VI.2.1 OPERATIONAL FORECAST SYSTEM PRE-INITIALIZATION CONSIDERATIONS

This Section contains information that a user of the Operational Forecast System (OFS) should consider before beginning to implement the system.

1. The OFS can be used in its entirety or certain portions of the system could be combined with existing forecast programs. The parts of the OFS that can be used separately are:

   - SHEF parsing program - the SHEF parsing program (SHEFPARS) decodes SHEF reports and stores the results on a file (SHEFOUT file) where a second program can access the data for posting to a data base (see Section VI.4.2)

   - Preprocessor Component and associated data bases - this includes the Preprocessor Initialization Program (PPINIT), the Preprocessor Data Base (PPDB), the Preprocessor Parametric Data Base (PPPDB), the Processed Data Base (PDB) and whichever Preprocessor Functions are needed in the Forecast Program (FCST). The available Preprocessor Functions are:

     - Mean Areal Precipitation (MAP)
     - Gridded Mean Areal Precipitation Preprocessor (MAPX)
     - Mean Areal Temperature (MAT)
     - River, Reservoir and Snow (RRS)
     - Mean Areal Potential Evaporation (MAPE)
     - Future MAP (FMAP)

     Each Preprocessor Function produces time series values that are stored on the PDB. The Hydrologic Command Language (HCL) is used to control the run period and options for each preprocessor. Further details on the Preprocessor Component are in Sections VI.2.2C, VI.3.3 and VI.5.3C.

   - Forecast Component and associated data bases - this includes the Forecast Component Initialization Program (FCINIT), the PDB and the Forecast Component Execution function (FCEXEC) in the FCST program. HCL is used to provide input to the FCEXEC function. Because of the flexibility included in the operations table concept used in the Forecast Component, this component can be used in varying degrees in a hybrid system. The Forecast Component could be used for all computations needed to produce a forecast (includes snow and rainfall-runoff modeling, routing, reservoir simulation, updating and adjusting, and displaying the results) or only for certain parts (e.g., just use the Forecast Component to perform snow and runoff computations). Further details on the Forecast Component are in Sections VI.2.2D, VI.3.4 and VI.5.3C-FCEXEC.

2. When first implementing the OFS, the user needs to decide whether to set up the system on a portion of the user area first as a test or whether to implement the system over the entire user area. It is recommended that the OFS first be setup and tested on a portion of the user's area such as a single river basin. This will allow the user to become familiar with the system and the ways that it can be used. Since there is a lot of flexibility in OFS, the use of the system on a test area should lead to better use of the OFS when it is applied to the entire area. The OFS files can be easily expanded, thus the disk space needed for the entire area does not have to be allocated during the test.

3. There are a variety of programs that users have which interface with the OFS. These include flash flood guidance and headwater advisory programs, extended outlook procedures and various types of utilities that generate data or network summaries, produce forecast messages or perform other functions. In the case of OFS, there is a direct linkage between the OFS and the ESP system. There are also several utility programs and commands in the file maintenance programs for displaying data and parameters. Linkages to other auxiliary programs need to be created. In most cases, this should not be too difficult since OFS has a well defined set of read/write routines for accessing its data bases. In a few cases, the changes will be more substantial.

4. As mentioned previously, there is a direct linkage between the OFS and the ESP system. At a minimum, the Forecast Component and PDB of the OFS must be used if ESP is to be used. The use of ESP also has implications on how computations are organized in the OFS. The number of disk accesses and the number of intermediate time series that must be stored when proceeding downstream with ESP computations can be minimized if all of the operations needed for each forecast point are executed in succession. This means that all operations for a given forecast point should be put in a single Segment or at least in successive Segments. Further items that need to be considered if ESP is to be used are discussed in Section VI.2.5.

5. The parametric input for OFS can be prepared manually, however, in most cases it is more efficient to write programs that will generate input from existing parametric files. In most cases the existing files do not contain all of the parametric data needed by OFS so that some additional information is needed. Programs can be written to assist in converting from other systems to OFS.

6. When defining the data network in OFS, each station is assigned a single 8-character identifier. A single station number can also be used as a secondary identifier for data entry purposes. It is critical that the character identifier for a station be the same as the identifier used in SHEF messages. This generally means that the identifier for all stations should be the NWS Communications Handbook No. 5 identifier.

In addition to station identifiers, OFS uses 8-character identifiers for all other entities such as areas, basin boundary definitions, Rating Curves, Segments, Forecast Groups and Carryover Groups. Some thought needs to be given to the assignment of these other identifiers so that they have some meaning to the user and there is consistency throughout the OFS.

7. Some of the preprocessors in OFS use a variety of data, some of which are optional. In addition, a user may not need all the preprocessors, plus the area definitions used by preprocessors may or may not coincide. Some of the issues related to the preprocessors that need to be considered before beginning the implementation process follow:

   - The MAP preprocessor uses daily and 6-hourly precipitation as required data. Stations are defined as having just daily totals or less than 24-hour values and daily totals. For the less than 24-hour stations, the daily total may be reported or determined by summing the 6-hour totals (1 and 3 hour data can be held on the PPDB, but these are summed to 6-hour values before being used in MAP). For stations that do not regularly report at less than 24-hour intervals, there are two options. One is to treat them as daily stations in which case they will affect the amount of MAP, but not the timing. The other option is to define them as 6-hour stations in which case any 6-hourly reports received will be used to time distribute MAP values as long as the daily total is also available. The only disadvantage with the second option is that extra file space, which will frequently contain missing values, is needed to retain the 6-hour values that are reported.

   - Since precipitation is the dominant input for river forecasting and the data with the greatest spatial variability, the MAP areas are generally the smallest of the preprocessor areas. The areas associated with the other preprocessors that compute areal values can be set up to coincide with the MAP areas or to contain a number of MAP areas; the decision is left up to the user. It is recommended in mountainous areas that MAT areas coincide with MAP areas. In non-mountainous areas, MAT areas can contain a number of MAP areas with an insignificant effect. MAPE areas certainly can contain multiple MAP areas, even in the mountains (the PE adjustment factor in the soil-moisture accounting procedure can adequately account for elevation differences). It is recommended that Future MAP areas definitely contain multiple MAP areas. This is because FMAP values must be manually input.

   - The MAP and RRS Preprocessors are needed by all OFS users. The MAT Preprocessor is required only when snow or frozen ground are to be included. The Future MAP Preprocessor is needed to generate input for QPF and contingency runs. An FMAP Preprocessor that uses digitized QPF estimates could

be an enhancement to the OFS in the future. The use of the MAPE Preprocessor is based on the rainfall-runoff models being used and user preference. The Sacramento Soil-Moisture Accounting model contains the option of using daily estimates of MAPE or seasonal mean ET-demand values. There is some question as to when the use of MAPE will produce improved results. The use of mean ET-demand is probably sufficient in most basins. There appears to be some improvement in results when using daily MAPE estimates in semi-arid areas and regions with a sizeable variation in annual PE.

8. The length of station data and time series data that are held on the PPDB and PDB, respectively and the number of carryover slots (basically days of carryover) are set up as variables so that the values assigned can be matched to the user's needs. Some of the factors to consider when selecting these values are:

   - There is a direct relationship between the amount of information held in the data bases and the disk space required. In some cases the amount of disk space available will limit the period of record that can be maintained or the number of carryover slots assigned to something less than ideal.

   - In some cases, such as RRS data on the PPDB and all PDB time series, the longer the period of record maintained on the file, the fewer stations or areas whose data can be held in the input/output buffers, thus the more disk accesses and the greater the turnaround time. In these cases there is a definite penalty for retaining more data than are really needed.

   - The PPDB stores data in two different ways. RRS data are stored for each station by observation. Data for the other preprocessors are stored by day. The length of RRS data retained can vary from one station to another. No more data should be held for a station than are really needed. The number of days of daily data should not be longer than the time needed to include late observations or to produce critical reports. Typically about 10 days of daily data should be sufficient.

   - The length of time series data held on the PDB varies by data type. In general, there is no reason to hold data for one type for a longer period than for other types. A long enough period should be held so that an entire event could be rerun after it is over to make any post-event analysis that is needed. At least 10 days of time series data based on observed values should be retained, plus the number of future days needed. In some areas, especially those with long snow melt runoff events, it would be nice to retain additional observed days though disk space limitations may prevent this option.

- o The frequently of saving carryover is determined by the user. Subsequent executions of the Forecast Component can only begin at times when carryover is available. Also, ESP runs can only begin when carryover is available. Normally as new carryover is saved, the oldest existing slot is used. However, OFS allows the user to protect selected carryover dates so that they will not be overwritten until the user no longer has a need for the carryover. Thus, carryover for the beginning of a month or of a storm can be saved as long as needed. Generally 5 to 10 carryover slots should be sufficient for most users.

  The length of data retained and the number of carryover slots selected initially can be changed later. The reorder program will allow the number of days of daily data on the PPDB, the length of time series on the PDB and the number of carryover slots to be changed (currently the number of carryover slots can only increase). The length of RRS data on the PPDB can only be changed by redefining individual stations.

9. The OFS contains a feature that allows the user to establish multiple Carryover Groups, i.e., carryover can be saved more or less frequently for a given group or portion of the user area than for other parts. For many users, carryover is needed for the same date for all parts of the area, thus only one Carryover Group should be used. However, in some cases the use of multiple Carryover Groups may have advantages. Whenever the frequency of forecast runs or the seasonal pattern in the frequency of forecast runs varies considerably from one part of the user's area to another, the use of multiple Carryover Groups should be considered.

This list of pre-initialization considerations is certainly not all inclusive. The user is encouraged to call their Focal Point or others who have used the system to discuss any questions or concerns before starting to implement the OFS. It is also highly recommended that after reading the rest of the user documentation that the user develop an implementation plan before actually starting to use the OFS.