51,900	6321	85,500	0	0		\$15,000	1985	5 Ton Dump Tuck	6187	415
	\$54,415	00 52,100	6,561 2,500	00 4	6 43	20,46	8,400				0	0	17,330	34,500	51,900	62×	85,500	0	0		\$35,000	1985	5 Ton Dump Truck	6195	416
	\$38,740	EI 27,54	2,350 27,301	50 2	23 21.5	14.825	7,298				0	0	17,300	34,500	51,900	61,200	85,500	0	0	0	\$35,000	1986	5 Ton Dump Truck	6200	415
	\$50,902	80 M,479	11,45 4 34	148 2	S 27,3	23.557	10,170				0	0	17,330	34,500	51,900	59,200	85,500	0	0		\$35,000	1985	5 Ton Dump Truck	5211	415
	\$30,30	10 25,01	6,260 11,710	85 1	61 15.9	7,901					0	0	17,200	34,530	51,900	61,200	86,500	0	0	0	\$85,000	1966	5 Ton Query Track	26	415
	\$22,525	22 15.418	5,46 11,325	70 1	SI 127	7,80					0	0	17,200	34,500	51,900	920	86,530		0	1	\$15,000	1965	5 Tom Dump Truck	223	415
	\$30,158	00 37,501	D,478 15,500	20 2	91 2LS	1381					0	17,500	3,70	2,00	70,400	52,000	0		0		\$25,000	1967	5 Tot Outry Track	7076	415
	\$1,304	1304									16,000	95000	0				0	0	0		\$85,000	1991	5 Ton Dump Truck	1055	415
	\$1,370	1270									76,000	95000	0	0	0	0	0			0	\$25,000	1201	5 Ten Dump Track	1074	416
	12,701	2761									75,000	95000		0		0	0	0	0	0	\$15,000	1991	5 Ton Dump Track	1052	415
	Site	1118									75,000	95000	0	•	0	0	0	0	:	0	22,000	1201	5 Ton Dump Truck	1090	216
	\$65,300	m 55,550	15789 45XX	60 5	03 45	21,902						23,300	4,50	55,500	93,200	116,500	0		0	0	\$12,000	1907	Torsion Curry Truck	7200	117
	\$55,090	9.20	5,16 4,29	X5 5	10 61,0	27,210					0	25,300	4,50	65,900	\$1,200	116,500	0	0	0	0	\$12,000	1367	Tanden Outp Ruck	7218	417
	\$40,264	SI 31,559	Q159 E550	900 4	32,8						24,000	48,000	77,000	E,000	122,000	0	0	0	0	0	\$122,000	1988	Tanden Dump Track	143	117
	\$25,668	5 2,20	4,360 12,525	90 1	11,1						23,750	45,000	91,250	07,500	79,750	91,000	0		0	0	\$104,500	1987	Soon Jet	7013	æ
	\$11,544	90 44,044	12,870 TO \$10.00C	190 3	253						51,000	50,000	70,000	80,000	90000	130,000	0	0	0	9	\$130,000	1967	Gradie	7611	501
	19,307	2 33,150	CIG BIL	1							77,000	88,000	99,300	110,000	0	0	0	0	0	0	\$125,000	1969	Grade	\$356	501
	127,570	05 24,200	7,860 SI,065	20 3	13 65	25,000					4,000	50,000	50,000	72,000	82,000	90,000	100,000	0	0	0	\$120,000	1986	Grade	6064	501
	\$25,586	48 27,763	2,539 23,548	43 4	N 42	27,831					40,000	52,000	60,000	70,000	80,000	90,000	100,000	- 0	0	0	\$120,000	1986	Grader	5005	501

APPENDIX L

TYPICAL FRAPOF PRIORITY MODULE

APPLOIX.L EQUIPMENT REPLACEMENT PRORTITIVOQUE PRESENTERS: 1991
UST/UPATE: NOV.581

				COST				HACK	SKINGE	MILE				FORE- CAST				ANG	LECIT	NOT	DEW CO	575		FORE-	PROSTY	CUMMU
UNE #		EQUAMENTOLASS	MODEL	ISI	1980	196	1985	1986	1967	1968	198	1990	1991	196	1963	1984	1965	36	190	98	190	1990	120			MENICOS
195 1	100	10 Ton Police	105	\$1470			1500	7.125	4770	1375							1994	179	£110	10.705	15,758	950	itre:	19394	E180	147
		One Ton Truck	195	500.40			12200	9.900	6.000	3300														22 101	4329	35
		10 Ton Polso	1036	\$14700			0	10,000	7.500	5,000	2530						1.200							17.728	451	61
		120	1985	\$1750			12.400	1300	1,200	3,100			1				1 Nu					1155			456	0
		10 for Pokup	1007	\$14700			0	- 0	12,200	1900	6500	1300					2,000	4,400						14.001	4.00	
		One for Truck	1985	120420		i	12,200	2300	6.600	3,300				0			1172	7.815				12.300			4296	102
		One for fruit	1995	520,400		0	0			14,800	11,100	7.400	1700				4,110	-	1,720					26,418	4215	122
		10 Ton Pokus	1986	\$1470	i	0		10,000	7.500	5,000	2500	-	1	. 0					4.85					11.153		137
		12 Ton Pickup	1986	\$14,730		0		10,000	7.500	5,000	2500			0				1171				12.250		8.865		157
		One Ton Truck	1986	120,400	0			0	2	14,800	11,100	7,400	2,722	0				***	-					11,024		172
		12 Ten Ratus	1986	\$14.700		0		10,900	7500	5,000	2,530		1						1200					12,339		187
		1/2 Ton Plokup	1965	\$14700		0	9,500	7,125	4750	2,375	0			0			****	2 100				1383				223
		Correct Cas	1985	\$14000	0	0	1,100	7,765	5,460	1540	1800						COM	2,446						13,500		255
		Water Torker	1966	152,000	0	0	0,100	43,000	35,833	28,667	21,530	14.333	7.157	0										41.27	2554	250
		One Ten Truck	1996	120,000	0	0		12,500	9,375	5.252	3.125	0	0	0				11,200				13,120				290
		1/2 Ten Pidica	1957	\$14700	0	0	i	0	13,200	1900	6.500	2,300												12,557	5.337	300
		Compact Cas	196	\$14,000	0	0	1100	7.260	5,450	2,540	1,530	2,000							1,301			7,130				
		1/2 Ton Pickup	1967	\$14,700		0	3,700	1200	13,700	100	5.500 5.500	3.300	÷	:										11,510		28
		Commency - Mounted		\$25,000		0		13714		9141	6,857	451	2.285													
			190	125,000	0		42.500	50,000			12,500	43/1	2,200	P										15,163		25
		5 Ton Dump Truck One Ton Truck	1960	\$30,400			2,00	2000	37,300	25,000	11,100	7.400	1700	0				30,000	3228			9570		46,008		6
		of Yeigelettmale	1900	25740			15.000	21,000	21,000	14,000	7,000	1,480	3/60													
		16 Yoldelbotatic One Ton Truck	192		4000	CIII	35,000	21,000							1,353	21,401	2(50)	23,539	20,00					4,45		21
				\$20,400						14,500	11,100	7,A00	3,700									11,365				51
		1/2 Ton Pickup	1986	\$14,700	0			1,20	8,800	6,500	1300		. 0	0								8,520		7,959		52
		1/2 Ton Pokup	1986	\$14700	0	۰			7,500	5,000	2,500	0	0									8,50				0
		12 Ton Rokup	187	\$14,700	. 0		0	. 0	13,200	9,900	5,500	730	0									5,960				2
		15 fd colectoratio	1922	22,30			25,000		21,000	14,000	7,000		0		12,720	20,017	40%	32,225							2.997	72
		12 Ton Rokup	1967	\$14,700	. 0			0	13.230	9,900	6,500	2,300							128			530				74
		10 Ton Rokup	1968	\$14,700						14,200	12,550	7,100	150									4,290			2,56	70
		12 Ton Pickup	198	21/700	0		0	0	. 0	14,200	10,550	7,100	1,53											12,538		117
	157		196	\$17,500		0	0	12,700	10,275	0.55	1,45	. 0		. 0										11,227	2813	754
		One Ton Truck	1985	\$23,400			0	12,500	9,375	6,250	1,125											\$,025				85
		Small Pol-up	1955	\$14,900			10,000	7,500	5,000	2.500	. 0	0		. 0			1,001	1,584				5,520			2775	800
		1/2 Tan Fidup	1967	\$14700	0		. 0		12200	9,900	6,500	3,300							1,92			8,870				844
11 7		One for Truck	1967	\$23,400	. 0		0		12,300	2,875	6,650	1,325		0						11,556	11,72	12,420	認	10,372	2,704	95
		1/2 Ton Pickup	1967	\$14700	. 0	0	0	0	13,200	9,000	5,500	3,300		. 0					650			5,350			253	879
		Sciewalt Plays	198	级概	0		. 0			52,000	43,233	34,667	25,000	17,333						18,984	19,950	47,450	2,5	55,517	2500	140
	175	TAN	1988	\$17,500		0		13,700	10,275	5,550	1,45		0	0					1,2%	8,227	1,55	10,913	150	11,219	2,555	25
11 5	259	One Ton Truck	1986	120,40	0	0		12,500	9,275	6,250	1,125	0	0	0					8,898	8,775	1,456	7,960	10,00	9,306	2,522	90
10 3	299	1/2 Ton Pickup	1983	\$14730	9,000	5,750	4,500	2,250			0	. 0	0	0		1,20	1,825	1255	4.194	3,258	254	5,864	1,7%	7,316	2,919	39
15 5	195	5 Ton Gump Truck	1966	\$25,000	0	0		86,500	53,200	\$1,900	34,500	17,300	0	0				1,400	20,40	45,900	45.60	20,600	2.10	53,416	258	1,05
11 5	30	One Ton Truck	1986	120,400	0	0		12,500	9,375	6,250	3,125		0	0					124	1,48	1,295	14,890	5,550	11,501	2.501	1,115
0 7	050	1/2 Ton Pickup	1987	\$14,700	0	0		0	13,200	1,900	5,500	3,300	0	0					2308	7,90	8,325	5.501	546	1573	2,513	1,12
3 3	433	15 Yel collecturadic	1963	\$37,500	50,000	52,500	6,000	27,500	30.1	22,500	15,000	7.500	0	0		6077	18,510	25518	25.32	30,825	12.06	22.520	476	0.00	2578	1.22
2 1	161	Lode	1980	\$150,000	59,250 5	12,807	41,083	39,500	32,4.1	25,303	12,750	13,157	6,562		21,079	40,021	41,905	9,51	56,745	43,035	22,002	11,012	45/85	40,253	2,544	1,35
0.6	219	10 Ton Pickup	1965	\$14,700	0	0		10,000	7.500	5,000	2,500		0	. 0				-				5,825			2511	1.30
		Compressor - Wounted	1985	\$25,000		0	15,000	12,714	11,429	9.143	8.807	451	226				2.149	1530				7.336				1.63
		Sidwolk Pines	1285	SE AM	0	0		48.000		32,000		15,000	8,000	0			-14							2,245		1,6
		5 Ton Dump Truck		\$25,000		0				51,900		17,300	0									25,730		4760		12

			COST			-	WOULS	AJAE	RUE				OST			ANUA	EDUR	100	DEN CO	STE		FORE-	PROPRIY	CIMIL- LETUE
UNE A	EQUIPMENT QUESS	MODE.	181	1965	15.7	195	198	126	32	186	192	181	=	180	184 185	1965	195	22	198	×	26			
										-				-				-			-			
DE 600	STor Date Track	1086	25.25				E.32	675	920	NE	730						mag		SRI	w to	216	Dan	247	15400
	Tanden Date Trust		1239			- 6				5,00		7770	-										236	1,500,000
	STor Date Truck		25.20		:		H.SE				230	-										20.00		180,900
	5 Ton Damp Track	1985	25,20				200																159	100.00
	10 Ton Polico	190	\$14.70			-			920	150	130					ac.ue						130		
	10 Ton Police	1088	\$14.700			- 6			11.700	10.50	7:00	190					-							20030
	STon Date Track		\$16.00		i		H-500				730	-	- 1			150	1163					5.80		2:2130
	5 Ton Dump Truck		65.00			0.00				12.500			- 6										2331	22/5300
	Science Pows	1981	22.40		750	11.90	Sam.	-	-	-				600	587 1598									
	12 Ton Rokup		614.700	-	-	-	-		14700	255	7.00	150		-		~~	700						2254	
	Tanden Dung Truck	1987	Size con		-					530	659	2380					2120						2205	2,65,400
	5 Ton Dumo Truck		\$95.000					53.20		350	230												210	
302 5658			\$162.000			9107	490	-				i		ESE.	SE SE									250,40
212 8543		1988	\$17.50	0					14,000	10500	7,000	250	1									13.823		2 (57 90)
	Street Boom		\$154,000		21.750			- 6	-	-	-			236	274 289	MIC	Ti COS							
415 F187	5 Ton Dump Truck	1986	\$95,000				86.500	5270	0.00	3450	230											Ø819		2565,900
	16 Yel collectomatic	1965	197,800			6300	55.125				25.65	15750	185		12.00							25.43		2,044,700
17 (70)	Compact Cars	1265	\$14,000			9100	7.380	5450	150	1,800					-							5.533		
	One Ton Truck	1967	221400						995	650	335		- 1			-						10.90		
74 656	Sidewalk Plants	1996	22,40				4.00	4000	200	3,000	830	8,000					930	19.30	25.190	26.25	14.00	20,791	1575	2141.500
202 2127		1981	\$150,000					450	527		21,250	S.E	700	175	920 E35	50.99								
454 125	Sidewalk Power	1981	92.40	23.333	17.500	11.97	CHE							2126	479 257	530	205	1470	14,500	200	15.00	18.80	190	3,363,900
202 910	Loader	1379	\$152,000	4.97	9.50	2530	245	330	18250	12167	5383		i		2500 3436									
277 5822	Rowr Atachment	195	\$114,000											630	2555 1.75									2,607.900
694 117	Sidewalk Plans	1981	22.40	25.302	7.500	11.957	Sam	- 1						276	19 19									170030
	12 Ten Police	196	\$1.78		0	-	-			13800		620	160		44.40	-						11.53		
20 849	12 Ton Polup	1988	2478						14200	1252	7.100	150						257	234	(3)	150	849	179	17579
111 858	One for Truck	1965	2548						1480	11.12	740	170						730	790	123	687	6.76	1,774	175010
416 600	5 Ton Dump Truck	1986	\$55.00				8.50	975	9.80	350	730					729	16.525	25	22.53	2220	TE:	2070	170	1,95,12
Q4 50E	25 Ye Collectornatic	1965	2620			650	7483	9175	248	575	253	2.55	188		1.00							5.40		
32 525	Leader	1985	10.24			530	77,917	7,50	670	357	620	. 57	547		1.08	1925	278	22	5434	323	349	2.0	1,725	49.3
212 523	120	198	\$7.50				1270	1925	US	145						119	427	423	129	673	497	500	172	41933
210 7055	12 Ton Polup	1967	2472					1228	1300	6530	330						220	234	150	15	153	150	171	11050
46 708	5 Ton Durse Truck	1967	15.00					50.00	140	232	832	250					180	22	200	150	250	215	170	4,778.50
111 852	One Ton Truck	198	2340						1430	11/00	7,400	370						153	175	176	720	19.28	157	(22)20
32 202	Leader	1973	25000	150	4250									2.30	338 353	ZI	E15	278	238	ZE	287	580	1.58	4455.00
46 307	5 Ton Dump Truck	1982	pine.	4,22	2,80	3450	1540	829						229	434 420	120	539	3(2)	28	15,00	250	239	1,595	4,552,00
114 5276	Snal Pei-up	198	\$4,90						1530	10.500	7300	150						120	120	215	155	10.25	1.575	4592.80
210 7134	10 Ton Polup	567	\$470					1228	930	55X	130						142	12	1 652	14	5 215	3.55	180	450250
124 3482	25 Yel Collectoration	190	\$428	12.00	71,750	6.50	25.	438	272	250	935				929 2135	25.98								4779.79
237 5111	Compact Cars	1985	\$14,000			1,00	7250	548	150	1820			1				1/8	1 20	250	123	0 140	5.86	150	470,70
Q4 559	25 Yel Collectoration	1965	24520			650	7480	912	24	479	250	21.55	158				-	420	66	4578	5 51:176	51.05	150	4,95100
	10 Ton Police		\$14,700			0					115	630	160					-			5 585			
277 594	Bowr Atachment	1965	\$114,000							0	-			146	575 5.39	280	1505	120						50168
	Small Pox-up	1988	\$14,900						1430	1150		150				-	-				5 552			
	Conned Cars		\$14,000		i			1050				7100					107				0 634			
277 9900	Bowe Atachment	1965	\$114,000			0		-	-	-	0			1.839	535 8.59	6 10 53							5 140	5.101.50
302 50:2			\$160,000						670	4.00	450		25,417	-								51,81		
	School Poet		302.40		i	. 0					2500	1550	520		4,44	-						15,41		
	One for fruit	1957			i							4	-								2 470			
						sem.			3,00				800	100	1220 144									
377 \$155	Sowe Attachment																							

				COST				AMNUAL	SALVAGE	NUE				FORE- CAST				NO.	AL EQU	WENT	OSM CC	3575		FORE- CAST	PRICETY	CUMU
UNIT	'	SOUPWENT CLASS	MODEL		1983	1984	195	1986	1987	1968	1889	1900	1351	1992	1983	1984	1965	1986	198	1985	1969	1990	190			NEVCO
54	5365	Steel Boom	1986	\$154,000				125,000	139,375	E1750	71.15	62,500	45,875	31,250				14,135	2635	33.745	36,277	41,305	H.025	50,641	1379	569.5
4	271	25 Yd Celectoratic	1986	\$146,200	0			90,000	81,275	63,750	91,125	45,500	34,875	20,250					21,50	44,785	3,504	44,105	31,198	41543	130	5888
Q4	7102	25 Vd Collectomatic	1967	1146,200		0		-	111,500	FF,563	81,05	69,503	55,750	41,813						30,890	3.34	44,720	51,314	F 229	1251	5902
210	803	1/2 Ton Plokup	1968	\$14,700	. 0	0		- 1		14300	10650	7130	3,550	0						2584	2500	3300	5,780	5988	1250	
227	92	Compact Cars	1965	\$14,000	. 0	0	9,100	7,250	5,460	1,540	1,830	. 0	0	0					2,189	4,174	1,799	1,345	1,965	3361	1342	
417	848	Tandem Dump Truck	1988	\$132.00	. 0	0				123,000	95,000	72,000	48,000	34,000						33.800	41.059	40550	33.885	10254	1330	6301
415	242	5 Ton Dump Truck	1982	\$35,000	32500	24,500	16,400	8,200		0	0		0	0	5273	550	11,258	2348	9.70	14,780	10,768	1596	2075	11,960	1,291	6200
431	3474	Potrole Patcher	1983	12.40	71,350	81,157	50,964	40,771	30,579	20,000	12,193	8	0	0		Un	9,339	10571	2024	9,791	1,355	1367	21,530	1934	1,386	
Q(7144	25 Nd Callectomatic	1967	\$145,200	. 0	0			111,500	\$7,963	11,45	69,98	55,750	41,813						35.500	\$1,805	331%	\$1,508	9311	1,275	
420	2065	Fold Truck	1962	188,400	30,25	29,250	24,375	13,500	14,625	1,750	4,875		0	0	1262	1907	6,800	9566	11.22	12.900	12022	1750	18.187	13.159	1334	690
415	25	5 Ten Dumo Tsudi	1986	\$35,000	. 0	0		86,500	69,200	\$1,500	34,500	17,30	0	0					730	15.989	18,050	15,710	20	nu	1,228	650
113	9214	12 Ton Pickag	1989	\$14,700		3	. 0			0	12,530	10,250	6,900	1,450							1,854	IIII	4.50	1,122	1200	650
74	823	Sidewa's Plows	1988	\$52,400	0	0				52,000	0.333	34.97	25,000	17,333						15.990	18 032	23.250	15,200	13345	1194	
210	1002	1@ Ton Pickarp	1967	\$14,700		0		- 1	11,200	1,500	£,500	3,30	0	0					1,74	2.500	150	5,210	569	2773		
41	6047	25 Nd Collectorate	1988	\$146,200		0		93,000	81,375	EL750	51.125	45.50	34.875	23,250					11.63	29.750	34,355	22240	41.520	41,730	1,136	5.67
41	7110	25 Yd Collectomatic	1967	\$146,200	. 0	0		-	111,500	\$1,563	11,65	60,00	55,750	41,813										41,139		
156	1048	Gang Nover	1962	\$33,000	15,750	13,500	11.250	9,000	8,750	4,500	2,250		0	0	1,389	136	8,510	1500	279	200	882	125	4.76%	1.583	1,154	7.07
222	2101	Looder/Snebber - fee	1962	\$209.000	. 0	0				0	0			0	15/22	4,535	7.420	17552	422	35.47	38900	39.45	25,405	38413	1138	726
434	1004	25 Yd Callectomatic	1967	\$146,200	. 0	0		- 1	111,500	E563	E1.635	59,92	55,750	41,813						36,43	38,275	36,230	48.530	41.03	1136	
145	8585	Sheet Broom	1968	\$154,000	0	0				15.000	119.875	10275	85,525	98,500						27,726	12:500	45,225	SADIE.	72,818	1,130	7.98
455	9009	Genc Nover	1979	\$33,000	8,500	6,275	4.230	2,125		0	0			0	1255	560	343	4394	119	5.53	5.530	250	5.154	5,221	1112	
415	9233	5 Tan Dump Truck	1989	\$75,000	0	0		-		0	9:.000	72.80	54,500	35,400							11,500	24,100	45,034	60345	1302	
494	7128	25 Td Calectomate	1987	\$146,235		0		- 1	111,500	\$1,563	12.625	59,05	55,750	41,812						34.76	2.850	39,455	43510	6,858	1,002	7.80
434	6054	25 Td Callectomate	1966	\$145,230	0	0		83,000	81,375	£1.750	58.125	45.5%	34,875	21,250					1252					41.02		
415	9354	5 Tan Dumo Truck	1988	195,000	0	0				\$1,000	72,800	54.55	35,400	18.200						4.700	5435	25.990	36.512	Ø 321	1094	1.00
6	1125	Portable Compressor	1961	120,530	5714	4571	3.09	2.285	1.143	0	0				825	1,884	2.568	2364	161	2.309	2470	2.00	2.500	2.578	100	1.82
222	2119	Londer/Snwbler - five	1962	\$239,000		0		-		0	0	- 1	- 0		18.223	7,527	13,554	15371	41	28.010	21,700	30,052	23.59	37.154	1077	
120	5228	Fost Truck	1965	\$30,430		0	61.500	53812.5	6.125	38.438	32.750	23363	15,375	7.588				8413	12.22	15.821	17.423	13,670	87£	37,198	-576	LGL
415	1252	5 Ton Damp Truck	1966	\$35,000	0	0		86,500	63,200	\$1,000	34,530	17.30		0					7,69	13.790	1545	19,320	13,416	21.829	100	
466	7275	Gong Worker	1977	\$33,000	8,500	3,250				0	0				1339	1,502	3,495	1.865	102	2,405	2554	287	12.05	5,984	1344	100
207	2543	Small Door	1982	\$55,000	24300	21,500	18.900	15.200	13500	11.600	8.130	5.00	2.700		198	24,750	7.575	17322	- 85	4.65	1232	170	SAT	140	100	167
377	145	Bawe Atachment	1950	\$114,000	48,000	4,000	40300	38,000	32,000	28,000	24,000	20,00	16,000	12,000	1766	1250	4,82	1/22	2.4	26.00	3350	7,348	9,720	21431	1211	838
210	251	12 Ten Pickas	1990	\$1478	. 0	0		-		0	0	1480	10.500	7,000								545	72€	9579	1300	880
212	E577	WW	1988	\$17,500		0		- 6		14,000	10,500	7.00	3,500							315	54	754		5534	180	
210	246	12 Ten Pickup	1990	\$14,700		0		- 1		0	0	14,00	10,500	7,000								550	7.093	1576	1371	840
110	1222	12 Ton Pickup	1989	\$14,700		0		- 1		0	12,800	10.20	6,900	3,450							2491	5130	188	5,227	183	8348
377	5800	Bowe Atachment	1375	\$114,000	22,333	20,000	16.50	13.333	12,000	LSE?	1.223				1,512	1798	4.373	465	17.06	17.49		350		15,427	1864	8,902
254	7080	Small Backhoe	1967	\$55,000		0		-	55,000	41.007	\$7,533	28.00	18,667	9.333						8,34	130	15940	14200	18,000	1.554	
120	5236	Heid Truck	1965	130,400		0	61.500	53.813	45.125	21.438	30,750	23.00	15.375	7.588				1,000	11.29	14.38	14490	7.50	12.140	17.235	1819	9.115
177	1888	Sow Atachmet	1175	\$114,000	25.557	20.333	20,000	15.667	13.333	12000	8.667	3.20	0		1269	336	500	28112	12:45	7.80	7.819	128		9,856	1817	
211	\$300	One Ton Truck	1989	\$20,400	0	0				0	1E.000	12.00	8,000	4000					-	.,		154		880		
211	5212	One Ton Truck	1989	120,400						0	15,000	12.00	8,000	4000										11,000		
354	8690	Small Backhoe	1988	\$55,000		0		- 6		57.000	0.500		28.500	19,000						6.03	5.115	1150				
377	5889	Sowe Atachment	1975	\$114,000		20,000	1630	13,333		1007	1.333	D.	0		1,391	473	5.225	424	819			140				
418	9066	5 Tan Dump Truck	1989	135,000	0	0				0	P1.000		54,600	35,400	1000		-	-	-	-				640		
110	5071	12 Ton Pokup	1989	114700		0		- 6		0	12,800	10.250	6,900	1,450								100		5000		
36	£146	GangNover	1966	\$33,000		0		7,000		5250	4.375	3500	2.625	1,750				49	130	40				(300		
566	30	Gong Nover	1960	133,000			6.503	4,575		0	0		0	0	2,079	1320	1.293			1,74			1,950	1,270		
	8651	Compact Cars	1968	\$14,000		0	-			12,000	9:500	728	4.800	2.400	-	,,,,,,,			(00		2,45			2401		
		Gang Nowa:	1964	\$32,000		5,400	5.500	4,800		1300	2,400	1,630	800	0		27	600	171	250	1.37			2.350	153		
		Smil Rol-up	1968	\$14,900		0		-			14.000	10,500	7.000	1500				-	477			1910		4367		
		Gard Worker	100	\$35,000		5.400	5.500	4.600		1100	7430	1,600	800	*****		54		-			220		2340			

								ARUAL S	ALVASE	VALUE				FORE-				AVERDA	EQUE	YEAT	OW CO	575		FORE-		CAMAJ
				COST										CAST										CKST	PRICATY	LATNE
UNE	-	EQUIPMENT QUASS	MODEL.	IOI	195	1584	1585	1986	1527	1988	1989	1990	1991	180	1585	1964	1985	1965	1987	1988	1989	1990	181	1992	FACTOR	NEW CO
415	9058	5 Ton Dump Truck	1989	125,000	- 0	0	. 0	0	0	0	\$1,000	72,800	14,600	35,400							4,365	22,045	24,813	35,90	0.518	9,815,9
455	5719	Gang Works	1965	\$33,000	. 0	0		0	0	. 0	0	0		0		762	2257	2640	1,544	1,905	1,960	1,060	2,50	2,083	0.506	9,848,1
385	ERIE	Gang Worker	1986	\$33,000	. 0	0		7,000	125	5,250	4,275	3,500	1625	1,750				730	3742	2,402	2.821	2,572	2,765	1,23	0.504	1,881,1
227	£768	Compact Cars	1988	\$14,000		0		0	0	12,000	9,500	1,200	4,800	2400						879	883	2.067	2,321	195	0.478	1,895,1
227	870	Compact Cars	1988	\$14,000		0	. 0	0	0	12,000	9,500	1200	4,800	1400						365	2248	2,505	1,400	2470	0.471	\$9091
156	3372	Gang Mores	1983	\$32,000	15,500	15,275	13,950	11,825	1,300	6,915	4,650	2325	0	0		2,332	2710	15%	1,187	82	1,080	1,221	1,854	50	0.451	1921
155	334	Gang Worker	1983	\$12,000	18,500	15,215	13,950	11,625	9.300	6,975	4,650	2325	0	0		25	50	20	306	1,864	205	2,000	4,575	3,900	0.445	8,975.5
110		12 Ton Polius	1989	\$14,700		0		0	0	0	13,800	10,250	5900	2430							1,000	2271	280	3.83	0.440	\$ 980.5
110	8582	10 Ton Polup	1989	114,700	- 0	0			0	. 0	13.800	10,250	5900	3,450							50	2.100	2,908	4130	2430	10,004.5
157		Large Role:	1574	\$105,000	3,300	0		0	0	0	0	. 0	0	0	479	482	1,120	557	5.425	150	340	9,050	1,850	4,502	0,419	
48		Gang/Yorker	1573	\$32,000			4,250	2.125	0	0	0	0	0		990	1.639	500	225	1,530	146	1225	2,188	1,655	1,883		101423
111	24		1900	10.500							0	15 500	11.805	7765	-	-	_	_	,,		-	1.540	4100	8,000		101601

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