GENERAL PLANNING CONSULTANT

TECHNICAL MEMORANDUM 88.4.9

BONDING MODELS FOR BENEFIT

ASSESSMENT DISTRICT PROGRAM

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SECTION 1.   INTRODUCTION

One of the major funding mechanisms for Metro Rail is the Benefit
Assessment District concept.   Properties in the vicinity of Metro
Rail stations will enjoy economic benefits attributable to their
proximity to stations.   Benefit Assessment is a program designed to
capture a portion of the benefits for construction of the Metro Rail
system.   In each station area, the number of assessable square feet
of space is determined. Multiplication of the number of square feet
by an assessment rate yields the annual income from this source.

It is planned to issue bonds at such levels that the annual
assessment income will provide debt service on the issue. The SCRTD
suggested that GPC staff develop some programs that could be used
to investigate various scenarios for the bonding program. A set of
three programs are presented:

1)   BAMOS1:   This program is designed for MOS-1 Benefit
      Assessment Districts.   It includes the option of
      deferring principal payments for several years.

2)   BAMOS1T: This program is designed for MOS-1 Benefit
      Assessment Districts.   It includes the option of
      capitalizing interest for up to five years.

3)   BAMOS2:   This program is identical to BAMOS1T but
      includes data relative to the MOS-2 Benefit Assessment
      District process.

All the programs run on MULTIPLAN, Version 3.0 which requires DOS
2.1 or better.   Details on the operation of each program are given
below. A problem the SCRTD has resolved concerns the payment of the
assessment fee by property owners.   Originally, the idea was to
collect assessments immediately, issue bonds as required, and defer
principal for several years to keep debt service as low as possible
in the early years of the program and consequently, also keep the
assessment rate as low as possible. Property owners objected on the
basis that assessments would be paid while benefits do not
materialize until Metro Rail opens for service. Thus, the District
suspended assessment payments until the facility is much closer to
revenue operations.

However, construction funds are needed much earlier than this.   The
idea changed to include the capitalization of interest for several
years until assessments are collected and actual debt service
payments begin.   The bond issue includes sufficient funds for
construction and the capitalization of interest for up to 5 years.
Thus, the program, BAMOS1, is of little use to the District.
However, it is presented below with user instructions. The program,
BAMOS1T, will be presented below with user instructions.   This
memorandum concludes with a brief discussion of the program, BAMOS2,
and several comments on user options.

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This bonding model allows the user to defer the principal portion of annual debt service for several years. Although the model may be of limited use to the District, it is presented below and detailed line-by-line. The user should refer to Figure 1 while studying the following text. Much of the line-by-line commentary is applicable to the two bonding models which are discussed later.

2.1 Fiscal Years

The program allows for the issuance of bonds over a 7 year period. The model currently suggests a 1987 to 1993 time frame. This is adjusted easily by updating the initial year of 1986. (See cell R8C8 on the spreadsheet.) In general, bond proceeds are assumed to be credited at the start of the fiscal year and debt service payments debited at the end of the fiscal year.

2.2 Proceeds Required From Bonds

The Metro Rail construction program calls for the expenditure of funds each fiscal year. Each funding partner contributes a portion of the required amount. The user enters the amounts expected from the Benefit Assessment program each fiscal year. Of course, the user may enter bond proceeds in any amount to test the feasibility of various funding scenarios.

2.3 Debt Service Reserve Fund

This row is zeroed in the program. Debt service reserve funds are assumed derived from assessments paid by property owners rather than from bond sale receipts. In any event, the debt service reserve fund consists of one full year of debt service for all bonds issued.

2.4 Discount From Par

Some bonds must be sold at less than par value. The user must enter the discount percentage in the cell provided. The model calculates this discount as a percentage of the Additional Bonds Required. Most often, this percentage will be zero.

2.5 Cost of Issuance

The sale of a bond issue entails a set of expenses on the part of the Broker handling the bond sales for the agency. The user must enter the estimated cost of issuance percentage in the cell provided. The cost of issuance percentage generally ranges from one to two percent. The model calculates this cost as a percentage of the Additional Bonds Required.

FIGURE 1

MODULE 6
JUNE 26,1988

BAMOS1 - BENEFIT ASSESSMENT RATE CALCULATIONS - DEFERRED PRINCIPAL

FISCAL YEARS	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
PROCEEDS REQUIRED FROM BONDS		6.0	24.0	35.0	18.0	17.0	35.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEBT SERVICE RESERVE FUND		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DISCOUNT FROM PAR 5.00%		0.3	1.8	1.9	1.0	0.9	1.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COST OF ISSUANCE 1.50%		0.1	0.5	0.5	0.3	0.3	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADDITIONAL BONDS REQUIRED		6.4	26.4	37.4	19.3	18.2	37.4	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PRINC AMOUNT	FISCAL YEAR	DUR (N)	INTEREST RATE(I)	DIVIDEND RATE(D)
6.4	1987	22	7.8	8
36.4	1988	21	7.8	8
37.4	1989	20	7.8	8
19.3	1990	19	7.8	8
18.2	1991	18	7.8	8
37.4	1992	17	7.8	8
36.4	1993	16	7.8	8

DEBT SERVICE REQUIREMENTS TABLE

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	-	-	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	-	-	-	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	-	-	-	-	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	-	-	-	-	-	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
	-	-	-	-	-	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
	-	-	-	-	-	-	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1

TOTAL=214.14

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
DEBT SERVICE	0.0	0.6	4.3	6.1	10.1	12.1	16.2	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3
COVERAGE RATIO	0.0	45.16	8.28	5.12	4.59	3.61	2.57	2.04	1.84	1.62	1.38	1.14	1.13	1.12	1.09	1.13	1.17	1.21	1.17	1.14	1.10	0.91	0.00
DEBT SERVICE RESERVE FUND	0.63	4.28	8.11	10.12	12.07	16.20	20.33	20.33	20.53	20.33	20.53	20.33	20.53	20.53	20.53	20.33	20.53	20.33	20.33	20.33	20.33	20.33	0.00
ADMIN COSTS INFLATED BY 4.00% /YR	0.55	0.57	0.59	0.62	0.64	0.67	0.70	0.72	0.75	0.78	0.81	0.85	0.88	0.92	0.95	0.99	1.03	1.07	1.11	1.16	1.21	1.25	1.30
TOTAL OBLIGATIONS	1.18	4.85	8.71	10.74	12.72	16.87	21.02	21.05	21.08	21.11	21.14	21.17	21.21	21.24	21.28	21.32	21.36	21.40	21.44	21.49	21.53	21.58	1.30

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
BEGINNING BALANCE	0.00	21.45	28.55	32.87	35.76	37.03	34.42	28.70	24.55	20.09	15.38	10.37	5.07	4.73	4.20	3.61	4.46	5.28	6.10	5.41	4.69	3.87	-0.04
INTEREST ON RESERVE FUND 7.80%	0.00	0.05	0.33	0.63	0.79	0.94	1.26	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59
INTEREST ON BALANCE 5.50%	0.00	0.59	1.37	1.85	1.89	2.00	1.97	1.74	1.46	1.23	0.98	0.71	0.42	0.27	0.25	0.21	0.22	0.27	0.31	0.32	0.28	0.24	0.11
ENDING BALANCE	21.45	28.55	32.87	35.76	37.03	34.42	28.70	24.55	20.19	15.53	10.37	5.07	4.73	4.20	3.61	4.46	5.28	6.10	5.41	4.69	3.87	-0.04	0.34

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
SQUARE FOOT SCHEDULE (M's) NO GROWTH	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43	75.43
INCOME EXPECTATIONS	22.63	11.31	11.31	11.31	11.31	11.31	12.07	13.59	13.58	13.58	13.58	13.58	18.85	18.85	18.86	20.37	20.37	20.37	18.86	18.86	18.86	15.84	0.00

| ANNUAL ASSESSMENT RATE | $0.30 | $0.15 | $0.15 | $0.15 | $0.15 | $0.15 | $0.16 | $0.18 | $0.18 | $0.18 | $0.18 | $0.18 | $0.25 | $0.25 | $0.25 | $0.27 | $0.27 | $0.27 | $0.25 | $0.25 | $0.25 | $0.21 | $0.00 |

BOND ISSUE EXISTS (DEBT SERVICE PAYMENTS MAY BE DUE)

		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
0	1987 22	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1988 21	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1989 20	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1990 19	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1991 18	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1992 17	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	1993 16	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

YEAR OF LIFE (OF A BOND ISSUE)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	0	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

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2.6 Additional Bonds Required

Additional Bonds Required represents the bonds which must be sold to realize the required bond proceeds and to provide for the reserves fund deposit (if any), the discount from par (if any), and the costs of issuance. Additional Bonds Required are calculated by dividing the Proceeds Required from Bonds by 1 minus the sum of the Discount From Par and Cost of Issuance percentages. For each fiscal year, Additional Bonds Required must equal the sum of the four row entries immediately above its row.

2.7 Defer Principal

The entries in this column represent the number of years of deferred principal for each of the seven possible bond issues. The number entered may range from 0 to one less than the duration of the bond issue. Normally, principal payments are deferred for five years or less.

2.8 Bond Amount

The entries in this column are transferred directly from the Additional Bonds Required row.

2.9 Fiscal Year

The entries in this column are calculated directly from the initial year entered in cell R8C8.

2.10 Duration

The duration of a bond issue is the number of years to maturity. It is also the equivalent number of annual debt service payments during the life of the issue. For this example, the final debt service payment is scheduled for 2008. If the first debt service payment is scheduled for 1987, the duration of the issue is 22 years (2008 - 1987 + 1). These data must be adjusted by the user as necessary.

2.11 Investment Rate

The investment rate is the interest earned on the sinking fund deposits to retire the bond principal. Generally, the investment rate is less than the dividend rate. However, if the bonds are callable, the investment rate is very close to the dividend rate.

2.12 Dividend Rate

The dividend rate is the interest rate paid to bond owners. Both the investment and dividend rates must be entered by the user. The rates may vary from year to year if the user has any rationale for such variation. One reason could be part of a sensitivity analysis

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which includes interest rates as a variable.

2.13 Debt Service Requirements Table

Each cell in the Debt Service Requirements Table contains a formula to calculate the debt service. An "If" statement consults the Bond Issue Exists Table which begins in Row 55. Entries in the Bond Issue Exists Table are 1 if a debt service payment could be due for the year in question and 0 otherwise. If the entry is 0, a dash is inserted in the corresponding cell of the Debt Service Requirements Table. If the entry in 1, then the debt service is calculated.

A second "If" statement consults the Year of Life Table (Row 65) and compares the cell entry with the number of years of deferred principal. If the year of life is less than or equal to the years of deferred principal, the debt service is calculated as follows (interest only):

$$D.S. = BA * D$$
where: BA is the Bond Amount
       D is the Dividend Rate

If the year of life is greater than the years of deferred principal, the debt service must include a principal payment as well as an interest payment. The debt service is calculated as follows:

$$DS = BA * D + BA * \frac{I}{(1 + I)^{(N - YDP)} - 1}$$

where: I is the Investment rate,
      N is the duration of the issue in years,
   YDP is the number of years of deferred principal.

2.14 Total

The Total is simply the sum of the seven possible bond issues.

2.15 Debt Service

The Debt Service represents the annual debt service for all the bonds issued during the seven year period covered by the model. It is the sum, by column, of the seven rows in the Debt Service Requirements Table.

2.16 Coverage Ratio

The coverage ratio is calculated as the available funds divided by debt service. The available funds consist of the Beginning Balance at the start of the fiscal year plus the Income Expectations during the year less the increase in the Debt Service Reserve Fund and the Administrative Costs, if applicable.

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2.17 Debt Service Reserve Fund

The Debt Service Reserve Fund is equivalent to the debt service payment scheduled for the subsequent fiscal year. The reserve fund earns interest credited at the end of the subsequent fiscal year. Any payment to the reserve fund is calculated as the difference between this year's balance and last year's balance in the reserve fund.

2.18 Administrative Costs

The administrative costs of the Benefit Assessment District Program are estimated at $550,000 for the first year. They are expected to increase annually at the same rate as the Consumer Price Index or at about 4% per year. There is some discussion as to whether the administrative costs can be paid with benefit assessment income or from other District income. The contention is that benefit assessment income can be used only for debt service on bond issues for Metro Rail construction. The user must adjust the inflation rate used as well as the administrative costs used in the analysis.

2.19 Total Obligations

Total obligations for a given year are the sum of debt service payments, administrative costs (if applicable), and the increase in the debt service reserve fund from a year earlier.

2.20 Beginning Balance

The beginning balance is transferred from the prior fiscal year's ending balance. The user must enter the appropriate balance on hand for the initial year of the analysis.

2.21 Interest on the Reserve Fund

The Debt Service Reserve Fund earns interest at a long-term investment rate. The reserve fund balance at the end of the prior fiscal year is multiplied by the long-term interest rate which must be adjusted by the user.

2.22 Interest on Balance

The cash on hand earns interest at a short-term investment rate. The interest earned in a given fiscal year is the average balance of the prior fiscal year multiplied by the short-term investment rate which must be adjusted by the user.

2.23 Ending Balance

The ending balance is the cash on hand at the end of a given fiscal year. It is calculated by adding all income to the beginning balance and subtracting total obligations. All income consists of

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the interest earned on the debt service reserve and average balance
plus the income expected from benefit assessments.

2.24 Square Foot Schedule

The entries in this row are the estimates of assessable square feet
on which assessments will be collected during the fiscal year. The
user must enter a schedule corresponding to the assumptions of a
given scenario. Several possible scenarios include no growth in
assessable square feet, some intermediate growth rate, and a maximum
growth rate for the station vicinities included in the portion of
Metro Rail under examination, i.e., MOS-1, MOS-2 or MOS-3. The
number of square feet is entered in millions.

2.25 Income Expectations

The expected income is calculated by multiplying the number of
assessable square feet in millions by the annual assessment rate in
dollars per square foot to yield income in millions of dollars.

2.26 Annual Assessment Rate

Annual assessment rates are entered by the user. The primary goal
is to set the assessment rate to meet total obligations while
maintaining the coverage ratio at some minimum value such as 1.10.
The program runs interactively. When all the data relative to the
bond issues and square foot schedules are entered, the user starts
at the left and enters assessments rates on a trial and error basis.
When the coverage ratio is satisfactory, proceed to the next year
and repeat the process.

In some instances while running the program, the user may notice
fields of number signs (####). The field or cell width for
numerical data is set at 5 with two decimals. As the user balances
the cash flow to maintain a coverage ratio of at least 1.1 or so,
these problems should clear up. If not, the cell widths should be
increased to accommodate the larger numbers. However, note that
cell widths of 5 are used to permit printing the program output on
a single page. Thus, an alternative solution is to reduce decimals
to 1 and leave the cell width at 5 spaces.

SECTION 3. BAMOS1T

This bonding model allows the user to capitalize interest payments to bond owners for from 1 to 5 years. Principal payments are deferred for the same years in which interest is capitalized. At the end of the interest capitalization time period, full debt service payments must be paid from the income of the Benefit Assessment District. Much of the detail on the model is identical to that for BAMOS1. Thus, only lines which are different will be presented below. The user should refer to Figure 2 while studying the following text.

3.1   Fiscal Years

The program allows for the issuance of bonds over a 7 year period. While a 1987 to 1993 time frame is suggested in the model, the user may update the initial year of 1986. Interest may be capitalized (and principal deferred) for up 5 years but not beyond the seventh year of the bond issue period. For example, bonds issued in 1987, 1988, and 1989 may be capitalized for up to 5 years but an issue sold in 1993 for only 1 year.

3.2   Debt Service Reserve Fund

In view of the capitalization of interest, the debt service reserve fund payment is financed through the sale of bonds. The reserve fund payment in equivalent to one year's debt service for each bond issue.   It is calculated by multiplying the Additional Bonds Required by the Reserve Factor.

3.3   Additional Bonds Required

Additional Bonds Required represents the bonds which must be sold to realize the required bond proceeds, to make the reserve fund deposit and pay the cost of issue fee, and to make the interest payments to bond owners during the capitalization period.   An expression for Bond Amount (BA) is given:

$$BA = BP + RFF * BA + ICF * BA + CAPF * BA$$

where: BP = Bond Proceeds
              RFF = Reserve Fund Factor
              ICF = Issue Cost Factor
              CAPF = Capitalization Factor

The solution of this expression for the Bond Amount yields the following:

$$BA = \frac{BP}{1 - ICF - RFF - CAPF}$$

Expressions for these three bonding factors are given below.

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FIGURE 2

BONDING MODULE
JUNE 26,1988

BAMOS1T - BENEFIT ASSESSMENT RATE CALCULATIONS - CAPITALIZED INTEREST

FISCAL YEARS   1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

	1986	1987	1988	1989	1990	1991	1992	1993
PROCEEDS REQUIRED FROM BONDS	0.0	18.5	30.5	38.5	27.7	15.1	0.0	
DEBT SERVICE RESERVE FUND 1	0.0	3.2	4.8	5.5	3.6	1.8	0.0	
DISCOUNT FROM PAR 0.00%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COST OF ISSUANCE 2.00%	0.0	0.6	0.9	1.1	0.7	0.3	0.0	
ADDITIONAL BONDS REQUIRED	0.0	36.6	45.8	52.7	34.6	17.2	0.0	

LEVEL BOND FISCAL DUR INVEST DIVIDEND
INTER AMOUNT YEAR (N) RATE(I) RATE(D)   DEBT SERVICE REQUIREMENTS TABLE

LEVEL INTER	BOND AMOUNT	FISCAL YEAR	DUR (N)	INVEST RATE(I)	DIVIDEND RATE(D)
5	0.0	1987	25	7.0	8.0
4	30.6	1988	24	7.0	8.0
3	45.8	1989	23	7.0	8.0
2	52.7	1990	22	7.0	8.0
1	34.6	1991	21	7.0	8.0
0	17.2	1992	20	7.0	8.0
0	0.0	1993	19	7.0	8.0

TOTAL=180.92

DEBT SERVICE
COVERAGE RATIO
DEBT SERVICE RESERVE FUND
ADMIN COSTS INFLATED BY 4.00% /YR
TOTAL OBLIGATIONS

BEGINNING BALANCE
INTEREST ON RESERVE FUND 7.50%
INTEREST ON BALANCE 5.50%
ENDING BALANCE

SQUARE FOOT SCHEDULE (M's) NO GROWTH
INCOME EXPECTATIONS

ANNUAL ASSESSMENT RATE

BOND FACTORS
   COST FACTOR
   RESERVE FACTOR
   CAPITALIZATION FACTOR

BOND ISSUE EXISTS (DEBT SERVICE PAYMENTS MAY BE DUE)

YEAR OF LIFE (OF A BOND ISSUE)

CAPITALIZED INTEREST TABLE (BY BOND ISSUE)

3.4 Defer Interest

The entries in this column represent the number of years during which interest payments are capitalized and principal payments are deferred. The maximum capitalization period is 5 years but cannot extend beyond 1993 for bonds issued in any one year.

3.5 Debt Service Requirements Table

The Debt Service Requirements Table is calculated exactly as for BAMOS1. The only difference is that BAMOS1 refers to years of deferred principal while BAMOS1T refers to the years of deferred interest. Otherwise, the methodology is identical.

3.6 Debt Service

Debt Service is calculated just as in the BAMOS1 model but must be reduced by the sum of interest payments derived from the capitalization of interest portion of the bond amount. These payments are calculated in the Capitalized Interest Table (Row 74) for each bond issue by multiplying the Dividend Rate by the Bond Amount for the years during which interest is capitalized.

3.7 Total Obligations

For this model, Total Obligations are the sum of debt service and administrative costs, if any. The debt service reserve fund payment is derived from the sale of bonds and does not constitute an obligation against assessment income. If it is desired to change this policy and derive the reserve fund payment from assessment income, one must do three things:

1) Set the reserve fund payment equal to the sum of debt service for each bond issue.

2) Revise Total Obligations to include the increase in the reserve fund from the previous year.

3) Set the Reserve Factor in the Bonding Factor Table to 0.0. This is accomplished by editing the Reserve Factor formula to include multiplication by 0.0.

3.8 Annual Assessment Rate

The same comments apply to the annual assessment rate for this model as for BAMOS1. However, assessments are not made during the years in which interest is capitalized.

3.9 Bond Factors Table

The Bond Factors Table includes the calculated value of the three bond factors used to calculate the Additional Bonds Required as

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outlined above. The bond factors are detailed:

1)   Cost Factor. The magnitude of this factor is equal to
      1 minus the sum of the discount from par and cost of
      issuance percentage rates.

2)   Reserve Factor. This factor yields the annual debt
      service for a bond issue when multiplied by the bond
      amount. The factor is calculated:

$$RFF = DR + \frac{IR}{(1 + IR)^{(N-YDI)} - 1}$$

where: DR = Dividend Rate
              IR = Investment Rate
               N = The life of the bond issue
             YDI = Years of Deferred Interest

3)   Capitalization Factor. This factor yields the funds
      needed to capitalize interest payments for a bond issue
      when multiplied by the bond amount. The factor is
      calculated by multiplying the annual interest paid for
      a bond issue of \$1 by the present worth of a uniform
      series. The factor is calculated:

$$CAPF = DR * \frac{(1 + IR)^{YDI} - 1}{IR * (1 + IR)^{YDI}}$$

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SECTION 4. BAMOS2

This bonding model is identical to BAMOS1T. The only differences are the initial year is changed to 1990 for BAMOS2 and a square foot schedule characteristic of MOS-2 stations is entered.

Two sample scenarios are developed with this model and presented in Figures 3 and 4. In Figure 3, the model is run with no years of deferred interest for any of the bond issues. In Figure 4, the model is run with the capitalization of interest for the bond issues as shown. Note that Bond proceeds are kept constant. The most obvious impacts of this difference are in the relative sizes of the bond issues required and in the annual assessment rates.

The user may change any parameters included in the model to test various assumptions and to perform sensitivity analyses. Elements that may be varied include the following:

o   The initial year.
o   The proceeds required from bonds over a seven year period.
o   The discount from par and cost of issuance rates.
o   The years of capitalized interest for each issue.
o   The duration of each issue.
o   The investment rate and dividend rates for the bond issue.
o   The coverage ratio.
o   The source of debt service reserve funds.
o   The administrative costs and associated escalation rate.
o   The long-term interest rate on the reserve fund.
o   The short-term interest rate on the annual average cash balance.
o   The square foot schedule under different growth assumptions.
o   The annual assessment rates.

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FIGURE 3

POWDING MODULE
JUNE 26,1989

BAMOS2 - BENEFIT ASSESSMENT RATE CALCULATIONS - WITHOUT CAPITALIZED INTEREST

FISCAL YEARS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
PROCEEDS REQUIRED FROM BONDS		25.0	31.0	0.0	0.0	0.0	0.0	0.0																			
DEBT SERVICE RESERVE FUND	1	2.7	3.4	0.0	0.0	0.0	0.0	0.0																			
DISCOUNT FROM PAR	0.00%	0.0	0.0	0.0	0.0	0.0	0.0	0.0																			
COST OF ISSUANCE	1.50%	0.4	0.5	0.0	0.0	0.0	0.0	0.0																			
ADDITIONAL BONDS REQUIRED		28.1	34.9	0.0	0.0	0.0	0.0	0.0																			

DEBT SERVICE REQUIREMENTS TABLE

DEFER BOND FISCAL DUE INTEST DIVIDEND INTER AMOUNT YEAR (N) RATE(I) RATE(D)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
0 28.1 1991 25 7.0 8.0	-	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	-
0 34.9 1992 24 7.0 8.0	-	-	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	-
0 0.0 1993 23 7.0 8.0	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
0 0.0 1994 22 7.0 8.0	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
0 0.0 1995 21 7.0 8.0	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
0 0.0 1996 20 7.0 8.0	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
0 0.0 1997 19 7.0 8.0	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-

TOTAL=63.033

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
DEBT SERVICE	0.0	2.7	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	0.0
COVERAGE RATIO	N/A	1.51	1.28	1.24	1.26	1.38	1.30	1.25	1.24	1.24	1.20	1.17	1.15	1.14	1.14	1.16	1.18	1.22	1.19	1.17	1.16	1.17	1.19	1.21	0.97	0.07	N/A
DEBT SERVICE RESERVE FUND	0.00	2.69	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	0.00
ADMIN COSTS INFLATED BY 4.00% /YR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL OBLIGATIONS	0.00	2.69	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	0.00	0.00

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BEGINNING BALANCE	0.0	0.0	2.4	2.0	2.1	2.4	2.9	2.4	2.2	2.0	2.1	1.8	1.6	1.5	1.4	1.4	1.5	1.7	1.9	1.7	1.6	1.6	1.6	1.7	1.9	0.4	0.0
INTEREST ON RESERVE FUND 7.80%	0.0	0.0	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0
INTEREST ON BALANCE 5.50%	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
ENDING BALANCE	0.0	2.4	2.0	2.1	2.4	2.9	2.4	2.2	2.0	2.1	1.8	1.6	1.5	1.4	1.4	1.5	1.7	1.9	1.7	1.6	1.6	1.6	1.7	1.9	0.4	0.0	0.0

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SQUARE FOOT SCHEDULE (M's) MAX GROWTH	0.00	34.23	35.71	37.20	38.65	40.18	41.66	43.15	44.64	46.13	47.62	48.28	48.96	49.65	50.35	51.05	51.77	52.50	53.23	53.98	54.74	55.50	56.28	57.07	57.87	58.69	59.51
INCOME EXPECTATIONS	0.00	5.13	5.35	5.58	5.80	6.03	5.00	5.18	5.36	5.54	5.24	5.31	5.39	5.46	5.54	5.62	5.69	5.78	5.32	5.40	5.47	5.55	5.63	5.71	4.05	0.00	0.00

| ANNUAL ASSESSMENT RATE | | $0.15 | $0.15 | $0.15 | $0.15 | $0.15 | $0.12 | $0.12 | $0.12 | $0.12 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.10 | $0.10 | $0.10 | $0.10 | $0.10 | $0.07 | $0.00 | $0.00 |

BOND FACTORS
	1990	1991	1992	1993	1994	1995	1996
COST FACTOR		0.985	0.985	0.985	0.985	0.985	0.985	0.985
RESERVE FACTOR		0.096	0.097	0.099	0.1	0.102	0.104	0.107
CAPITALIZATION FACTOR		0	0	0	0	0	0	0

BOND ISSUE EXISTS (DEBT SERVICE PAYMENTS MAY BE DUE)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
0 1991 25	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1992 24	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1993 23	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1994 22	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1995 21	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1996 20	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0 1997 19	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

YEAR OF LIFE (OF A BOND ISSUE)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	0
0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	0
0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	0
0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	0
0	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	0

CAPITALIZED INTEREST TABLE (BY BOND ISSUE)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0

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FIGURE 4

BONDING MODULE
JUNE 26,1988

BAMOS2 - BENEFIT ASSESSMENT RATE CALCULATIONS - WITH CAPITALIZED INTEREST

FISCAL YEARS

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016

PROCEEDS REQUIRED FROM BONDS   25.0 31.0 0.0 0.0 0.0 0.0 0.0
DEBT SERVICE RESERVE FUND   1   4.7   5.3 0.0 0.0 0.0 0.0 0.0
DISCOUNT FROM PAR   0.00%   0.0   0.0 0.0 0.0 0.0 0.0 0.0
COST OF ISSUANCE   1.50%   0.7   0.8 0.0 0.0 0.0 0.0 0.0
ADDITIONAL BONDS REQUIRED   45.2 50.9 0.0 0.0 0.0 0.0 0.0

DIFFER BOND FISCAL DUR INTEST DIVIDEND
INTER AMOUNT YEAR (N) RATE(I) RATE(D)   DEBT SERVICE REQUIREMENTS TABLE

```
5   45.2   1991   25   7.0   8.0     -   3.6  3.5  3.6  3.6  3.6  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.7   -
4   50.9   1992   24   7.0   8.0     -    -   4.1  4.1  4.1  4.1  4.1  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3  5.3   -
3    0.0   1993   23   7.0   8.0     -    -    -   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0   -
2    0.0   1994   22   7.0   8.0     -    -    -    -   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0   -
1    0.0   1995   21   7.0   8.0     -    -    -    -    -   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0   -
0    0.0   1996   20   7.0   8.0     -    -    -    -    -    -   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0   -
0    0.0   1997   19   7.0   8.0     -    -    -    -    -    -    -   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0   -
```

TOTAL=96.092

DEBT SERVICE   0.0   0.0   0.0   0.0   0.0   0.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 0.0
COVERAGE RATIO   N/A   N/A   N/A   N/A   N/A   N/A 1.52 1.29 1.08 1.11 1.15 1.20 1.17 1.15 1.15 1.16 1.18 1.21 1.21 1.22 1.18 1.17 1.16 1.16 0.84 0.04 N/A
DEBT SERVICE RESERVE FUND   0.00 4.72 10.03 0.00
ADMIN COSTS INFLATED BY   4.00% /YR 0.00
TOTAL OBLIGATIONS   0.00 0.00 0.00 0.00 0.00 0.00 10.03 0.00

BEGINNING BALANCE   0.0   0.0   5.1   5.6   6.7   7.8   9.0   6.5   4.1   1.9   2.0   2.4   2.9   2.6   2.5   2.4   2.5   2.7   3.1   3.0   3.1   2.8   2.6   2.5   2.5   0.4   0.0
INTEREST ON RESERVE FUND   7.80%   0.0   0.0   0.4   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.8   0.6   0.0   0.0
INTEREST ON BALANCE   5.50%   0.0   0.0   0.0   0.3   0.3   0.4   0.5   0.4   0.3   0.2   0.1   0.1   0.1   0.2   0.1   0.1   0.1   0.1   0.2   0.2   0.2   0.2   0.1   0.1   0.1   0.0   0.0
ENDING BALANCE   0.0   5.1   5.6   6.7   7.8   9.0   6.5   4.1   1.9   2.0   2.4   2.9   2.6   2.5   2.4   2.5   2.7   3.1   3.0   3.1   2.8   2.6   2.5   2.5   0.4   0.0   0.0

SQUARE FOOT SCHEDULE (M's) MAX GROWTH 0.00 34.23 35.71 37.20 38.69 40.18 41.66 43.15 44.64 46.13 47.62 48.28 48.96 49.65 50.35 51.05 51.77 52.50 53.23 53.98 54.74 55.50 56.28 57.07 57.87 58.69 59.51
INCOME EXPECTATIONS   0.00 5.13 0.00 0.00 0.00 0.00 6.25 6.47 6.70 9.23 9.52 9.66 8.81 8.94 9.06 9.19 9.32 9.45 9.65 9.18 8.76 8.88 9.00 9.13 6.94 0.00 0.00

ANNUAL ASSESSMENT RATE $0.15 $0.00 $0.00 $0.00 $0.00 $0.15 $0.15 $0.15 $0.20 $0.20 $0.20 $0.18 $0.18 $0.18 $0.18 $0.18 $0.18 $0.17 $0.17 $0.16 $0.16 $0.16 $0.16 $0.16 $0.12 $0.00 $0.00

BOND FACTORS
   COST FACTOR   0.985 0.985 0.985 0.985 0.985 0.985 0.985
   RESERVE FACTOR   0.104 0.104 0.104 0.104 0.104 0.104 0.107
   CAPITALIZATION FACTOR   0.328 0.271 0.21 0.145 0.075 0   0

BOND ISSUE EXISTS (DEBT SERVICE PAYMENTS MAY BE DUE)
```
5   1991   25     0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
4   1992   24     0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
3   1993   23     0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
2   1994   22     0   0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
1   1995   21     0   0   0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
0   1996   20     0   0   0   0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
0   1997   19     0   0   0   0   0   0   0   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   0
```

YEAR OF LIFE (OF A BOND ISSUE)
```
5               0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25   0
4               0   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24   0
3               0   0   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23   0
2               0   0   0   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22   0
1               0   0   0   0   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21   0
0               0   0   0   0   0   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20   0
```

CAPITALIZED INTEREST TABLE (BY BOND ISSUE)
```
                3.619 3.619 3.619 3.619 3.619   0   0   0   0   0
                  0   4.068 4.068 4.068 4.068   0   0   0   0   0
                  0     0     0     0     0     0   0   0   0   0
                  0     0     0     0     0     0   0   0   0   0
                  0     0     0     0     0     0   0   0   0   0
                  0     0     0     0     0     0   0   0   0   0
                  0     0     0     0     0     0   0   0   0   0
```

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SECTION 5. SUMMARY

Three bonding models are presented with appropriate documentation. The first model allows the user to defer principal payments during the early years of the assessment program. The other two models, one for MOS-1 and one for MOS-2, allow the user to capitalize interest on bond issues during the early years of the assessment program.

All three models are interactive. The user inputs a wide variety of data considered representative and calculates the annual assessment rates necessary to support the program. Conversely, it is possible to set the assessment rates and determine the bond proceeds that may be raised. This can be done in the context of sensitivity analyses. Diskettes containing the three bonding models are available to the District.

LODESTAR User's Manual Technical Memorandum 88.5.2, may be consulted for information on the use of MULTIPLAN spreadsheets.