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OPEN BURN/OPEN DETONATION DISPERSION MODEL (OBODM) USER'S GUIDE

Volume III. Program Maintenance

by

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SECTION 1. INTRODUCTION

1.1 General Information

The Open Burn/Open Detonation Dispersion Model (OBODM) is intended for use in evaluating the potential air quality impacts of the open-air burning or detonation of obsolete munitions, solid rocket propellants, and manufacturing wastes at Department of Defense and Department of Energy installations. OBODM predicts the downwind transport and dispersion of pollutants using cloud rise and dispersion model algorithms taken from existing dispersion models. OBODM is strictly a transport and dispersion model; it does not contain a source preprocessor to predict the total quantities of pollutants released by an open burn or detonation. Rather, it is designed to use either empirical emissions factors such as those derived from measurements in the Dugway Proving Ground Bang Box™ or the emissions predicted by a products of combustion model (for example, Baroody and Tominack, 1987). OBODM calculates peak concentration, time-mean concentration, and dosage (time-integrated concentration) for quasi-continuous (open burn) and instantaneous (open detonation) releases. It can also consider the effects on concentration and dosage of the gravitational settling and deposition of particulates such as soil particles entrained into the cloud from an open detonation.

1.2 Conventions and Assumptions

The OBODM program is written in the FORTRAN 77 and C languages and is designed for use on IBM compatible PC computer systems under the MS-DOS operating system. OBODM will also run under most WINDOWS configurations.

The OBODM program code conventions and assumptions are:

- Underflows do not cause an error trap, but result in zero;
- Integers are size integer*4;
- Double precision are greater than or equal to size real*8;
- All character type parameters begin with the letter m (except the single letter m or double mm which are used as integer indices);
- All integer type parameters begin with i, j, k, l or n and include a single m or double mm;
- All real or double type parameters begin with the letters a through h or o through z;
- All common variable names are six letters long. all local variable names are less than six letters long; and
- Variable names that are all caps are global names.

Sections of coding within OBODM that are computer, compiler or graphics dependent begin and end with special sentinels in the first few characters of the line image. These sentinels are:

	Begin	End	Application
•	CCOMP1S	CCOMP1E	Hewlett Packard HP9000/835.
•	CCOMP1S-HP2645A	CCOMP1E-HP2645A	HP2645A & 700/92 terminals.
•	CCPCITS	CCPCITE	IBM compatible PC.
•	CC-DEBUGS	CC-DEBUGE	debug only.
•	CC>		code not presently used

Do not activate the CCOMP1S-CCOMP1E codes as related code is not included on the accompanying diskette.

Variables within this program that are computer or graphics dependent are:

- isystm, in common block OCNTRL.INC;

1.3 Subroutines and Functions

The OBODM program uses a segmentation architecture with a main program (OBODM) and 40 segments, where each called segment (primary subroutine) overlays the previous segment immediately following the main. The subroutine segment names are:

GMENU, RINPA, RINPB, RINDA, RINDB, RINPC, RINPD, RINPE,
RINPF, RINPG, RINPH, RINPI, RINPJ, RINPK, RINPL, RINPM,
RINPN, RINPO, RINPP, RINPQ, RINPR, RPRTA, RPRTB, RPRTC,
RPRTD, RMDLA, RMDLB, RMDLC, ROUTA, ROUTB, RPLTA, RPLTB,
RPLTC, RPLTD, RPLTE, RPLTF, RPLTG, RPLTH, RPLTI, and RPLTJ

These primary routines are designed to be segments, overlays or subroutines depending on the limitations of the computer where installed.

Secondary subroutines are all subroutines and functions referenced by the primary (segment) routines. Some of these routines will not appear as individual files on the accompanying disks. This is because they are imbedded within one or more of the above segment files. Leave these routines in their respective segment, because if they are removed the resulting subroutine library may be too large for your system and you may not be able to load the program. The secondary subroutines are:

General:

BLOCK DATA

Screen/menu related:

DTSET, FNAME, GETD1, GETD2, GETD3, GETD4, GETD5, GETD6, GETD6, IDISC, IDSPL, IFRSP, IFULS, IHLPS, IPACK, IRDSC, IWHER, IWTSC, JWHER, LUNIT, STODT, UNITS, IOSCN, OBSTR, OBEND, IWRSC, SPDSP, IBELL, OBSIO, IOCRT, INCRT, JFCTL, KFCTL, SHDOW, FILES, QSMOD, QRMOD, QVIDB, QLINE, QCLER, QSCLR, QUSCL, QCOLR, QPREG, QOVSC, QINKY, QRTXT, QSTXT, CLRPG, DISPG, QCMOV, SETMS, RESMS, CLSMS, RDALL, POPBX, INBAR, STATB, PRBAR, CRTYP, LFCTL, FRAME, IFCTC, JFCTC, KFCTC, IRSBK, GTBRK, STBRK, WRBUF, JFJMP, KNCRT, IFFLD, SETDM, GETDM, GETBD, SETPX, CLRSC, SCRUP, SCRDN, MPCGA, MPVGA, SETOV, RDKEY, RDCHR, WRCHR, CURSP, SETPG, GETFL, ISMOS, SHOWM, HIDEM, GETML, SETML, GETCL, WAITM, RDSTA, CSCAN, GTRGC, WRKEY, IFORM, NFORM, IOERROR, SEGREAD, FINDFIRS, INT86, SOUND, GETCBRK.

Dispersion related:

ARTAN, CONCD, CONCE, CRSSA, CRSSE, DECAA, DELTD, DELTU, DISPR, DISPS, ERFXF, ERFXS, FSEXP, GAMMA, GRVDP, PLUMC, PLUMI, PWLAW, SGXYZ, TZ1Z2, VERT1, VERT2, VERT3, VRXYZ, YLATR

Meteorology related:

AIRDN, AIRVS, DFMET, IPSQL, IRNDX, ISODA, IUSDA, JULAN, NETRX, NMXDY, PRSVP, SUNAN, WSBAR, UVTWD

Particle related:

DDST1, DRPAV, TRMVS

Utility related:

ACCUM, ICNTR, IFALF, IFCHR, IFCMP, IFEQU, IFNBR, IFNUM,
IFSRD, IGTDT, INONE, IOPUT, IPKBK, IRDBF, ISUMI, ISVDT,
IVGET, ADEXT, IVSTO, IWTBF, IZGET, JINIT, JPACK, JRNIT,
KERRS, MBLK1, KERRP, MVCH1, NUMC1, NUMLB, ORDER, OUTPT,
RLABL, LRJST, ANTRU, CMXMN, IANYI, JANYI, IFNUL, ISEAS,
IDATR, IFFOP, SAVID, GETID, LOCAL, IFWER, INRAN, IORAN,
INCPT, IOCPT, INITD, JDSKR, JACUM, JHAVG, JDSKW, CHXYZ,
IFCHS

Graphics related:

BKGDQ, CHCKQ, CLRCQ, CMXNQ, CNRXQ, CURVQ, DIFNQ, DMXMQ,
FLWKQ, HD01Q, HD02Q, HD03Q, HD04Q, ICLRQ, IDOLQ, IFBKQ,
IFBXQ, IFOTQ, ILXEQ, ITRPQ, JCLRQ, LABLQ, LBLPQ, LSCLQ,
NBXPQ, PLT1Q, PLT2Q, PLT3Q, PLTSQ, PMAPQ, PNTSQ, SCRLQ,
SPCLQ, SPLNQ, STRPQ, SWCHQ, SYMBQ, XINTQ, FILLQ, LBITQ,
IFANQ, IFSPQ, GLABL, PLABL

The OBODM program contains common blocks that are compiled as INCLUDE files, these files are:

OCALCS.INC, OCNTRL.INC, ONAMES.INC, OWNTRL.INC, OCDSPM.INC

1.4 Program Maintenance

The OBODM program is documented by comment statements embedded within the source code. Each subroutine or function begins with an explanation as to the purpose of the subroutine. Also, the definition of each argument passed to the subroutine as well as returned arguments and returned function values are shown. The accompanying file OBODM.DOC gives the definition of each common variable as well as other important information. Due to PC memory size limitations many common variables in OBODM are used for multiple purposes in various areas of the program. Also, some common variables may seem to perform the same function as others or may seem redundant. The user is warned to be very careful with common variables, especially arrays, and to search out every occurrance of a variable, before any changes are made.

1.5 Data Files

The OBODM program can use up to 19 data files. Data files used by the OBODM program are:

- OBODMENU.OBD - Required direct access screen menu template database file, created by program OBODMENU (or subroutine GMENU through the OBODM /m option). The name is stored in mdbnam, the logical unit number (20) is stored in idbfil, and the file is opened in subroutine RINPA.

- OBODWORK.OBD - Required direct access work file created by OBODM. The name is stored in mwknam, the logical unit number (21) is stored in iwkfil, and the file is opened in subroutine RINPA.

- OBODFUEL.OBD - Optional sequential fuels/explosives and pollutant/species (Bang Box™) default data file. The file name is stored in mfdnam, the logical unit number (22) is stored in ifdfil, and the file is opened in subroutine RINPA.

- OBODMERR.OBD - Required file containing OBODM error messages. The name is stored in mernam, the logical unit number (17) is stored in ierfil, and the file is opened in function KERRS.

- *user-specified*.INP - Optional input save data file, created in a previous run of the OBODM program. The file name is stored in mgtnam, the logical unit number (23) is stored in igtfil, and the file is opened in subroutine RINPB.

- *user-specified*.INP - Optional output save data file, all program input data for the current run are saved in this file. The file name is stored in msvnam, the logical unit number (24) is stored in isvfil, and the file is opened in subroutine RINPB. The default is SCRATCH2.OBD, but is only temporary.

- *user-specified.*OUT - Optional output solution print file, the file name is stored in motnam, the logical unit number (25) is stored in iotfil, and the file is opened in subroutine RINPB. The default is OBPRINT.OUT.

- *user-specified*.SOL - Optional input/output graphics/solution data save file, the file name is stored in mognam, the logical unit number (26) is stored in iogfil, and the file is opened in subroutine RINPB. The default is SCRATCH1.OBD, but is only temporary.

- *user-specified.ext* - Optional input hourly meteorological data file, the file name is stored in mnhnam, the logical unit number (27) is stored in inhfil, and the file is opened in subroutine RINPO.

- *user-specified.ext* - Optional input hourly source data file, the file name is stored in mshnam, the logical unit number (28) is stored in ishfil, and the file is opened in subroutine RINPJ.

- *user-specified.ext* - Optional output plot data file. The file name is stored in mplnam, the logical unit number (29) is stored in iplfil, and the file is opened in subroutine RINPR.

- SCRATCH3.OBD - Scratch sequential file used in graphics generation. The file logical unit number (30) is stored in iscfil, and the file is opened in subroutine RINPR.

- *user-specified.ext* - Optional input terrain data to be used in graphics. The file name is stored in mtrnam, the logical unit number (31) is stored in itrfil, and the file is opened in subroutine RINPR.

- *user-specified.ext* - Optional input digitized map data to be used in graphics. The file name is stored in mapnam, the logical unit number (32) is stored in impfil, and the file is opened in subroutine RINPR.

- OBD#####.PLT - Optional graphics hard copy print/plot file. The file logical unit number (33) is stored in ihdfl, the file is opened in subroutine PLTSQ, where the program replaces ##### with a number from 00001 to 99999.

- *user-specified.ext* -Batch processing file. The file contains sets of four 22- character records, where record one of each set contains the input file name, record two contains the output save file name or blanks, record three contains the print file name orblanks and record four contains the solution file name or blanks. The file name is stored in mbcnam, the logical unit number (19) is stored in ibcfil, and the file is opened in subroutine RINPB.

- SCRATCH4.OBD - Scratch file used to compile highest and second highest concentration, dosage, etc. tables. The logical unit number (18) is stored in imxfil, and the file is opened in subroutine ROUTA and RPLTB.

- *user-specified.ext* - Plot output file used to save Sigma Plot output information for subsequent plotting. The file name is stored in msgnam, the logical unit number (34) is stored in isgfil, and the file is opened in subroutine OUTPT.

- *user-specified.ext* - File used to input (X,Y) coordinates and Z elevation data. The file contains the number of X coordinates and number of Y coordinates in the first record, X axis coordinates optionally follow, Y axis coordinates optionally follow, with optional Z elevations last. The file name is stored in mxynam, the logical unit number (31) is stored in ixyfl. Subroutine RINPD.

SECTION 2. COMPILING AND LINKING

2.1 Application

The OBODM program is designed for execution on an IBM compatible PC system under the Microsoft MS-DOS operating system. OBODM will also run under most WINDOWS configurations.

2.2 Installing OBODM files

The accompanying diskette contains the OBODM source files, screen menu files, and utility files. The diskette contains file OBODMSOR.EXE, which is a self-extracting file. Type A: or B:\OBODMSOR C:*target-directory-name* to extract the OBODM files and place them in the *target-directory*. A complete installation of the OBODM program and related files will require approximately 5.5 megabytes of hard disk storage. However, after the executable (OBODM.EXE) has been brought up, much of the space can be freed up by removing unnecessary files. Necessary files are OBODM.EXE, OBODMENU.OBD, OBODMERR.OBD and optionally OBODFUEL.OBD. The files included in OBODMSOR.EXE are:

OBODM.DOC 113,422 07-24-97
OBODM.FOR 32,043 07-24-97
GMENU.FOR 17402 12-04-95
RINPA.FOR 20919 02-14-97
RINPB.FOR 16977 01-17-96
RINDA.FOR 44,245 07-24-97
RINDB.FOR 37,252 07-24-97
RINPC.FOR 41,214 07-24-97
RINPD.FOR 27676 02-07-97
RINPE.FOR 25839 04-02-96
RINPE.FOR 25759 12-22-95
RINPF.FOR 32065 02-06-97
RINPG.FOR 23657 12-04-95
RINPH.FOR 25,994 07-24-97
RINPI.FOR 14598 12-04-95
RINPJ.FOR 8214 12-04-95
RINPK.FOR 9,026 07-24-97
RINPL.FOR 10,329 07-24-97
RINPM.FOR 21173 02-13-97
RINPN.FOR 19637 12-04-95
RINPO.FOR 24032 02-13-97
RINPP.FOR 22627 02-13-97
RINPQ.FOR 27,043 07-24-97
RINPR.FOR 28216 12-20-95
RPRTA.FOR 18867 02-07-97
RPRTB.FOR 22,761 07-24-97

RPRTC.FOR 18,282 07-24-97
RPRTD.FOR 31,865 07-24-97
RMDLA.FOR 55,050 07-24-97
RMDLB.FOR 96,590 07-24-97
RMDLC.FOR 21887 02-07-97
ROUTA.FOR 24260 02-07-97
ROUTB.FOR 13946 02-07-97
RPLTA.FOR 35,041 07-24-97
RPLTB.FOR 18899 02-07-97
RPLTC.FOR 33381 02-07-97
RPLTD.FOR 29645 12-20-95
RPLTE.FOR 29186 12-20-95
RPLTF.FOR 33192 03-07-97
RPLTG.FOR 19875 12-20-95
RPLTH.FOR 45163 12-20-95
RPLTI.FOR 1215 12-04-95
RPLTJ.FOR 9023 02-07-97
ACCUM.FOR 879 12-05-95
AIRDN.FOR 1253 12-05-95
AIRVS.FOR 710 12-04-95
ANTRU.FOR 585 12-05-95
ARTAN.FOR 1020 12-04-95
BKGDQ.FOR 1481 12-05-95
CHXYZ.FOR 1644 12-04-95
CLRCQ.FOR 4399 12-04-95
CLRPG.FOR 1246 12-04-95
CLSMS.FOR 590 12-04-95
CMXMN.FOR 1472 12-05-95
CMXNQ.FOR 2103 12-04-95
CNRXQ.FOR 1250 12-04-95
CRTYP.FOR 1249 02-18-97
DFMET.FOR 4494 12-04-95
DISPG.FOR 789 12-04-95
DMXMQ.FOR 3673 12-20-95
DRPAV.FOR 996 12-05-95
ERFXS.FOR 1283 12-05-95
FILES.FOR 2285 12-20-95
FILLQ.FOR 2449 12-04-95
FNAME.FOR 2442 12-04-95
FRAME.FOR 2230 12-04-95
FSEXP.FOR 659 12-05-95
GAMMA.FOR 1053 12-04-95
GETID.FOR 6,535 07-24-97
GLABL.FOR 2705 12-04-95
GTBRK.FOR 904 12-04-95

HD01Q.FOR 11452 12-04-95
HD02Q.FOR 12867 12-04-95
HD03Q.FOR 9464 12-04-95
HD04Q.FOR 9757 12-04-95
IANYI.FOR 1136 12-04-95
IBELL.FOR 1254 12-04-95
ICLRQ.FOR 1183 12-05-95
ICNTR.FOR 1027 12-04-95
IDATR.FOR 1332 12-04-95
IDISC.FOR 12243 07-11-96
IDSPL.FOR 2887 12-04-95
IDSTM.FOR 1909 12-04-95
IFALF.FOR 1152 12-04-95
IFANQ.FOR 1541 12-04-95
IFBKQ.FOR 918 12-05-95
IFBXQ.FOR 915 12-05-95
IFCHR.FOR 3062 12-04-95
IFCHS.FOR 1664 12-04-95
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IFEQU.FOR 1030 12-05-95
IFFLD.FOR 2667 12-04-95
IFFOP.FOR 906 12-05-95
IFNBR.FOR 1443 12-04-95
IFNUL.FOR 1221 12-04-95
IFNUM.FOR 4529 12-04-95
IFORM.FOR 4637 12-04-95
IFPTH.FOR 1533 12-20-95
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IFSPQ.FOR 1551 12-04-95
IFSRD.FOR 13251 03-07-97
IFULS.FOR 9104 01-17-96
IFWER.FOR 1166 12-04-95
IGTDT.FOR 1662 02-13-97
IHLPS.FOR 2309 12-04-95
INBAR.FOR 1829 12-04-95
INCPT.FOR 1979 12-04-95
INCRT.FOR 17144 12-18-95
INITD.FOR 1162 12-04-95
INONE.FOR 1032 12-04-95
INRAN.FOR 1153 12-04-95
IOCPT.FOR 1553 12-04-95
IOCRT.FOR 4733 12-04-95
IOPUT.FOR 9154 02-18-97
IORAN.FOR 980 12-04-95

IOSCN.FOR 6130 03-05-96
IPACK.FOR 15756 12-22-95
IPKBK.FOR 1249 12-05-95
IPSQL.FOR 1544 12-04-95
IRDBF.FOR 2193 12-04-95
IRDSC.FOR 6228 12-04-95
IRNDX.FOR 1838 12-05-95
IRSBK.FOR 1236 12-04-95
ISEAS.FOR 1090 12-04-95
ISUMI.FOR 800 12-04-95
ISVDT.FOR 1134 12-04-95
ITRPQ.FOR 1921 12-05-95
IVGET.FOR 1015 12-05-95
IVSTO.FOR 1099 12-18-95
IWHER.FOR 1567 12-04-95
IWRSC.FOR 2990 12-04-95
IWTBF.FOR 8648 12-04-95
IWTSC.FOR 2735 12-04-95
IZGET.FOR 1370 12-04-95
JANYI.FOR 1039 12-04-95
JCLRQ.FOR 1564 12-05-95
JDSKR.FOR 1482 12-04-95
JFCTL.FOR 2629 12-04-95
JFCTC.FOR 4003 03-12-97
JINIT.FOR 1023 12-05-95
JNCRT.FOR 18883 12-18-95
JPACK.FOR 2272 12-04-95
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JWHER.FOR 1247 12-04-95
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QCOLR.FOR 1288 12-04-95
QINKY.FOR 1180 12-04-95
QLINE.FOR 2722 12-04-95
QOVSC.FOR 950 12-04-95
QPREG.FOR 1412 12-04-95
QRMOD.FOR 1079 12-04-95
QRTXT.FOR 1342 12-04-95
QSCLR.FOR 973 12-04-95
QSMOD.FOR 2171 12-04-95
QSTXT.FOR 1477 12-04-95
QUSCL.FOR 2004 12-04-95
QVIDB.FOR 1146 12-04-95
RDALL.FOR 3544 02-13-97
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STATB FOR 2353 07-11-96
STBRK.FOR 908 12-04-95
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GETBD.C 634 03-25-95
GETCL.C 693 03-25-95
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GETFL.C 1019 03-25-95
GETML.C 418 03-25-95
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RDCHR.C 935 03-25-95
RDKEY.C 347 03-25-95
RDSTA.C 353 09-21-95
SCRDN.C 1435 03-25-95
SCRUP.C 1439 03-25-95
SETDM.C 1271 03-25-95
SETML.C 396 03-25-95
SETOV.C 507 03-25-95
SETPG.C 392 03-25-95
SETPX.C 694 05-24-95
SHOWM.C 222 03-25-95
WAITM.C 365 03-25-95
WRCHR.C 997 03-25-95
WRKEY.C 394 09-22-95
OCALCS.INC 2,179 07-24-97
OCDSPM.INC 2514 12-04-95
OCNTRL.INC 2,109 07-24-97
ONAMES.INC 1,352 07-24-97
OWNTRL.INC 2,098 07-24-97
ASSOBD.BAT 1481 09-30-95
ASSSUB.BAT 5958 12-01-95
BLDLIB.BAT 44 03-25-95
OBLINK.BAT 44 03-25-95
OBODM.LNK 489 10-03-95
OBSUB.BLD 1369 12-01-95
OBODMENU.OBD 177,912 07-23-97

OBODMERR.OBD 8,480 07-16-97
OBODFUEL.OBD 7802 01-19-93
OBODMENU.FOR 28561 11-01-95
OBODMERR.FOR 9601 09-29-95
OBODMERR.DAT 10,184 07-16-97
SCREEN01 1,793 01-17-96
SCREEN02 2,051 10-06-95
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SCREEN04 2,054 11-22-95
SCREEN05 1,551 12-04-95
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SCREEN11 2,056 01-17-96
SCREEN12 2,053 10-06-95
SCREEN13 2,056 07-21-97
SCREEN14 2,059 01-17-96
SCREEN15 1,999 07-18-97
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SCREEN17 1,990 07-18-97
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SCREEN19 2,053 11-22-95
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SCREEN23 2,056 01-17-96
SCREEN24 2,053 02-13-97
SCREEN25 1,921 12-12-95
SCREEN26 2,056 01-17-96
SCREEN27 1,631 12-08-95
SCREEN28 2,053 02-13-97
SCREEN29 2,065 11-22-95
SCREEN30 2,066 11-22-95
SCREEN31 2,058 01-17-96
SCREEN32 1,442 01-17-96
SCREEN33 1,999 01-17-96
SCREEN34 1,624 01-17-96
SCREEN35 1,968 07-21-97
SCREEN36 2,053 11-22-95
SCREEN37 2,053 10-06-95
SCREEN38 1,934 09-19-96
SCREEN39 2,055 11-22-95
SCREEN40 1,986 11-22-95

SCREEN41 2,043 11-22-95
SCREEN42 2,055 11-22-95
SCREEN43 2,056 10-06-95
SCREEN44 2,056 10-06-95
SCREEN45 2,059 01-17-96
SCREEN46 2,058 01-17-96
SCREEN47 1,421 12-20-95
SCREEN48 2,053 11-22-95
SCREEN49 2,053 10-06-95
SCREEN50 1,945 11-01-95
SCREEN51 2,105 03-13-97
SCREEN52 2,056 11-01-95
SCREEN53 2,055 01-17-96
SCREEN54 2,056 10-06-95
SCREEN55 2,053 10-06-95
SCREEN56 2,134 10-06-95
SCREEN57 2,054 10-06-95
SCREEN58 2,054 10-06-95
SCREEN59 2,054 10-06-95
SCREEN60 1,934 07-21-97
SCREEN61 2,136 01-17-96
SCREEN62 2,054 01-17-96
SCREEN63 2,053 10-06-95
SCREEN64 2,053 10-06-95
SCREEN65 2,052 10-06-95
SCREEN66 2,054 10-06-95
SCREEN67 2,058 10-06-95
SCREEN68 2,236 11-01-95
SCREEN69 2,054 12-05-95
SCREEN70 2,054 12-05-95
SCREEN71 2,054 10-06-95
SCREEN72 2,058 10-06-95
SCREEN73 2,053 10-06-95
SCREEN74 2,053 10-06-95
SCREEN75 2,136 01-17-96
SCREEN76 2,054 01-17-96
SCREEN77 1,806 07-23-97
SCREEN78 2,053 10-06-95

2.3 Compiling the OBODM Program:

The OBODM program requires FORTRAN 77 and C language compilers. This document uses the Microsoft FORTRAN 5.1 (Professional Development System) and the Borland C++ Version 2.0 compilers.

All FORTRAN, C and include (*.INC) files should be on the current directory. You must have at least 515 kilobytes of conventional memory in order to load and execute the OBODM program.

The compiler options used for Fortran routines are /c /AL and /G2. The /c option specifies create an object file only, the /AL option chooses the large memory model, and the /G2 option uses the 80286/80386 instruction set. All other options are defaulted. For example, FL /c /AL /G2 OBODM.FOR compiles the main OBODM program (and block data subroutine in OBODM.FOR), creating OBODM.OBJ. You can use the accompanying ASSOBD.BAT and ASSSUB.BAT files to compile all of the FORTRAN routines (*.FOR). These .BAT files and other included unitility files assume Microsoft FORTRAN 5.1 (large model) was installed in directory C:\FL5. All FORTRAN routines that call C language routines include INTERFACE routine code, with the C attribute to conform to C naming and calling conventions.

Compile the C language routines (*.C)using the Borland BC compiler. Use the 'large model', '80286 instruction set', '80287 floating point' and 'generate underbars' options to create object code only. The C language routines are:

SETDM, GETDM, GETBD, SETPX, CLRSC, SCRUP, SCRDN, MPCGA, MPVGA, SETOV, RDKEY, RDCHR, WRCHR, CURSP, SETPG, GETFL, ISMOS, SHOWM, HIDEM, GETML, SETML, GETCL, WAITM, RDSTA, CSCAN, GTRGC, and WRKEY.

2.4 Building a Subroutine Library.

Due to the large number of subroutines required by the OBODM program you must construct a subroutine library. The following shows the contents of accompanying file OBSUB.BLD used to construct the subroutine library. The name of the library will be OBSUB.LIB:

```
OBSUB.LIB
Y
+ACCUM+AIRDN+AIRVS+ANTRU+ARTAN+BKGDQ+CHXYZ+CLRCQ &
+DRPAV+ERFXS+FILES+FILLQ+CLRPG+CLSMS+CMXMN+CMXNQ &
+CNRXQ+DFMET+DISPG+DMXMQ+FNAME+FSEXP+GAMMA+GETID &
+HD01Q+HD02Q+HD03Q+HD04Q+IANYI+IBELL+ICLRQ+ICNTR &
+IDATR+IDISC+IDSPL+IDSTM+IFALF+IFBKQ+IFBXQ+IFCHR &
+IFCHS+IFCMP+IFEQU+IFFLD+IFFOP+IFNBR+IFNUL+IFNUM &
+IFRSP+IFSRD+IFULS+IFWER+IGTDT+IHLPS+INCPT+INCRT &
+INONE+INRAN+IOCPT+IOCRT+IOPUT+IORAN+LRJST+IOSCN &
+IPACK+IPKBK+IPSQL+IRDBF+IRDSC+IRNDX+ISEAS+ISUMI &
+ISVDT+ITRPQ+IVGET+IVSTO+IWHER+IWRSC+IWTBF+IWTSC &
+IZGET+JANYI+JCLRQ+JFCTL+JINIT+JPACK+JRNIT+JULAN &
+JWHER+KERRS+KFCTL+LBITQ+LBLPQ+LOCAL+LSCLQ+LUNIT &
+MBLK1+MVCH1+NBXPQ+JNCRT+NETRX+NMXDY+NUMC1+NUMLB &
+OBEND+OBSIO+OBSTR+ORDER+OUTPT+PLT1Q+PLT2Q+PLT3Q &
+PLTSQ+PRSVP+PWLAW+QCLER+QCMOV+QCOLR+QINKY+QLINE &
+QOVSC+QPREG+QRMOD+QRTXT+QSCLR+QSMOD+QSTXT+QUSCL &
```

```
+QVIDB+RDALL+RESMS+RLABL+SAVID+SCRLQ+SETMS+IFPTH &
+SPCLQ+STODT+STRPQ+STRTQ+SUNAN+SYMBQ+TRMVS+UNITS &
+UVTWD+XINTQ+KERRP+FRAME+SHDOW+SPDSP+POPBX+CLRSC &
+CURSP+GETBD+GETCL+GETDM+GETFL+GETML+HIDEM+ISMOS &
+MPCGA+MPVGA+RDCHR+RDKEY+RDSTA+SCRDN+SCRUP+SETDM &
+SETML+SETOV+SETPG+SETPX+SHOWM+WAITM+WRCHR+PRBAR &
+INBAR+STATB+GTRGC+LFCTL+CRTYP+CSCAN+IFSPQ+IFANQ &
+IFCTC+JFCTC+STBRK+GTBRK+IRSBK+KFCTC+WRBUF+WRKEY &
+INITD+JDSKR+JHAVG+GLABL+IFORM                    &
+IOERROR+SEGREAD+FINDFIRS+INT86+SOUND+GETCBRK
OBSUB.LST
```

The contents of the library OBSUB.LIB are listed in file OBSUB.LST. Note the routines IOERROR, SEGREAD, FINDFIRS, INT86, SOUND and GETCBRK. These files must be removed from the Borland C++ library CL.LIB and placed as .OBJ files in the current directory. This is because we do not want to load the entire CL.LIB library, only referenced routines. Subroutine IOERROR processes errors, SEGREAD is a utility, FINDFIRS finds the first file in a directory and any subsequent files, INT86 generates an interrupt, SOUND changes the frequency of sounds and GETCBRK controls Ctrl-C and Ctrl-Break interrupts. If you have a conflict with DOSERRORNO between IOERROR above and FORTRAN, you will have to edit IOERROR to change the name DOSERRORNO to a dummy name. To construct the library, use the accompanying file BLDLIB.BAT or type:

```
DEL  OBSUB.LIB              delete any old copies
LIB  @OBSUB.BLD                   create OBSUB.LIB using OBSUB.BLD
```

2.5 Linking the OBODM Programs

The OBODM primary routines must be linked as segments to the main routine OBODM.OBJ. The accompanying file OBODM.LNK shows the structure required to link the OBODM programs. Segments (overlays) are shown in parentheses.

```
OBODM+(GMENU)+(RINPA)+(RINDA)+(RINDB)+(RINPB)+(RINPC)      +
+(RINPD)+(RINPE)+(RINPF)+(RINPG)+(RINPH)+(RINPI)          +
+(RINPJ)+(RINPK)+(RINPL)+(RINPM)+(RINPN)+(RINPO)          +
+(RINPP)+(RINPQ)+(RINPR)+(RPRTA)+(RPRTB)+(RPRTC)          +
+(RPRTD)+(RMDLA)+(RMDLB)+(RMDLC)+(ROUTA)+(ROUTB)          +
+(RPLTA)+(RPLTB)+(RPLTC)+(RPLTD)+(RPLTE)+(RPLTF)          +
+(RPLTG)+(RPLTH)+(RPLTI)+(RPLTJ)                          +
blank line
OBODM.EXE                         executable program name
OBODM.MAP                         create map of OBODM programs
OBSUB C:\FL5\LIB\LLIBFOR7         FORTRAN library
blank line
```

To complete the link for program OBODM.EXE use the accompanying file OBLINK.BAT or type:

```
C:\FL5\BINB\LINK/NOE/NOD/SE:350/E  @OBODM.LNK
```

This assumes Microsoft FORTRAN 5.1 (large model) was installed in directory C:\FL5. Link options are: /NOE prevents the linker from searching extended dictionaries; /NOD do not search default libraries named in object files; /SE:350 sets the maximum number of program segments; and /E directs LINK to remove sequences of repeated bytes (nulls) and to optimize the load-time relocation table. Prior to executing the OBODM program (OBODM.EXE) you must have files OBODMENU.OBD and OBODMERR.OBD in the current directory. If these files are not present or do not function properly see the following section.

SECTION 3. REQUIRED DATA FILES

3.1 Creating Files OBODMENU.OBD and OBODMERR.OBD

File OBODMERR.OBD contains the OBODM error, warning and information messages required to run the OBODM program. This file is created by program OBODMERR.EXE. This program reads ASCII file OBODMERR.DAT and creates file OBODMERR.OBD. If any of the information in OBODMERR.DAT is modified, function KERRS.FOR may have to be modified for proper OBODM execution. The executable OBODMERR.EXE is created via the Microsoft FORTRAN compiler by typing:

```
FL  /AL  /G2  OBODMERR.FOR
```

File OBODMENU.OBD is the menu template file required by OBODM. All program menu templates are packed in this file. The menu templates are taken from files SCREEN01 through SCREEN78. Do not modify these files, as some of the OBODM code will expect parts of these menus to be exactly as distributed. First make sure all of the SCREEN01 through SCREEN78 files are in the current directory. Then type:

```
OBODM  /m
```

to generate OBODMENU.OBD. When the generation is complete, OBODM will pause. Hit any character to continue on to OBODM execution. Program OBODMENU.EXE will also generate file OBODMENU.OBD. The executable OBODMENU.EXE is created via the Microsoft FORTRAN compiler by typing:

```
FL  /AL  /G2  OBODMENU.FOR
```

Then with SCREEN01 through SCREEN78 in the current directory, type OBODMENU.EXE and a new copy of OBODMENU.OBD will be generated.

SECTION 4. CALCULATION DETAILS

4.1 Printing OBODM model equation variables

The OBODM program contains code that will print the value of various model variables as the program model equations are calculated. The definitions of variables printed are found in file OBODM.DOC. This output is controlled by the common variable IFDBUG. The IFDBUG print is activated by including one of the options /a, /b, /c, /d, /e or /f as a command line argument.

OBODM */option*

Where the options are:

/a - Prints the minimum amount of debug information,
.
.
.
/f - Prints the maximum amount of debug information. Only include a few X,Y receptor points and only one source, because a great deal of print output can be generated under the f option.

Also, special processing options are set via a command line argument. These are:

/m - Generate a new menu database file from files SCREEN01, SCREEN02, etc.
/z - Swap Y and Z input grid system points. Assumes the Y axis coordinate points specified are to be used as Z heights and the single Z value specified is to be used as Y. Also, assumes the wind direction is specified as 270 degrees. This allows for the calculation of concentrations in the X,Z plain at a lateral distance of Y from the maximum centerline. If Y is zero, maximum centerline values are calculated. Complex terrain cannot be used with this option. If the input data or solution data are saved, this command line argument must be used in subsequent runs, because it is not saved with the data or solution.