# WRF-Hydro hydro.namelist File with Description of Options

Below is an annotated hydro.namelist file. Notes and descriptions are indicated with <<-- Blue text.

```
&HYDRO_nlist
!!!! ---------------------- SYSTEM COUPLING -------------------- !!!!

! Specify what is being coupled:  1=HRLDAS (offline Noah-LSM), 2=WRF,
3=NASA/LIS, 4=CLM
sys_cpl = 1   <<-- Specify the coupling option; for offline runs, this will be option 1.

!!!! ------------------- MODEL INPUT DATA FILES -----------------!!!!

! Specify land surface model gridded input data file (e.g.: "geo_em.d03.nc")
GEO_STATIC_FLNM = "./DOMAIN/geo_em.nc"  <<-- Path to the geogrid file; which contains base
information on the LSM grid (this file is generally created via WPS).

! Specify the high-resolution routing terrain input data file (e.g.:
"Fulldom_hires.nc")
GEO_FINEGRID_FLNM = "./DOMAIN/Fulldom_hires.nc" <<-- Path to the routing stack, which
contains base information on the high-resolution routing grid. This file is generally created via the GIS
pre-processing tools.

! Specify the spatial hydro parameters file (e.g.: "HYDRO_TBL_2D.nc")
! If you specify a filename and the file does not exist, it will be created for
you.
HYDROTBL_F = "./DOMAIN/HYDRO_TBL_2D.nc" <<-- Path to the new 2d hydro parameters file. If this
file does not exist, it will be created for you based on HYDRO.TBL and the soil and land class grids found in
the geogrid netcdf file.

! Specify spatial metadata file for land surface grid. (e.g.:
"geospatial_data_template_land_GIS.nc")
LAND_SPATIAL_META_FLNM = "./DOMAIN/GEOGRID_LDASOUT_Spatial_Metadata.nc"
<<-- Path to the geospatial metadata file for your domain. This file is required if using any of the
io_form_outputs options (i.e., io_form_outputs > 0). This file is generally created via the GIS pre-processing
tools.

! Specify the name of the restart file if starting from restart...comment
out with '!' if not...
RESTART_FILE  = 'HYDRO_RST.2013-09-12_00:00_DOMAIN1'  <<-- Path to hydro restart file if
using; this contains a "warm" model state from a previous model run.

!!!! ---------------- MODEL SETUP OPTIONS-------------!!!!

! Specify the domain or nest number identifier...(integer)
```

```
IGRID = 1
```
<<-- Domain ID number. This comes from the WRF coupling framework and is intended to specify which nested domain you are running. For offline runs, this is not relevant HOWEVER this ID must match the number specified after DOMAIN in your forcing file names (e.g., the "3" in "2013091200.LDASIN_DOMAIN3").

```
! Specify the restart file write frequency...(minutes)
! A value of -99999 will output restarts on the first day of the month
only.
rst_dt = 120
```
<<-- Specify how often hydro restart files should be generated, in minutes. This should generally track your LSM restart file frequency (as specified in namelist.hrldas). A value of -99999 will simply output restarts on the start of each month, useful for longer model runs. Hydro restart files are generally quite large, so be cognizant of storage space and runtime impacts when specifying.

```
! Reset the LSM soil states from the high-res routing restart file
(1=overwrite, 0=no overwrite)
! NOTE: Only turn this option on if overland or subsurface routing is
active!
rst_typ = 1
```
<<-- Specify whether or not to use the soil conditions (soil moisture and ponded water) from the high-resolution hydro restart file, if "warm" starting the model with a provided HYDRO_RST file. If this option is 0, the LSM restart states will be used instead. IMPORTANT: If you are NOT running with terrain routing turned on, do not set this option to 1 as it may being in invalid values.

<<-- Options to specify whether restart files (both read in and output) should be in binary or netcdf format. Generally recommend using netcdf format (option 0) for both. -->>

```
! Restart file format control
rst_bi_in = 0       !0: use netcdf input restart file (default)
                    !1: use parallel io for reading multiple restart
files, 1 per core
rst_bi_out = 0      !0: use netcdf output restart file (default)
                    !1: use parallel io for outputting multiple restart
files, 1 per core

! Restart switch to set restart accumulation variables to 0 (0=no reset,
1=yes reset to 0.0)
RSTRT_SWC = 1
```
<<-- Specify whether or not to reset any accumulated output variables to 0 (option 1) or to continue accumulating from the values in the hydro restart file (option 0). Note that this only applies to the hydrologic model outputs; the LSM outputs will always continue to accumulate from the LSM restart file.

```
! Specify baseflow/bucket model initialization...(0=cold start from table,
1=restart file)
GW_RESTART = 1
```
<<-- Specify whether to initialize the groundwater bucket states from the hydro restart file (option 1) or "cold" start the bucket states from the parameter table, GWBUCKPARM.TBL or GWBUCKPARM.nc.

```
!!!! ------------------ MODEL OUTPUT CONTROL------------- !!!!

! Specify the output file write frequency...(minutes)
out_dt = 60   <<-- Timestep for hydro model outputs, in minutes. This covers all output options listed below (CHRTOUT, GWOUT, RTOUT, LAKEOUT, etc.) so be cognizant of impacts on disk space and runtime when specifying.

! Specify the number of output times to be contained within each output history file...(integer)
!   SET = 1 WHEN RUNNING CHANNEL ROUTING ONLY/CALIBRATION SIMS!!!
!   SET = 1 WHEN RUNNING COUPLED TO WRF!!!
SPLIT_OUTPUT_COUNT = 1  <<-- Number of timesteps to put in a single output file.

! Specify the minimum stream order to output to netcdf point file...(integer)
! Note: lower value of stream order produces more output.
order_to_write = 1  <<-- Lowest stream order to include in output files. Selecting 1 gives you output for every reach/channel cell, selecting a higher order number gives you fewer channel output elements.

! Flag to turn on/off new I/O routines: 1 = with scale/offset/compression,
! 2 = with scale/offset/NO compression,
! 3 = no scale/offset/WITH compression,
! 4 = no scale/offset/NO compression
io_form_outputs = 1  <<-- Specify which output option to use.

! Realtime run configuration option:
! 0=all (default), 1=analysis, 2=short-range, 3=medium-range,
4=long-range, 5=retrospective
io_config_outputs = 5   <<-- Specify which configuration of output variables to generate.

! Option to write output files at time 0 (restart cold start time): 0=no,
1=yes (default)
t0OutputFlag = 1  <<-- Select whether or not to create outputs at the initial timestep.

! Options to output channel & bucket influxes to drive FORCE_TYPE 9.
! Nonzero choice requires that out_dt above matches NOAH_TIMESTEP in
namelist.hrldas.
! 0=None (default), 1=channel influxes (qSfcLatRunoff, qBucket)
! 2=channel+bucket fluxes    (qSfcLatRunoff, qBucket,
qBtmVertRunoff_toBucket)
! 3=channel accumulations    (accSfcLatRunoff, accBucket) *** NOT TESTED
***
```

```
output_channelBucket_influx = 0  <<-- Select which additional channel and groundwater bucket outputs will be generated. These additional variables can be used to drive the channel-only model.

<<-- Specify which outputs to generate for the run. -->>
! Output netcdf file control
<<-- Channel output variables (streamflow, velocity, head, etc.) -->>
CHRTOUT_DOMAIN = 1           ! Netcdf point timeseries output at all
                             channel points (1d)
                             ! 0 = no output, 1 = output
<<-- Streamflow for forecast points (gridded routing) or Route Link gages (reach routing) in netcdf format -->>
CHANOBS_DOMAIN = 0           ! Netcdf point timeseries at forecast points
                             or gage points (defined in Routelink)
                             ! 0 = no output, 1 = output at forecast
                             points or gage points.
<<-- Channel output variables on the 2D grid (gridded channel routing only) -->>
CHRTOUT_GRID = 0             ! Netcdf grid of channel streamflow values
                             (2d)
                             ! 0 = no output, 1 = output
                             ! NOTE: Not available with reach-based
                          routing
<<-- Variables passed between the routing code and the LSM (generally used for diagnostics only) -->>
LSMOUT_DOMAIN = 0            ! Netcdf grid of variables passed between LSM
                             and routing components (2d)
                             ! 0 = no output, 1 = output
                             ! NOTE: No scale_factor/add_offset available
<<-- Terrain variables on the high-res grid; these files can be large -->>
RTOUT_DOMAIN = 1             ! Netcdf grid of terrain routing variables on
                             routing grid (2d)
                             ! 0 = no output, 1 = output
<<-- Groundwater bucket outputs (level, inflow, outflow) -->>
output_gw = 1                ! Netcdf GW output
                             ! 0 = no output, 1 = output
<<-- Lake output variables if lakes are included in the domain (level, inflow, outflow) -->>
outlake  = 1                 ! Netcdf grid of lake values (1d)
                             ! 0 = no output, 1 = output
<<-- Streamflow for forecast points (gridded routing) or Route Link gages (reach routing) in txt format -->>
frxst_pts_out = 0            ! ASCII text file of forecast points or gage
                             points (defined in Routelink)
                             ! 0 = no output, 1 = output


!!!! -------PHYSICS OPTIONS AND RELATED SETTINGS --------- !!!!
```

```
! Switch for terrain adjustment of incoming solar radiation: 0=no, 1=yes
! Note: This option is not yet active in Verion 1.0...
!      WRF has this capability so be careful not to double apply the
correction!!!
TERADJ_SOLAR = 0

! Specify the number of soil layers (integer) and the depth of the bottom
of each layer... (meters)
! Notes: In Version 1 of WRF-Hydro these must be the same as in the
namelist.input file.
!      Future versions will permit this to be different.
NSOIL=4   <<-- Number of soil layers
ZSOIL8(1) = -0.10 <<-- Depth of bottom boundary of top soil layer in meters
ZSOIL8(2) = -0.40 <<-- Depth of bottom of second soil layer in meters (note that this is specified
differently than the namelist.hrldas; this is total depth from the surface instead of thickness)
ZSOIL8(3) = -1.00  <<-- Depth of bottom of third soil layer in meters (note that this is specified
differently than the namelist.hrldas; this is total depth from the surface instead of thickness)
ZSOIL8(4) = -2.00 <<-- Depth of bottom of the last soil layer in meters (note that this is specified
differently than the namelist.hrldas; this is total depth from the surface instead of thickness)

! Specify the grid spacing of the terrain routing grid...(meters)
DXRT = 250.0  <<-- Resolution of the high-res routing grid

! Specify the integer multiple between the land model grid and the terrain
routing grid...(integer)
AGGFACTRT = 4  <<-- Aggregation factor between the high-res routing grid and the LSM grid; e.g., a 100-m
routing grid resolution and a 1km LSM grid resolution would be AGGFACTRT = 10.

! Specify the channel routing model timestep...(seconds)
DTRT_CH = 6   <<-- Timestep for the channel routing module to cycle, in seconds; model runtime will be
sensitive to this timestep, so choose something appropriate for your domain resolution (finer resolutions
generally require finer timesteps).

! Specify the terrain routing model timestep...(seconds)
DTRT_TER = 10  <<-- Timestep for the terrain routing module to cycle, in seconds; model runtime will be
sensitive to this timestep, so choose something appropriate for your domain resolution (finer resolutions
generally require finer timesteps).

! Switch to activate subsurface routing...(0=no, 1=yes)
SUBRTSWCRT = 1   <<-- Turn on/off subsurface routing module.
```

```
! Switch to activate surface overland flow routing...(0=no, 1=yes)
OVRTSWCRT = 1
```
<<-- Turn on/off overland routing module.

```
! Specify overland & subsurface flow routing option: 1=Seepest Descent(D8)
2=CASC2D (not active)
! NOTE: Currently only option 1 is supported
rt_option = 1
```
<<-- For both terrain routing modules, specify whether flow should follow the steepest path (option 1) or multi-directional (option 2). Option 2 is currently unsupported.

```
! Switch to activate channel routing...(0=no, 1=yes)
CHANRTSWCRT = 1
```
<<-- Turn on/off channel routing module.

```
! Specify channel routing option: 1=Muskingam-reach, 2=Musk.-Cunge-reach,
3=Diff.Wave-gridded
channel_option = 3
```
<<-- If channel routing module is active, select which physics option to use.

```
! Specify the reach file for reach-based routing options (e.g.:
"Route_Link.nc")
!route_link_f = "./DOMAIN/RouteLink.nc"
```
<<-- If using one of the reach-based channel routing options (channel_option = 1 or 2), specify the path to the route link file, which provides the channel-reach parameters.

```
! Specify the lake parameter file (e.g.: "LAKEPARM.nc" for netcdf or
"LAKEPARM.TBL" for text)
route_lake_f = "./DOMAIN/LAKEPARM.nc"
```
<<-- If lakes are active, specify the path to the lake parameter file, which provides the lake parameters.

```
! Switch to activate baseflow bucket model...(0=none, 1=exp. bucket,
2=pass-through)
GWBASESWCRT = 1
```
<<-- Turn on/off the groundwater bucket module. Option 1 activates the exponential bucket model, option 2 bypasses the bucket model and dumps all flow from the bottom of the soil column directly into the channel, and option 0 creates a sink at the bottom of the soil column (water draining from the bottom of the soil column leaves the system, so note that this option will not have water balance closure).

```
! Groundwater/baseflow 2d mask specified on land surface model grid (e.g.:
"GWBASINS.nc" for netcdf
! or "gw_basns.txt" for ascii). Note: Only required if baseflow bucket
model is active and UDMP_OPT=0.
gwbasmskfil = "./DOMAIN/GWBASINS.nc"
```
<<-- For configurations where the bucket or pass-through groundwater modules are active, provide the path to the 2d ascii or netcdf file (LSM grid resolution) that maps the groundwater basin IDs. Bucket parameters will be specified through the GWBUCKPARM.TBL or GWBUCKPARM.nc file, whose IDs should match those in the groundwater basin mask file.

```
! Groundwater bucket parameter file (e.g.: "GWBUCKPARM.nc" for netcdf or
"GWBUCKPARM.TBL" for text)
GWBUCKPARM_file = "./DOMAIN/GWBUCKPARM.nc"
```
<<-- For configurations where the groundwater bucket model is active, specify the path to the bucket parameter file, which provides bucket parameters by catchment.

```
! User defined mapping, such NHDPlus: 0=no (default), 1=yes
UDMP_OPT = 0
```
<<-- If 1, this tells the model to use a "user-defined mapping" scheme to translate between terrain and groundwater flow and reaches, e.g., NHDPlus.

```
! If on, specify the user-defined mapping file (e.g.: "spatialweights.nc")
!udmap_file = "./DOMAIN/spatialweights.nc"
```
<<-- If UDMP_OPT=1 (user defined mapping is active), provide the path to the required spatial weights file, which maps between grid cells and catchments.