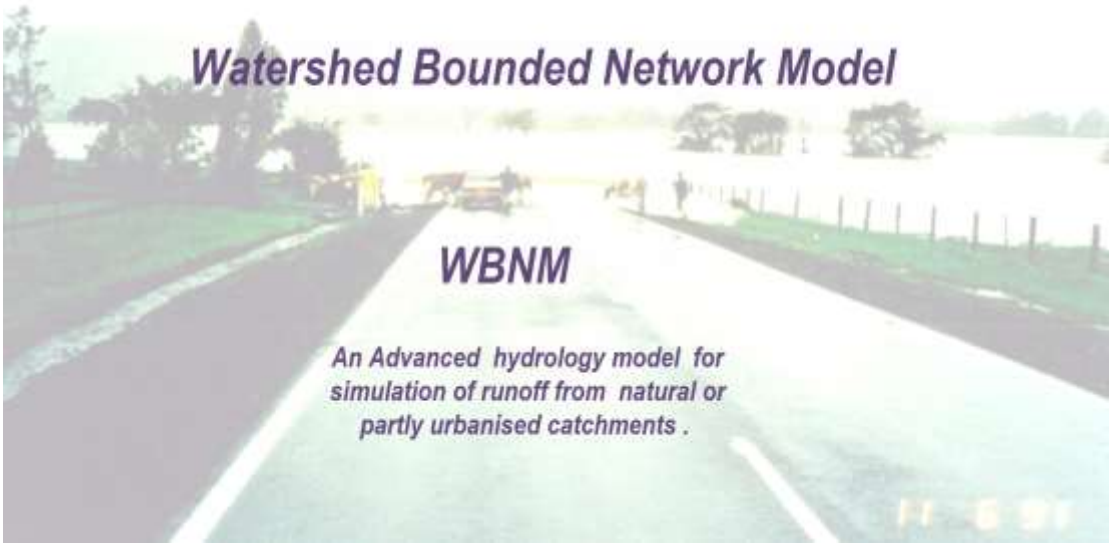

RUNFILE STRUCTURE

WBNM2017 May 2018

For all other details See:
WBNM_History.pdf
WBNM_References.pdf
WBNM_Validation.pdf
WBNM_Theory.pdf
WBNM_Tutorial.pdf
WBNM_UserGuide.pdf

This document describes the structure of the runfiles for **WBNM 2017, an extension of WBNM2012** . All WBNM2012and later runfiles are compatible with this current version with minor change to the runfile and ini files.. Current 2017 runfiles do however include features that are not supported in earlier versions of wbnm.

The sample runfiles included with this software in folder **Sample Runfiles** give examples of file structures.

Actual lines of input data are shown **BOLD**
Exactly 8 blank lines and/or text lines MUST be in the PREAMBLE block
Blank lines are NOT allowed in all other blocks
Every block MUST have a start and end line
Each block MUST be separated by 2 blank lines

ALL characters eg #####BOX, #####ROUTING etc, plus Subarea names MUST start in column 1.
ALL characters eg #####BOX, #####ROUTING etc control reads of the runfile and MUST be exactly as shown

The field width for all data items is 12, except for the Remarks at the end on the design rainfall data rows which are 36. In lines with the Subarea name followed by numerical data, the first 12 spaces MUST be reserved for the Subarea name.

To allow reliable readability in the Topology Block, give 1 space between the Outlet_N coordinate and the Downstream subcatchment name, ie the Downstream subcatchment name starts in column 62.

Design rainfall coefficients MUST be formatted as set out at the end of this document.

A description of all input variables, and their units, is given at the end of this document.

Default extension for runfiles is .WBN

#####START_PREAMBLE_BLOCK##########|##########|##########|##########|
Exactly 8 lines of text allowed in preamble block

Blanks allowed in preamble block, 2 blank lines should be placed between blocks
Blank lines NOT allowed anywhere else

ALL characters eg B, P, #####INLET MUST be upper case
WARNING text with # controls READs & format MUST be EXACTLY as shown

#####END_PREAMBLE_BLOCK##########|##########|##########|##########|

#####START_STATUS_BLOCK##########|##########|##########|##########|
PATHNAME & NAME OF CURRENT RUNFILE
DATE OF LAST EDIT
NAME OF LAST EDITOR
VERSION_NUMBER FILE_STATUS
#####END_STATUS_BLOCK##########|##########|##########|##########|

#####START_DISPLAY_BLOCK##########|##########|##########|##########|
Window coords **TOPLEFT_E TOPLEFT_N BOTTOMRIGHT_E BOTTOMRIGHT_N**
GIS_MAP_FILENAME
Map coords **TOPLEFT_E TOPLEFT_N BOTTOMRIGHT_E BOTTOMRIGHT_N**
TOP_RIGHT_E TOPRIGHT_N (all on 1 line)
#####END_DISPLAY_BLOCK##########|##########|##########|##########|

#####START_TOPOLOGY_BLOCK##########|##########|##########|##########|
NUMBER_OF_SUBAREAS CATCHMENT NAME AND LOCATION
Do for each SUBAREA, a row of:
SUBAREA_NAME CG_E CG_N OUTLET_E OUTLET_N DOWNSTREAM_SUB_NAME
#####END_TOPOLOGY_BLOCK##########|##########|##########|##########|

#####START_SURFACES_BLOCK##########|##########|##########|##########|
NONLINEARITY_EXPONENT LAG_PARAMETER IMPERVIOUS_LAG_FACTOR
DISCHARGE_WHEN_ROUTING_SWITCHES_FROM_NONLINEAR_TO_LINEAR
Do for each SUBAREA, a row of:
SUB_NAME AREA IMP%
#####END_SURFACES_BLOCK##########|##########|##########|##########|

#####START_FLOWPATHS_BLOCK##########|##########|##########|##########|
NUMBER_OF_SUBAREAS_WITH_STREAM_SEGMENT
(If NUMBER is zero, no more lines in this block)

Remainder of this block is repeated for each subarea with a stream
SUBAREA_NAME

STREAM_ROUTING_TYPE (#####ROUTING, #####DELAY or #####MUSK)
If #####ROUTING :
STREAM_LAG_FACTOR (default 1.0)

If #####DELAY :
DELAY

If #####MUSK :
MUSKINGUM_K MUSKINGUM_X
#####END_FLOWPATHS_BLOCK##########|##########|##########|##########|

#####START_LOCAL_STRUCTURES_BLOCK##|##########|##########|##########|
NUMBER_OF_SUBAREAS_WITH_LOCAL_STRUCTURE_STORAGE
(If NUMBER is zero, no more lines in this block)

Remainder of this block is repeated for each subarea with local structure
#####START_LOCAL_STRUCTURE#N
DESCRIPTION_OF_LOCAL_STRUCTURE
SUBAREA_NAME
STRUCTURE_TYPE (#####H_S_Q , #####H_S, #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC))

--If #####H_S_Q (elevation-storage-discharge table entered directly)
|
|
| **#####START_OUTLET_DETAILS**
| **NUMBER_OF_BLOCKS_OF_OUTLETS**
| -DO for each block of outlets
| | **#####HSQ**
| | **DISCHARGE_FACTORBLOCKAGE_TIME (optional)**
| | **DELAY_TIME_TO_BOTTOM_OF_SUBAREA**
| -End DO for each block of outlets
| **#####END_OUTLET_DETAILS**
|
| **#####START_BASIN_DETAILS**
| **NUMBER_OF_POINTS_IN_ELEVATION-STORAGE-DISCHARGE_RELATION**
| Table of **ELEVATION STORAGE_VOLUME DISCHARGE** values
|
| **INITIAL_WATER_LEVEL_IN_STORAGE**
| **SURFACE_AREA**
| **STORAGE_FACTOR**
| **#####END_BASIN_DETAILS**
|
| **#####START_INFLOW_DETAILS**
| **%_PERVIOUS_FLOW_TO_OSD %_IMPERVIOUS_FLOW_TO_OSD**
| **#####END_INFLOW_DETAILS**
|
--End If #####H_S_Q

--If #####H_S (inlet control culverts)
|
| **#####START_OUTLET_DETAILS**
|
| **NUMBER_OF_BLOCKS_OF_OUTLETS**
|
| --Do for each block of outlets :
| | **OUTLET_TYPE** (#####PIPE, #####BOX, #####WEIR or #####SCOUR)
| |

| | | If type #####BOX :
| | | **INVERT_ELEVATION_AT_ENTRANCE**
| | | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**
| | | **ENTRANCE_TYPE** (1, 2 or 3)
| | | **BOX_CULVERT_WIDTH**
| | | **BOX_CULVERT_DEPTH**
| | | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| | | **DELAY_TIME_TO_BOTTOM_OF_SUBAREA**
| | | End IF #####BOX
| | |
| | | If type #####PIPE :
| | | **INVERT_ELEVATION_AT_ENTRANCE**
| | | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**
| | | **ENTRANCE_TYPE** (1, 2 or 3)
| | | **PIPE_CULVERT_DIAMETER**
| | | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| | | **DELAY_TIME_TO_BOTTOM_OF_SUBAREA**
| | | End IF #####PIPE
| | |
| | | If type #####WEIR :
| | | **INVERT_ELEVATION_AT_ENTRANCE**
| | | **WEIR_LENGTH**
| | | **WEIR_COEFFICIENT**
| | | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| | | **DELAY_TIME_TO_BOTTOM_OF_SUBAREA**
| | | End IF #####WEIR
| | |
| | | If type #####SCOUR :
| | | **CREST_INVERT_ELEVATION**
| | | **WEIR_CREST_LENGTH**
| | | **WEIR_COEFFICIENT**
| | | **SCOURABLE_WEIR_CREST_LENGTH**
| | | **SCOURABLE_WEIR_BOTTOM_ELEVATION**
| | | **SCOURABLE_WEIR_TOP_WIDTH** (in flow direction)
| | | **SCOURABLE_WEIR_BOTTOM_WIDTH** (in flow direction)
| | | **PILOT_CHANNEL_CREST_LENGTH**
| | | **PILOT_CHANNEL_CREST_ELEVATION**
| | | **SCOUR_FACTOR**
| | | **TIME_WHEN_SCOUR_STARTS**
| | | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| | | **DELAY_TIME_TO_BOTTOM_OF_SUBAREA**
| | |
| | | End IF #####SCOUR
| | |
| --End Do for each block of outlets
|
| **#####END_OUTLET_DETAILS**
|
| **#####START_BASIN_DETAILS**
|
| **NUMBER_OF_POINTS_IN_ELEVATION-STORAGE_RELATION**
| Table of **ELEVATION** **STORAGE_VOLUME** values
|
| **INITIAL_WATER_LEVEL_IN_STORAGE**
| **SURFACE_AREA**
| **STORAGE_FACTOR**
|
| **#####END_BASIN_DETAILS**
|

```
|       #####START_INFLOW_DETAILS
|       %_PERVIOUS_FLOW_TO_OSD    %_IMPERVIOUS_FLOW_TO_OSD
|       #####END_INFLOW_DETAILS
|
--End If #####H_S


--If  #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC)
 (culverts checked for both inlet & outlet control)
|
|       #####START_OUTLET_DETAILS
|
|        NUMBER_BLOCKS_OF_OUTLETS
|
|   ------Do for each block of outlets :
|   |
|       OUTLET_TYPE (#####BOX, #####PIPE, #####WEIR or #####SCOUR)
|
|       --If type #####BOX :
|       |       ENTRANCE_INVERT_ELEVATION
|       |       NUMBER_OF_OUTLETS_IN_THIS_BLOCK
|       |       ENTRANCE_TYPE (1, 2 or 3)
|       |       BOX_CULVERT_WIDTH
|       |       BOX_CULVERT_DEPTH
|       |       ENTRANCE_COEFFICIENT
|       |       CULVERT_LENGTH
|       |       OUTLET_INVERT_ELEVATION
|       |       CULVERT_MANNING_N
|       |       DISCHARGE_FACTOR          BLOCKAGE_TIME (optional)
|       |       DELAY_TIME_TO_BOTTOM_OF_SUBAREA
|       |
|       --End IF #####BOX
|
|       --If type #####PIPE :
|       |       ENTRANCE_INVERT_ELEVATION
|       |       NUMBER_OF_OUTLETS_IN_THIS_BLOCK
|       |       ENTRANCE_TYPE (1, 2 or 3)
|       |       PIPE_CULVERT_DIAMETER
|       |       ENTRANCE_COEFFICIENT
|       |       CULVERT_LENGTH
|       |       OUTLET_INVERT_ELEVATION
|       |       CULVERT_MANNING_N
|       |       DISCHARGE_FACTOR          BLOCKAGE_TIME (optional)
|       |       DELAY_TIME_TO_BOTTOM_OF_SUBAREA
|       |
|       --End IF #####PIPE
|
|       --If type #####WEIR :
|       |       CREST_INVERT_ELEVATION
|       |       WEIR_CREST_LENGTH
|       |       WEIR_COEFFICIENT
|       |       DISCHARGE_FACTOR          BLOCKAGE_TIME (optional)
|       |       DELAY_TIME_TO_BOTTOM_OF_SUBAREA
|       |
|       --End IF #####WEIR
|
|       --If  type #####SCOUR :
|       |       CREST_INVERT_ELEVATION
|       |       WEIR_CREST_LENGTH
```

```
|           |           WEIR_COEFFICIENT
|           |           SCOURABLE_WEIR_CREST_LENGTH
|           |           SCOURABLE_WEIR_BOTTOM_ELEVATION
|           |           SCOURABLE_WEIR_TOP_WIDTH (in flow direction)
|           |           SCOURABLE_WEIR_BOTTOM_WIDTH (in flow direction)
|           |           PILOT_CHANNEL_CREST_LENGTH
|           |           PILOT_CHANNEL_CREST_ELEVATION
|           |           SCOUR_FACTOR
|           |           TIME_WHEN_SCOUR_STARTS
|           |           DISCHARGE_FACTOR          BLOCKAGE_TIME (optional)
|           |           DELAY_TIME_TO_BOTTOM_OF_SUBAREA
|           |
|           --End IF #####SCOUR
|     |
|     ------End Do for each block of outlets
|
|           #####END_OUTLET_DETAILS
|
|           #####START_TAILWATER_DETAILS
|
|           --  If  #####H_S(TWF)
|           |           TAILWATER_ELEVATION
|           --  End IF #####H_S(TWF)
|
|           --  If #####H_S(TWR)
|           |           NUMBER_OF_POINTS_IN_TAILWATER_RATING_TABLE
|           |           Table of TAILWATER_ELEVATION    DISCHARGE_IN_D/S_CHANNEL
|           --  End IF #####H_S(TWR)
|
|           --  If #####H_S(TWC)
|           |           CHANNEL_BED_WIDTH
|           |           CHANNEL_SIDE_SLOPE
|           |           CHANNEL_BED_SLOPE%
|           |           CHANNEL_MANNING_N
|           |           DOWNSTREAM_CHANNEL_BED_ELEVATION
|           --  End IF #####H_S(TWC)
|
|           #####END_TAILWATER_DETAILS
|
|           #####START_BASIN_DETAILS
|
|           NUMBER_OF_POINTS_IN_ELEVATION-STORAGE_RELATION
|           Table of ELEVATION    STORAGE_VOLUME values
|
|           INITIAL_WATER_LEVEL_IN_STORAGE
|           SURFACE_AREA
|           STORAGE_FACTOR
|
|           #####END_BASIN_DETAILS
|
|
|           #####START_INFLOW_DETAILS
|           %_PERVIOUS_FLOW_TO_OSD     %_IMPERVIOUS_FLOW_TO_OSD
|           #####END_INFLOW_DETAILS
|

--End If #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC)
```

#####END_LOCAL_STRUCTURE#N
#####END_LOCAL_STRUCTURES_BLOCK####|##########|##########|##########|

#####START_OUTLET_STRUCTURES_BLOCK#|##########|##########|##########|
NUMBER_OF_SUBAREAS_WITH_OUTLET_STRUCTURE_STORAGE
(if NUMBER is zero, no more lines in this block)

Remainder of this block is repeated for each subarea with outlet structure
#####START_OUTLET_STRUCTURE#N
DESCRIPTION_OF_OUTLET_STRUCTURE
SUBAREA_NAME
STRUCTURE_TYPE (#####H_S_Q, #####H_S, #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC))

--If #####H_S_Q (elevation-storage-discharge table entered directly)
|
| **#####START_OUTLET_DETAILS**
|
| **NUMBER_BLOCKS_OF_OUTLETS**

| --Do for each block of outlets :
| | **#####HSQ**
| | **DISCHARGE_FACTOR BLOCKAGE_TIME (optional)**
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| --End Do for each block of outlets
|
| **#####END_OUTLET_DETAILS**
|
| **#####START_BASIN_DETAILS**
|
| **NUMBER_OF_POINTS_IN_ELEVATION-STORAGE-DISCHARGE_RELATION**
| Table **ELEV STORAGE…DISCHARGE_DIRECTED_TO_EACH_D/S….**
|
| **INITIAL_WATER_LEVEL_IN_STORAGE**
| **SURFACE_AREA**
| **STORAGE_FACTOR**
|
| **#####END_BASIN_DETAILS**
|
--End If #####H_S_Q

--If #####H_S (inlet control culverts)
|
| **#####START_OUTLET_DETAILS**
|
| **NUMBER_BLOCKS_OF_OUTLETS**
|
| ------Do for each block of outlets :
| |
| **OUTLET_TYPE** (#####BOX, #####PIPE, #####WEIR or #####SCOUR)
|
| --If type #####BOX :
| | **ENTRANCE_INVERT_ELEVATION**
| | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**

| | **ENTRANCE_TYPE** (1, 2 or 3)
| | **BOX_CULVERT_WIDTH**
| | **BOX_CULVERT_DEPTH**
| | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| |
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| |
| --End IF #####BOX
|
| --If type #####PIPE :
| | **ENTRANCE_INVERT_ELEVATION**
| | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**
| | **ENTRANCE_TYPE** (1, 2 or 3)
| | **PIPE_CULVERT_DIAMETER**
| | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| |
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| |
| |
| --End IF #####PIPE
|
| --If type #####WEIR :
| | **CREST_INVERT_ELEVATION**
| | **WEIR_CREST_LENGTH**
| | **WEIR_COEFFICIENT**
| | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| |
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| |
| --End IF #####WEIR
|
| --If type #####SCOUR :
| | **CREST_INVERT_ELEVATION**
| | **WEIR_CREST_LENGTH**
| | **WEIR_COEFFICIENT**
| | **SCOURABLE_WEIR_CREST_LENGTH**
| | **SCOURABLE_WEIR_BOTTOM_ELEVATION**
| | **SCOURABLE_WEIR_TOP_WIDTH** (in flow direction)
| | **SCOURABLE_WEIR_BOTTOM_WIDTH** (in flow direction)
| | **PILOT_CHANNEL_CREST_LENGTH**
| | **PILOT_CHANNEL_CREST_ELEVATION**
| | **SCOUR_FACTOR**
| | **TIME_WHEN_SCOUR_STARTS**
| | **DISCHARGE_FACTOR** **BLOCKAGE_TIME (optional)**
| |
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| |

| --End IF #####SCOUR
|
| ------End Do for each block of outlets
|
| **#####END_OUTLET_DETAILS**
|
| **#####START_BASIN_DETAILS**
|
| **NUMBER_OF_POINTS_IN_ELEVATION-STORAGE_RELATION**
| Table of **ELEVATION STORAGE_VOLUME** values
|
| **INITIAL_WATER_LEVEL_IN_STORAGE**
| **SURFACE_AREA**
| **STORAGE_FACTOR**
|
| **#####END_BASIN_DETAILS**
|
--End If #####H_S

--If #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC)
(culverts checked for both inlet & outlet control)
|
| **#####START_OUTLET_DETAILS**
|
| **NUMBER_BLOCKS_OF_OUTLETS**
|
| ------Do for each block of outlets :
| |
| **OUTLET_TYPE** (#####BOX, #####PIPE, #####WEIR or #####SCOUR)
|
| --If type #####BOX :
| | **ENTRANCE_INVERT_ELEVATION**
| | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**
| | **ENTRANCE_TYPE** (1, 2 or 3)
| | **BOX_CULVERT_WIDTH**
| | **BOX_CULVERT_DEPTH**
| | **ENTRANCE_COEFFICIENT**
| | **CULVERT_LENGTH**
| | **OUTLET_INVERT_ELEVATION**
| | **CULVERT_MANNING_N**
| | **DISCHARGE_FACTOR BLOCKAGE_TIME (optional)**
| |
| | **SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED**
| | **DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA**
| | (TOP or BOTTOM)
| | **DELAY_OF_DIRECTED_FLOWS**
| |
| --End IF #####BOX
|
| --If type #####PIPE :
| | **ENTRANCE_INVERT_ELEVATION**
| | **NUMBER_OF_OUTLETS_IN_THIS_BLOCK**
| | **ENTRANCE_TYPE** (1, 2 or 3)
| | **PIPE_CULVERT_DIAMETER**
| | **ENTRANCE_COEFFICIENT**
| | **CULVERT_LENGTH**
| | **OUTLET_INVERT_ELEVATION**
| | **CULVERT_MANNING_N**
| | **DISCHARGE_FACTOR BLOCKAGE_TIME (optional)**

```
|       |
|       |       SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED
|       |       DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA
|       |                       (TOP or BOTTOM)
|       |       DELAY_OF_DIRECTED_FLOWS
|       |
|       --End IF #####PIPE
|
|       --If type #####WEIR :
|       |       CREST_INVERT_ELEVATION
|       |       WEIR_CREST_LENGTH
|       |       WEIR_COEFFICIENT
|       |       DISCHARGE_FACTOR       BLOCKAGE_TIME (optional)
|       |
|       |       SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED
|       |       DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA
|       |                       (TOP or BOTTOM)
|       |       DELAY_OF_DIRECTED_FLOWS
|       |
|       --End IF #####WEIR
|
|       --If  type #####SCOUR :
|       |       CREST_INVERT_ELEVATION
|       |       WEIR_CREST_LENGTH
|       |       WEIR_COEFFICIENT
|       |       SCOURABLE_WEIR_CREST_LENGTH
|       |       SCOURABLE_WEIR_BOTTOM_ELEVATION
|       |       SCOURABLE_WEIR_TOP_WIDTH (in flow direction)
|       |       SCOURABLE_WEIR_BOTTOM_WIDTH (in flow direction)
|       |       PILOT_CHANNEL_CREST_LENGTH
|       |       PILOT_CHANNEL_CREST_ELEVATION
|       |       SCOUR_FACTOR
|       |       TIME_WHEN_SCOUR_STARTS
|       |       DISCHARGE_FACTOR       BLOCKAGE_TIME (optional)
|       |
|       |       SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED
|       |       DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA
|       |                       (TOP or BOTTOM)
|       |       DELAY_OF_DIRECTED_FLOWS
|       |
|       --End IF #####SCOUR
|
|   ------End Do for each block of outlets
|
|       #####END_OUTLET_DETAILS
|
|       #####START_TAILWATER_DETAILS
|
|       --  If  #####H_S(TWF)
|       |       TAILWATER_ELEVATION
|       --  End IF #####H_S(TWF)
|
|       --  If #####H_S(TWR)
|       |       NUMBER_OF_POINTS_IN_TAILWATER_RATING_TABLE
|       |       Table of TAILWATER_ELEVATION    DISCHARGE_IN_D/S_CHANNEL
|       --  End IF #####H_S(TWR)
|
|       --  If #####H_S(TWC)
|       |       CHANNEL_BED_WIDTH
```

| | CHANNEL_SIDE_SLOPE
| | CHANNEL_BED_SLOPE%
| | CHANNEL_MANNING_N
| | DOWNSTREAM_CHANNEL_BED_ELEVATION
| -- End IF #####H_S(TWC)
|
| #####END_TAILWATER_DETAILS
|
| #####START_BASIN_DETAILS
|
| NUMBER_OF_POINTS_IN_ELEVATION-STORAGE_RELATION
| Table of ELEVATION STORAGE_VOLUME values
|
| INITIAL_WATER_LEVEL_IN_STORAGE
| SURFACE_AREA
| STORAGE_FACTOR
|
| #####END_BASIN_DETAILS
|
--End If #####H_S(TWF), #####H_S(TWR), or #####H_S(TWC)

#####END_OUTLET_STRUCTURE#N
#####END_OUTLET_STRUCTURES_BLOCK###|##########|##########|##########|

#####START_STORM_BLOCK##########|##########|##########|##########|
NUMBER_OF_STORMS

Remainder of this block is repeated for each storm
#####START_STORM#N

DESCRIPTION_OF_STORM
CALCULATION_TIME_STEP
TIME_STEP_FOR_OUTPUT_TO_METAFILE

One of the following 4 rain types:

#####START_RECORDED_RAIN
EVENT_DATE
EVENT_TIME
NUMBER_OF_RAIN_PERIODS TIME_STEP_OF_HYETOGRAPH
RAIN_UNITS (MM/HOUR or MM/PERIOD or PERCENT)

NUMBER_OF_RAIN_GAUGES

If MM/PERIOD or MM/HOUR
Do for each rain gauge:
RAIN_GAUGE_NAME
GAUGE_E GAUGE_N
RAINFALL_HYETOGRAPH (values in column)
End Do for each rain gauge
End If

If PERCENT
Do for each rain gauge:
RAIN_GAUGE_NAME
GAUGE_E GAUGE_N RAINTOTAL (mm)
RAINFALL_HYETOGRAPH (values in column, percent of total depth in storm)
End Do for each rain gauge

End If
#####END_RECORDED _RAIN

OR (BURST_DURATION can now be -1 meaning use ARR 1987 dura spectrum)

#####START_DESIGN_RAIN_ARR1987
BURST_ARI BURST_DURATION AREAL_REDUCTION_FACTOR
LOCATION_OF_IFD_DATA (IFD_COEFFS_IN_IFD_FILE or IFD_COEFFS_IN_THIS_FILE)

--If IFD_COEFFS_IN_IFD_FILE
| **PATHNAME_&_NAME_OF_IFD_DATAFILE**
| **NUMBER_OF_RAIN_GAUGES**
|
| Do for each rain gauge:
| **RAIN_GAUGE_NAME**
| End Do for each rain gauge
--End If IFD_COEFFS_IN_IFD_FILE

--If IFD_COEFFS_IN_THIS_FILE
| **NUMBER_OF_RAIN_GAUGES**
|
| Do for each rain gauge:
|
| **RAIN_GAUGE_NAME ZONE MAP_NAME GAUGE_E GAUGE_N**
| **ELEVATION i0201 i0212 i0272 i5001 i5012 i5072 F2 F50 G**
| **AV_ANNUAL_RAIN %ROUGH MOISTURE_ADJUSTMENT_FACTOR**
| **DETAILS**
| (NOTE: these go on 1 line, must be formatted-see format details at end of file)
| End Do for each rain gauge
--End If IFD_COEFFS_IN_THIS_FILE

#####END_DESIGN_RAIN_ARR1987

OR

#####START_EMBEDDED_DESIGN_RAIN_ARR1987
BURST_ARI BURST_DURATION EVENT_ARI EVENT_DURATION ARF_
LOCATION_OF_IFD_DATA (IFD_COEFFS_IN_IFD_FILE or IFD_COEFFS_IN_THIS_FILE)

--If IFD_COEFFS_IN_IFD_FILE
| **PATHNAME_&_NAME_OF_IFD_DATAFILE**
| **NUMBER_OF_RAIN_GAUGES**
|
| Do for each rain gauge:
| **RAIN_GAUGE_NAME**
| End Do for each rain gauge
|
--End If IFD_COEFFS_IN_IFD_FILE

--If IFD_COEFFS_IN_THIS_FILE
| **NUMBER_OF_RAIN_GAUGES**
|
| Do for each rain gauge:
|
| **RAIN_GAUGE_NAME ZONE MAP_NAME GAUGE_E GAUGE_N**
| **ELEVATION i0201 i0212 i0272 i5001 i5012 i5072 F2 F50 G**
| **AV_ANNUAL_RAIN %ROUGH MOISTURE_ADJUSTMENT_FACTOR**
| **DESCRIPTION**
| (NOTE: these go on 1 line, must be formatted-see format details at end of file)

```
|       End Do for each rain gauge
|
--End If  IFD_COEFFS_IN_THIS_FILE
```

#####END_EMBEDDED_DESIGN_RAIN_ARR1987

OR

#####START_DESIGN_RAIN_ARR2016
(Note Burst DURA/PATT can all be -1 meaning run spectrum)
(ARF can be – 1 meaning use ARR 2016 calculated value)
(Partial Area Check Subname is optional – only needed if running a PAC)
BURST_AEP BURST_DURATION BURST_PATTERN ARF PAC_SUBNAME

(no options at this time for location of ARR 2016 IFD data)
IFD_DATA_IN_DATABASE_FILE
FULL_PATHNAME_OF_IFD_DATABASE

NUMBER_OF_RAIN_GAUGES
```
|       Do for each rain gauge:
|       RAIN_GAUGE_NAME_IN_DATABASE
|       End Do for each rain gauge
```

(no options at this time for location of ARR 2016 Pattern data)
PAT_DATA_IN_REGION_FILE
(Note make sure name corresponds to correct type (Areal or Point)
FULL_PATHNAME_OF_PATTERN_DATA

(no options at this time for location of ARR 2016 catchment data)
CAT_DATA_IN_CATCHMENT_FILE
FULL_PATHNAME_OF_CATCHMENT_DATA

#####END_DESIGN_RAIN_ARR2016

One of the following 2 rain gauge weighting types:

#####START_INPUT_RAINGAUGE_WEIGHTS
```
    Do for each subarea:
    SUBAREA_NAME  THIESSEN_WEIGHTS_FOR_EACH_GAUGE……..
    End Do for each subarea
```
#####END_INPUT_RAINGAUGE_WEIGHTS

OR

#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS

One of the following 4 rainfall loss types:

#####START_LOSS_RATES
Option 1 (sub varying IL and CL rates)
```
    Do for each subarea
    SUBAREA_NAME    INITIAL_LOSS  LOSS_RATE   IMP_I_L
    End DO for each subarea
```
Option2 (applies same losses to all subs)
```
  GLOBAL       INITIAL_LOSS  LOSS_RATE   IMP_I_L
```
Option 3 (only if DES16 storm type)
```
  ARR16LOSSES
```
#####END_LOSS_RATES

OR

#####START_RUNOFF_PROPORTIONS
Do for each subarea
SUBAREA_NAME INITIAL_LOSS RUNOFF_PROP IMP_I_L
End DO for each subarea
#####END_RUNOFF_PROPORTIONS

OR

#####START_HORTON_INFILT
Do for each subarea
SUBAREA_NAME F0 FC K IMP_INITIAL_LOSS
End DO for each subarea
#####END_HORTON_INFILT

OR

#####START_TIME_VARYING
RAINFALL_LOSS_RATE_FOR_EACH_TIME_STEP (mm/hr)
(Note: enter 1 value for each rainfall value, ie NUMBER_OF_RAIN_PERIODS)
(Note: Impervious surface initial loss is set at zero for this case)
#####END_TIME_VARYING

#####START_RECORDED_HYDROGRAPHS
NUMBER_OF_RECORDED_HYDROGRAPHS
(if NUMBER is zero, no more lines in this block)

Do for each recorded hydrograph:
#####START_RECORDED_HYDROGRAPH#N
SUBAREA_NAME
LOCATION_OF_RECORDED_HYDROGRAPH (TOP or BOTTOM)
NUMBER_OF_RECORDED_HYDROGRAPH_ORDINATES TIME_STEP
RECD_HG_UNITS (STAGE or DISCHARGE)
RECORDED_HYDROGRAPH (values in column)

IF RECD_HG_UNITS=STAGE
#####START_RATING_TABLE
NUMBER_OF_POINTS_IN_RECD_HG_RATING_TABLE
(if NUMBER is zero, no more lines in this block)
Table of ELEVATION DISCHARGE values
#####END_RATING_TABLE
End IF

#####END_RECORDED_HYDROGRAPH#N
End Do for each recorded hydrograph

#####END_RECORDED_HYDROGRAPHS

#####START_IMPORTED_HYDROGRAPHS
NUMBER_OF_IMPORTED_HYDROGRAPHS
(if NUMBER is zero, no more lines in this block)

Do for each imported hydrograph:
#####START_IMPORTED_HYDROGRAPH#N
SUBAREA_NAME
LOCATION_OF_IMPORTED_HYDROGRAPH (TOP or BOTTOM)
NUMBER_OF_IMPORTED_HYDROGRAPH_ORDINATES TIME_STEP
IMPORTED_HG_UNITS (STAGE or DISCHARGE)

IMPORTED_HYDROGRAPH (values in column)

IF IMPORTED_HG_UNITS=STAGE
#####START_RATING_TABLE
NUMBER_OF_POINTS_IN_IMPORTED_HG_RATING_TABLE
(if NUMBER is zero, no more lines in this block)
Table of ELEVATION DISCHARGE values
#####END_RATING_TABLE
End IF

#####END_IMPORTED_HYDROGRAPH#N
End Do for each imported hydrograph

#####END_IMPORTED_HYDROGRAPHS

#####END_STORM#N
#####END_STORM_BLOCK###############|###########|###########|###########|

FORMAT DETAILS for ARR 1987 DESIGN RAINFALL IFD COEFFICIENTS

The line of data with the design rainfall coefficients contains several text entries and **MUST** be formatted as follows:

All values on the one line
Format for each entry is -

RAIN_GAUGE_NAME	A12	12
ZONE	I12	24
MAP_NAME	A12	36
GAUGE_E	F12.2	48
GAUGE_N	F12.2	60
ELEVATION	F12.2	72
i0201	F12.2	84
i0212	F12.2	96
i0272	F12.2	108
i5001	F12.2	120
i5012	F12.2	132
i5072	F12.2	144
F2	F12.2	156
F50	F12.2	168
G	F12.2	180
AV_ANNUAL_RAIN	F12.2	192
%ROUGH	I12	204
MOISTURE_ADJUSTMENT_FACTOR	F12.2	216
DESCRIPTION	A36	253

For numerical values, the LAST character of each runfile entry therefore MUST be in the column specified above.
For Alphabetic values (Subarea names, Raingauge names, Remarks), the FIRST character MUST be in the first column of the field.
To allow easier readability, give 1 space between the Moisture_Adjustment_Factor and the DESCRIPTION at the end of the line, ie the DESCRIPTION starts in column 218.

IFD coefficients held in an external IFD file (such as WBNM.IFD) use the same format.

See sample files EMBEDDED_DESIGN.WBN and DESIGN_EXTERNAL.WBN for examples of formatting.

FORMAT DETAILS for ARR 2016 DESIGN RAINFALL IFD DATABASE
This is rearranged form of the BOM downloaded IFD data – principally rearranged to stack multiple gauges into a single file. It is critical that the header lines be retained as provided (with enclosing apostraphes) as the code uses the headers to locate a specific Intensity for a Freq/Dura combinations. All data for a particular gauge is stored on one line as in the following truncated extract. (refer IFD csv template supplied in sample_runfiles.

```
#,WBNM2017 IFD file database - IFD header line and data starts.....
#,Any text in the  lines above START_DATA is ignored  - NOTE a.....
#,This file should be saved in csv format (name and extension.....
#,If you use spaces in the gauge name - enclose the name in qu.....
#,DO NOT change the format of the data header line - it is use.....
START_DATA=========================================================.....
"Gauge","Easting","Northing","Zone","Downloaded","1 min 63.2",.....
SorellCkBot,545841,5261381,55,23-Mar-17,1.06,1.2,1.66,2,2.36,2.....
SorellCkMid,548789,5270022,55,23-Mar-17,1.11,1.25,1.74,2.1,2.4.....
SorellCkTop,545888,5276088,55,23-Mar-17,1.1,1.25,1.74,2.1,2.48.....
```

FORMAT DETAILS for ARR 2016 DESIGN RAINFALL PATTERN DATA
(As downloaded from ARR datahub)

FORMAT DETAILS for ARR 2016 CATCHMENT DATA
(As downloaded from ARR datahub)

DESCRIPTION of VARIABLES

STATUS_BLOCK:
PATHNAME & NAME OF CURRENT RUNFILE -written by WBNM for QA records
DATE OF LAST EDIT -written by WBNM for QA records
NAME OF LAST EDITOR -written by WBNM for QA records
VERSION NUMBER – checks runfile for compatability with current version of WBNM & warns
FILE_STATUS -program version and status of runfile, written by WBNM for QA records. WBNM checks the version number of your runfile against the program version and gives an error message if they are not compatible

DISPLAY_BLOCK:
TOPLEFT_E TOPLEFT_N BOTTOMRIGHT_E BOTTOMRIGHT_N – window coordinates, adopt East, North axes
GIS_MAP_FILENAME – to place GIS catchment map under schematic of catchment structure

TOPLEFT_E TOPLEFT_N BOTTOMRIGHT_E BOTTOMRIGHT_N TOPRIGHT_E..
TOPRIGHT_N– coordinates of GIS map-3 coords needed if GIS map is not oriented east-north

TOPOLOGY_BLOCK:
NUMBER_OF_SUBAREAS CATCHMENT_NAME – 64 Chars max
SUBAREA_NAME – 18 characters maximum
CG_E CG_N - East and North coordinates of centre of subarea
OUTLET_E OUTLET_N - East and North coordinates of subarea outlet
DOWNSTREAM_SUB_NAME
Note, coordinates are only needed if rainfall weights are calculated by WBNM, or if the schematic catchment structure is to be plotted

SURFACES_BLOCK:
NONLINEARITY_EXPONENT - recommended to be left at m=0.77, m=1.0 gives linear model.
DISCHARGE_WHEN_ROUTING_SWITCHES_FROM_NONLINEAR_TO_LINEAR – (m^3/s) use –99.9 if model is to be fully nonlinear, the recommended condition
SUB_NAME – subarea name, maximum 18 characters
AREA – of each subarea (hectares)
IMPERVIOUS% - for urban subareas, the impervious area, as a percent

LAG_PARAMETER – controls hydrograph shape and peak discharge, used for fitting calculated and recorded hydrographs, value should be about 1.70 (see User Guide for calibrated values).
IMPERVIOUS_LAG_FACTOR – reduction factor for lag time on impervious surfaces compared to natural catchment surfaces, recommend 0.10

FLOWPATHS_BLOCK:
NUMBER_OF_SUBAREAS_WITH_STREAM_SEGMENT – all subareas which are not at the top end of a stream
SUBAREA_NAME – of each subarea which has a stream segment
STREAM_ROUTING_TYPE (#####ROUTING, #####DELAY or #####MUSK)
STREAM_LAG_FACTOR - for #####ROUTING, value is 1.0 for natural streams. If the stream is modified so that velocities and hence lag times change, use a different factor, eg 0.90
DELAY - for #####DELAY, time by which hydrograph is delayed in moving through stream segment (minutes)
MUSKINGUM_K - for #####MUSK, Muskingum lag parameter (minutes)
MUSKINGUM_X – range 0 to 0.5

LOCAL_STRUCTURES_BLOCK:
NUMBER_OF_SUBAREAS_WITH_ONSITE_DETENTION_STORAGE
DESCRIPTION_OF_LOCAL_STRUCTURE – 128 character description of the storage
SUBAREA_NAME – of each subarea which has an onsite detention storage
STRUCTURE_TYPE (#####H_S_Q, #####H_S, #####H_S(TWF), #####H_S(TWR) or #####H_S(TWC))
NUMBER_BLOCKS_OF_OUTLETS – eg 3 blocks, the first consisting of 2 identical box culverts, the second consisting of 3 identical pipe culverts, and the third consisting of a weir
DELAY_TIME_TO_BOTTOM_OF_SUBAREA – hydrograph is delayed by this much in going to the bottom of the subarea (minutes).

NUMBER_OF_POINTS_IN_ELEVATION-STORAGE-DISCHARGE_RELATION – number of points in the next table
Table of **ELEVATION** (metres) **STORAGE_VOLUME** (thousands m^3) **DISCHARGE** (m3/s) values. ELEVATION can have any datum. STORAGE VOLUME is the total storage volume in the basin at that elevation. DISCHARGE is the discharge from the basin at that elevation
INITIAL_WATER_LEVEL_IN_STORAGE – storage can be part full at start of storm (metres)
SURFACE_AREA – of onsite detention storage. Rain falling on this area is added to the inflow to the basin (hectares)
STORAGE_FACTOR – (decimal eg 0.9) a factor to adjust up or down the storage volumes in the elevation-storage table for local structure basins. Set to zero will pass the inflow through the structure with no flood routing ie outflow hydrograph is the same as inflow hydrograph - a quick way of switching off the storage routing effects.

OUTLET_TYPE – (#####HSQ, #####BOX, #####PIPE, #####WEIR or #####SCOUR)
INVERT_ELEVATION_AT_ENTRANCE – elevation of culvert/ weir invert at its upstream entrance (metres)
NUMBER_OF_OUTLETS_IN_THIS_BLOCK (eg 2 identical box culverts)

ENTRANCE_TYPE (1, 2 or 3)
BOX_CULVERT_WIDTH (mm)
BOX_CULVERT_DEPTH (mm)
PIPE_CULVERT_DIAMETER (mm)
ENTRANCE_COEFFICIENT – for entrance loss, eg 0.5
CULVERT_LENGTH (metres)
OUTLET_INVERT_ELEVATION – elevation of culvert/ weir invert at its downstream outlet (metres)
CULVERT_MANNING_N
WEIR_LENGTH (metres)
WEIR_COEFFICIENT (SI units, eg 1.70)

DISCHARGE_FACTOR (decimal eg 0.9) a factor to adjust up or down the elevation-discharge relation for culverts or weirs. Can be used to model culvert/ weir blockage by debris. Set to zero will fully block the culvert, weir or discharge in an HSQ relation. Set to 0.9, will reduce discharges by 10%
BLOCKAGE_TIME (minutes) time at which culverts, weirs, or discharges in an HSQ relation are partly or fully blocked. Set to a positive number (ie 120) will block outlets at 120 minutes. Left blank or set to zero, will block outlets at time zero. Set at a negative number (ie –99.0) will block outlets at the time of maximum rainfall intensity. Note- ALL outlets are blocked at the time specified for the first outlet in the runfile. If blockage times are specified for the second and later outlets, these are ignored and only the time specified for the first outlet is applied.

If type #####SCOUR :
Dimensions of the weir within which the scourable section is incorporated -
WEIR_CREST_LENGTH (metres)
WEIR_COEFFICIENT (SI units, eg 1.70)
Dimensions of the scourable weir -
SCOURABLE_WEIR_CREST_LENGTH – the length within the total weir length which scours out (metres)
Note, the initial scourable weir elevation is set equal to the weir crest elevation
SCOURABLE_WEIR_BOTTOM_ELEVATION – elevation which the scourable weir erodes down to (metres)
SCOURABLE_WEIR_TOP_WIDTH (in flow direction, metres) – the embankment cross section is trapezoidal with a top width and a bottom width
SCOURABLE_WEIR_BOTTOM_WIDTH (in flow direction, metres)
PILOT_CHANNEL_CREST_LENGTH a small length within the scourable weir where overflow and erosion commences (metres)
PILOT_CHANNEL_CREST_ELEVATION – an elevation just below the weir elevation where overflow commences (metres)
SCOUR_FACTOR – the volume of overflowing water required to erode 1 m^3 of soil from the scourable weir (eg. 200 m^3/ m^3)
TIME_WHEN_SCOUR_STARTS – you can nominate a time (minutes) before which scour will not occur.

If STRUCTURE_TYPE is #####H_S(TWF) :
TAILWATER_ELEVATION - a fixed water elevation (metres)

If STRUCTURE_TYPE is #####H_S(TWR) :
NUMBER_OF_POINTS_IN_TAILWATER_RATING_TABLE
Table of **TAILWATER_ELEVATION** (metres) and corresponding
DISCHARGE_IN_DOWNSTREAM_CHANNEL (m^3/s)

If STRUCTURE_TYPE is #####H_S(TWC) :
CHANNEL_BED_WIDTH **(metres)**
CHANNEL_SIDE_SLOPE (decimal ratio V:H eg 0.20)
CHANNEL_BED_SLOPE% - in downstream direction (eg 0.5%)
CHANNEL_MANNING_N
DOWNSTREAM_CHANNEL_BED_ELEVATION (metres)

%_PERVIOUS_FLOW_TO_OSD – for runoff from pervious or non-urban surfaces on a subarea, you can nominate the percentage which goes to the onsite detention storage, with the remainder bypassing the storage.
%_URBAN_FLOW_TO_OSD – for runoff from the urban part of the subarea, you can nominate the percentage which goes to the onsite detention storage, with the remainder bypassing the storage.

OUTLET_STRUCTURES_BLOCK:
NUMBER_OF_SUBAREAS_WITH_STORAGE_RESERVOIR/BASIN
DESCRIPTION_OF_OUTLET_STRUCTURE – 128 character description of the storage
SUBAREA_NAME – of each subarea which has a storage reservoir or flood detention basin
STRUCTURE_TYPE (#####H_S_Q, #####H_S, #####H_S(TWF), #####H_S(TWR) or #####H_S(TWC)

NUMBER_BLOCKS_OF_OUTLETS – eg 3 blocks, the first consisting of 2 identical box culverts, the second consisting of 3 identical pipe culverts, and the third consisting of a weir
SUBAREA_TO_WHICH_FLOWS_ARE_DIRECTED flows from the storage will go to the top or the bottom of this nominated subarea
DIRECT_TO_TOP_OR_BOTTOM_OF_SUBAREA (TOP or BOTTOM)
DELAY_OF_DIRECTED_FLOWS – hydrograph is delayed by this much in going to the nominated downstream subarea (minutes).

NUMBER_OF_POINTS_IN_ELEVATION-STORAGE-DISCHARGE_RELATION – number of points in the next table
Table of **ELEVATION** (metres) **STORAGE_VOLUME** (thousands m^3) **DISCHARGE** (m3/s) values **DIRECTED_TO_EACH_D/S SUBAREA**
ELEVATION can have any datum. STORAGE VOLUME is the total storage volume in the basin at that elevation. DISCHARGE is the discharge from the basin at that elevation
INITIAL_WATER_LEVEL_IN_STORAGE – storage can be part full at start of storm (metres)
SURFACE_AREA – of storage reservoir. Rain falling on this area is added to the inflow to the basin (hectares)
STORAGE_FACTOR – (decimal eg 0.9) a factor to adjust up or down the storage volumes in the elevation-storage table for local structure basins. Set to zero will pass the inflow through the structure with no flood routing ie outflow hydrograph is the same as inflow hydrograph - a quick way of switching off the storage routing effects.

OUTLET_TYPE (#####HSQ, #####BOX, #####PIPE, #####WEIR or #####SCOUR)
ENTRANCE_INVERT_ELEVATION – elevation of culvert/ weir invert at its upstream entrance (metres)
NUMBER_OF_OUTLETS_IN_THIS_BLOCK (eg 2 identical box culverts)
ENTRANCE_TYPE (1, 2 or 3)

BOX_CULVERT_WIDTH (mm)
BOX_CULVERT_DEPTH (mm)
PIPE_CULVERT_DIAMETER (mm)
ENTRANCE_COEFFICIENT – for entrance loss, eg 0.5
CULVERT_LENGTH (metres)
OUTLET_INVERT_ELEVATION – elevation of culvert/ weir invert at its downstream outlet (metres)
CULVERT_MANNING_N
WEIR_CREST_LENGTH (metres)
WEIR_COEFFICIENT (SI units, eg 1.70)
DISCHARGE_FACTOR (decimal eg 0.9) a factor to adjust up or down the elevation-discharge relation for culverts or weirs. Can be used to model culvert/ weir blockage by debris. Set to zero will fully block the culvert, weir or discharge in an HSQ relation. Set to 0.9, will reduce discharges by 10%
BLOCKAGE_TIME (minutes) time at which culverts, weirs, or discharges in an HSQ relation are partly or fully blocked. Set to a positive number (ie 120) will block outlets at 120 minutes. Left blank or set to zero, will block outlets at time zero. Set at a negative number (ie –99.0) will block outlets at the time of maximum rainfall intensity. Note- ALL outlets are blocked at the time specified for the first outlet in the runfile. If blockage times are specified for the second and later outlets, these are ignored and only the time specified for the first outlet is applied.

If type #####SCOUR :
Dimensions of the weir within which the scourable section is incorporated -
WEIR_CREST_LENGTH (metres)
WEIR_COEFFICIENT (SI units, eg 1.70)
Dimensions of the scourable weir -
SCOURABLE_WEIR_CREST_LENGTH – the length within the total weir length which erodes out (metres)
Note, the initial scourable weir elevation is set equal to the weir crest elevation
SCOURABLE_WEIR_BOTTOM_ELEVATION – elevation which the scourable weir erodes down to (metres)

SCOURABLE_WEIR_TOP_WIDTH (in flow direction, metres) – the embankment cross section is trapezoidal with a top width and a bottom width
SCOURABLE_WEIR_BOTTOM_WIDTH (in flow direction, metres)
PILOT_CHANNEL_CREST_LENGTH a small length within the scourable weir where overflow and erosion commences (metres)
PILOT_CHANNEL_CREST_ELEVATION – an elevation just below the weir elevation where overflow commences (metres)
SCOUR_FACTOR – the volume of overflowing water required to erode 1 m^3 of soil from the scourable weir (eg. 200 m^3/ m^3)
TIME_WHEN_SCOUR_STARTS – you can nominate a time (minutes) before which scour will not occur.

If STRUCTURE_TYPE is #####H_S(TWF) :
TAILWATER_ELEVATION - a fixed water elevation (metres)

If STRUCTURE_TYPE is #####H_S(TWR) :
NUMBER_OF_POINTS_IN_TAILWATER_RATING_TABLE
Table of **TAILWATER_ELEVATION** (metres) and corresponding
DISCHARGE_IN_DOWNSTREAM_CHANNEL (m^3/s)

If STRUCTURE_TYPE is #####H_S(TWC) :
CHANNEL_BED_WIDTH **(metres)**
CHANNEL_SIDE_SLOPE (decimal ratio V:H eg 0.20)
CHANNEL_BED_SLOPE% - in downstream direction (eg 0.5%)
CHANNEL_MANNING_N
DOWNSTREAM_CHANNEL_BED_ELEVATION (metres)

STORM_BLOCK:
NUMBER_OF_STORMS
DESCRIPTION_OF_STORM – 128 character description of the storm
CALCULATION_TIME_STEP – calculations are made at this time step (minutes)
TIME_STEP_FOR_OUTPUT_TO_META_FILE – to avoid large output files, you can write results at a longer time step. Must be a multiple of the calculation time step (minutes)

For #####START_RECORDED_RAIN
EVENT_DATE – text string, eg 01/01/2005
EVENT_TIME – text string, eg 0645
NUMBER_OF_RAIN_PERIODS – number of values in the hyetograph
TIME_STEP_OF_HYETOGRAPH – of each rain period (minutes)
RAIN_UNITS (MM/HOUR or MM/PERIOD or PERCENT)
NUMBER_OF_RAIN_GAUGES
RAIN_GAUGE_NAME

If RAIN_UNITS is MM/HOUR OR MM/PERIOD,
GAUGE_E GAUGE_N – East, North coordinates of the rain gauge location. Only needed to plot their location or if rainfall weights are calculated by WBNM. Must be consistent with subarea coordinate system. For a design storm where no actual gauge exists, use coordinates of the location at which the rainfall IFD data are specified.
RAINFALL_HYETOGRAPH - values in rows or columns, (mm/hour or mm/time period of hyetograph)

If RAIN_UNITS is PERCENT,
GAUGE_E GAUGE_N RAINTOTAL (mm)
RAINFALL_HYETOGRAPH - values in rows or columns, (percent of total depth in storm)

For #####START_DESIGN_RAIN_ARR1987 and
#####START_EMBEDDED_DESIGN_RAIN_ARR1987
BURST_ARI – average recurrence interval (1, 2, 5, 10, 20, 50, 100, 200, 500, years, PMP-use 9999)
BURST_DURATION – (minutes)

EVENT_ARI – for an embedded storm, the average recurrence interval of the longer storm event within which the design burst is embedded (1, 2, 5, 10, 20, 50, 100, 200, 500, years, PMP-use 9999)
EVENT_DURATION – for an embedded storm, the duration of the longer storm event within which the design burst is embedded (minutes)
AREAL_REDUCTION_FACTOR – reduction factor from point to areal rainfall (eg 0.90). If set at -1 WBNM calculates this based on the storm duration and catchment area, according to Australian Rainfall and Runoff 1987
LOCATION_OF_IFD_DATA (IFD_COEFFS_IN_IFD_FILE or …_IN_THIS_FILE)
PATHNAME_&_NAME_OF_IFD_DATAFILE - for IFD_COEFFS_IN_IFD_FILE, the name of the file containing the design IFD data
ZONE – zone 1 to 8 for design storm temporal patterns, as in Australian Rainfall and Runoff
MAP_NAME – for QA records, your map reference for the rain gauge location, not used in calculations
GAUGE_E GAUGE_N – East, North coordinates of rainfall station location
ELEVATION – elevation of rainfall station above sea level, used in PMP calculations (metres)
i0201 i0212 i0272 i5001 i5012 i5072 – design IFD data from Australian Rainfall and Runoff, 2 year 1 hour, 2 year 12 hour etc. (mm/hour)
F2 F50 – design IFD data from Australian Rainfall and Runoff
G – skew coefficient from Australian Rainfall and Runoff
AV_ANNUAL_RAIN – for QA records, the average annual rainfall on the catchment.
%ROUGH – for PMP calculations, the terrain roughness (%)
MOISTURE_ADJUSTMENT_FACTOR – for PMP calculations, the moisture adjustment factor (eg 0.65)
DESCRIPTION – for QA records, your comments

For #####START_DESIGN_RAIN_ARR2016
BURST_AEP – Annual exceedance probability (%) (63.32,50.0,20.0,10.0,5.0,2.0 1.0)
BURST_DURATION(min) (1,2,3,4,5,10,15,30,60,120,180,360,720,1440,2880,4320,5760,7200, 8640,10080) - in spectrum analysis only those coinciding with pattern/losses duras used.
BURST_PATTERN (Areal or Point) (10 for each Zone, AEP,DURA)(Areal >75km2,Point <= 75km2)
AREAL_REDUCTION_FACTOR – reduction factor from point to catchment wide (eg 0.90). If set at -1 WBNM calculates ARF based on the storm duration and catchment area, according to Australian Rainfall and Runoff 2016
PAC_SUBNAME (optional) subarea for which partial area check requested
LOCATION_OF_IFD_DATA (IFD_DATA_IN DATABASE_FILE) – no options at this time
FULL PATHNAME _OF_IFD_DATABASE_FILE – if the CD is the runfile directory and the IFD database is in the CD, only need local name
NUMBER OF GAUGES
IFD_DATABASE GAUGE NAME – must be exactly as in IFD database file
LOCATION_OF_PATTERN_DATA (PAT_DATA_IN REGION_FILE) – no options at this time
FULL PATHNAME _OF_PAT_FILE – if the CD is the runfile directory and PAT data is in the CD, only need local name
LOCATION_OF_CATCHMENT_DATA (CAT_DATA_IN_DATA_FILE) – no options at this time
FULL_ PATHNAME _OF_CATCHMENT_ DATA_FILE – if the CD is the runfile directory and the CAT data is in the CD, only need local name

For #####START_INPUT_RAINGAUGE_WEIGHTS
SUBAREA_NAME THIESSEN_WEIGHTS_FOR_EACH_GAUGE……..

eg for 3 rain gauges:	SUB1	0.1	0.3	0.6
	SUB2	1.0	0.0	0.0
	SUB3	0.0	1.2	0.0

Note, weights will normally sum to 1.00 for each subarea, but can be different, and this will weight the rainfall up or down, as in SUB3. We recommend that you use the weights to select the appropriate rain gauge and set all other weights to 0.0, as in SUB2 and SUB3.

Rainfall Losses:

INITIAL_LOSS – on pervious surfaces (mm)

IMP_I_L – initial loss on impervious surfaces of catchment (mm)
LOSS_RATE (mm/hour)
RUNOFF_PROP – runoff proportion (range 0 to 1.0)
F0 FC - Horton initial and final infiltration rates (mm/hour)
K – Horton time constant (1/hours)
For #####TIME_VARYING losses:
RAINFALL_LOSS_RATE_FOR_EACH_TIME_STEP – allows you to use a time varying loss rate, by specifying the value for each rainfall period, (values in rows or columns, mm/hour)
Note, Urban surface initial loss is set at zero for this case, and the same losses apply to all subareas

NUMBER_OF_RECORDED_HYDROGRAPHS
NUMBER_OF_RECORDED_HYDROGRAPH_ORDINATES
TIME_STEP – of recorded hydrograph (minutes)
SUBAREA_NAME – where the recorded hydrograph occurs
LOCATION_OF_RECORDED_HYDROGRAPH – can be at TOP or BOTTOM of subarea
RECD_HG_UNITS - STAGE or DISCHARGE – allows entry of either type & converts
RECORDED_HYDROGRAPH (values in rows or columns, m^3/s)
NUMBER_OF_POINTS_IN_RECD_HG_RATING_TABLE
ELEVATION value (m)
DISCHARGE value corresponding to ELEVATION (m^3/s)

NUMBER_OF_IMPORTED_HYDROGRAPHS – allows you to import a hydrograph into any subarea in the catchment. The hydrograph is added to the **top** of the subarea.
NUMBER_OF_IMPORTED_HYDROGRAPH_ORDINATES
TIME_STEP – of imported hydrograph (minutes)
SUBAREA_NAME – where the imported hydrograph is added
LOCATION_OF_IMPORTED_HYDROGRAPH – can be at TOP or BOTTOM of subarea
IMPORTED_HYDROGRAPH (values in rows or columns, m^3/s)

Units:

Coordinates of maps, subareas and rain gauges	(metres)
Subarea size	(hectares)
Urban percentage	(%)
Time, Delay time, Muskingum K	(minutes)
Elevation in storages	(metres)
Discharge	(m^3/s)
Storage volume	(thousands m^3)
Surface area of local/outlet structure storages	(hectares)
Culvert dimensions	(mm)
Weir length	(metres)
Weir coefficient	(SI units eg 1.70)
Stream channel dimensions	(metres)
Stream channel bed slope	(% eg 0.5)
Stream channel side slope	(decimal ratio V:H eg 0.20)
Tailwater elevation	(metres)
Percentage of pervious, urban runoff to local structure	(%)
Discharge Factor for culvert blockage	(decimal eg 0.9)
Storage Factor for flood detention basin volumes	(decimal eg 0.9)
Time of culvert blockage	(minutes)

Recorded Rainfall hyetograph	(mm/hour or mm/time period or percent)
Design Rainfall hyetograph	(mm/hour)
Rainfall period	(minutes)
Raingauge weighting factor	(decimal eg 0.9)
Area Reduction Factor	(decimal eg 0.95, use –1.0 for automatic adjustment according to Book 2, section 1.7 of Australian rainfall and Runoff 1987 or to ARR 2016 ARF procedure)

Terrain Roughness	(% eg 25)
Moisture Adjustment Factor	(decimal eg 0.63)

- uses PMP procedure of Australian Bureau of Meteorology).

Initial loss	(mm)
Continuing loss rate	(mm/hour)
Horton infiltration rates	(mm/hour)
Horton k	(1/hour eg 2.0)
Runoff proportion	(decimal eg 0.75)

NOTE: All elevations of water surfaces, culvert and weir inverts, channel levels etc are ELEVATIONS relative to your selected datum. Water DEPTHS are not used.